Curriculum and Detailed Syllabi

For

B.Tech. Information Technology

(I to VIII semester)

For Students admitted from 2018 onwards

Thiagarajar College of Engineering

(A Govt. Aided, Autonomous Institution, Affiliated to Anna University)

Madurai – 625 015, Tamil Nadu

OUTCOME BASED EDUCATION

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

Contents approved from 56th to 60th Academic Council meeting

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING

(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)

MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41
Fax: 0452 2483427
Web: www.tce.edu

VISION AND MISSION OF THE INSTITUTION

Vision

World class quality technical education with strong ethical values.

Mission

We at TCE shall strive continuously,

- Academic excellence in Science, Engineering and Technology through dedication to duty, commitment to research, innovation in learning and faith in human values.
- Enable the students to develop into outstanding professionals with high ethical standards capable of creating, developing and managing global engineering enterprises.
- Fulfill expectations of the society and industry by equipping students with state of art technology resources for developing sustainable solutions.
- Achieve these through team efforts making Thiagarajar College of Engineering the socially diligent trend setter in technical education.

VISION

Evolve into a **Centre of Excellence for Education and Research** in Information Technology.

MISSION

- Attaining academic excellence through well designed curriculum adaptable to dynamic technological needs, competent faculty and innovative teaching-learning process.

- Promoting collaborative research through special interest groups, state of the art research labs and industry institute interactions.

- Facilitating value added courses to produce highly competent and socially conscious information technology professionals and entrepreneurs.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Educational Objectives
B.Tech (Information Technology) Programme

PEO 1. Graduates of the programme will provide IT solutions to address the business and societal needs.

PEO 2. Graduates of the programme will contribute significantly in the technological developments of Information Technology through research practices.

PEO 3. Graduates of the programme will hone their professional expertise in quest for improved career opportunities through sustained learning.

PEO 4. Graduates of the programme will lead a team of diversified professionals with good communication skills, leadership virtues and professional ethics.

Programme Specific Outcomes

B.Tech (Information Technology) Programme

Upon the successful completion of B-Tech Information Technology, the students will be able to:

PSOs for B.Tech Information Technology		Corresponding POs
PSO1	Provide appropriate IT solutions in Data Engineering, Distributed Computing, Information Security and Mobile Technologies domains.	PO1, PO2, PO3, PO4
PSO2	Select suitable computer-based tools for the analysis, design and development of IT based systems adhering to professional standards and practices.	PO5, PO6
PSO3	Exhibit teamwork skills with professional ethics and serve as effective member of societal and multidisciplinary projects	PO7, PO8, PO9, PO10, PO11, PO12

B.TECH SCHEDULING OF COURSES 2018-19

Semester	Theory					Theory cum Practical	Practical			Mandatory Audit Courses	Credits
	1	2	3	4	5	6	7	8	9	10	
I	18MA110 Engineering Calculus (4)	18PHB20 Physics (3)	18CHB30 Chemistry (3)	18EG180 English (2)	18ES150 Engineering Exploration (3)	18ME160 Engineering Graphics (4)	18EG170 English Laboratory (1)	18PH180 Physics Laboratory (1)	18CH190 Chemistry Laboratory (1)	-	22
II	18MA210 Matrices and Ordinary Differential Equations (3)	18IT220 Problem Solving Using Computers (3)	18IT230 Operating Systems (3)	18IT240 Computer Organization and Design (3)		18IT260 Essentials of Information Technology (3)	18IT270 Python Programming Lab. (1)	18IT280 Workshop (1)	18ES290 Lateral Thinking (1)	18CHAA0 Environmental Sciences	18
III	18IT310 Discrete Mathematics (3)	18IT320 Object Oriented Programming (3)	18IT330 Software Engineering (3)	18IT340 Data Structures (3)		18IT360 IT operations and Management (3)	18IT370 Object Oriented Programming Lab (1)	18IT380 Data Structures Lab (1)	18ES390 Design Thinking (2)	-	19
IV	18IT410 Probability and Statistics (3)	18IT420 Algorithm Design Principles (3)	18IT430 Computer Networks (3)	18IT440 Database Management Systems (3)	18YYFX0 Foundation Elective (3)	18EG460 Professional Communication (2)	18IT470 Computer Networks Lab. (1)	18IT480 Database Management Systems Lab (1)	18IT490 Project Management (3)	18CHAB0 Constitution of India	22
V	18IT510 Web Technologies (3)	18IT520 Information Security (3)	18IT530 Data Mining (3)	18IT540 Accounting and Finance (3)	18YYGX0 Gen. Elective (3)	18ITPX0 Prog. Elective (3)	18IT570 Web Technologies Lab. (1)	18IT580 Information Security Lab (1)	18ES590 System Thinking (2)	18CHAC0 Essence of Indian Knowledge	22
VI	18IT610 Cloud Computing (3)	Engineering Science Elective 18YYEX0 (3)	18IT630 Programming for Internet of Things (3)	18ITPX0 Prog. Elective (3)	Prog. Elective / Foundation Elective (3)	18IT660 Mobile Application Development (3)	18IT670 Cloud Computing Lab (1)		18ES690 Engineering Design Project (3)	-	22
VII	18IT710 Human Computer Interaction (3)	18ITPX0 Prog. Elec. (3)	18ITPX0 Prog. Elec (3)	18ITPX0 Prog. Elec. (3)	Prog. Elective. / Gen. Elective (3)		18IT770 Virtual Platforms Lab (1)	18IT780 Human Computer Interaction Lab.(1)	18ES790 Capstone Design Project (3)	-	20
VIII	18ITPX0 Prog. Elec. (3)	18ITPX0 Prog. Elec. (3)		-	-	-	-	-	18IT810 Project (9)	-	15

Total Credits:160

Passed in Board of Studies Meeting on 4.07.2020

Approved in 60th Academic Council Meeting on 25.7.2020

Humanities and Social Science	**Engineering Science**	**Basic Science**	**Audit Courses**
Core Courses	**Programme Electives**	**General/Foundation Elective**	**Project**
General/Foundation/Programme Elective			

Graduate Attributes defined by NBA

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

GA vs. PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
GA1												
GA2												
GA3												
GA4												
GA5												
GA6												
GA7												
GA8												
GA9												
GA10												
GA11												
GA12												

Rationale behind the mapping of PEOs and Mission

PEOs	Mission – 1 Academic Excellence	Mission – 2 Collaborative Research	Mission 3 – Transferable Skills
Design and development of IT solutions to address business and societal needs	**3** Academic excellence is achieved by incorporating emerging trends in curriculum, adopting innovating teaching learning process and developing working models and applications	**2** Knowledge in research and design is improved by participating in research-based SIG activities, projects, and industry interactions	**3** Professionalism in technology is obtained by developing working models and applications in project teams.
Contribution to technology development through research practice	**2** Academic excellence is attained by inculcating research practice and methodology through courses and projects	**3** Knowledge in research is improved by participating in research-based SIG activities, inter-disciplinary projects, and internship opportunities in higher learning institutions	**2** High competent professionalism is obtained by team participation in technical design contests and events for product development
Professional expertise with improved career opportunities and sustained learning	**3** Academic excellence is attained through participation in self learning courses and motivation and mentorship by competent faculty	**2** Knowledge in research is improved by doing collaborative and inter-disciplinary projects in teams	**2** Leadership and professional qualities are obtained by providing technology-based solutions to social relevant problems through project teams
Possession of leadership virtues and professional ethics	**2** Academic excellence is attained by assigning team projects to improve their communication skills and ethical practices	**2** Knowledge in research is improved by participating and organizing SIG-based technical contests, design and development of products	**3** Leadership virtues and professional ethics are improved through extra-curricular activities and organizing technical/non-technical events

The recommended distribution of credits for each category is given Table 1.

Table1: Credit Distribution

S.No	Category	Credits (Regular)	Credits (Lateral)
A.	**Foundation Courses**	**53 - 58**	**23-28**
	Humanities and Social Science (HSS)	9 - 11	6-8
	Basic Science (BS)	21	6
	Engineering Science (ES)	23-26	11-14
B.	**Professional Core Courses**	**55**	**45**
C.	**Elective Courses**	**24 – 48**	**24 – 48**
	Programme specific Elective	12 - 24	12-24
	Programme Elective for Expanded Scope	6 -12	6-12
	General Elective	3 - 6	6
	Foundation Elective	3 - 6	6
D.	Project, Seminar, Internship in industry or at Higher Learning institutions	**15**	**15**
E.	Mandatory Courses prescribed by AICTE/UGC **(Not to be included for CGPA)**	**-**	**-**
	Minimum Credits to be earned for the award of the Degree	**160** (from A to D) and the successful completion of Mandatory Courses	**120** (from A to D) and the successful completion of Mandatory Courses

4.2.1 Personality and Character Development:

All students shall register, on admission, in any one of the personality and character development programmes (NCC/NSS) and undergo training and attends camps as prescribed by the respective officers / coordinators. The training shall include classes on hygiene and health awareness and also training in first aid.

- **National Cadet Corps (NCC)** will have a number of parades/camps specified by the NCC officer.
- **National Service Scheme (NSS)** will have social service activities in and around the college specified by the NSS coordinator
- **Sports, games, drills and physical exercises** specified by the Physical Director

While the training activities will normally be during weekends, the camp will normally be during vacation period. Every student shall put in a minimum attendance in the training and attend the camp. The training and camps shall be completed during the first year of the programme. However, for valid reasons, the Principal may permit a student to complete this requirement in the second year.

4.3 In assigning the credits for the courses, 1 hour lecture/week, 1 hour tutorial/week, 2 hours practical/week, 2 hours project work or seminar/week is equivalent to 1 credit.

THIAGARAJAR COLLEGE OF ENGINEERING, MADURAI- 625 015

(A Govt. Aided, ISO 2000:2008 certified Autonomous Institution affiliated to Anna University)

CDIO-CATEGORIZATION OF COURSES

Degree: B.Tech **Programme: INFORMATION TECHNOLOGY**

A. Foundation Courses: **Total Credits to be earned: 53-58**

a. Humanities and Social Science 9-11

S.No	Course Code	Name of the Course	Number of Hours / Week			Credit	Prerequisite
			L	T	P		
THEORY							
1.	18EG180	English	2	0	0	2	NIL
2.	18IT490	Project Management	3	0	0	3	NIL
3.	18IT540	Accounting and Finance	3	0	0	3	NIL
THEORY CUM PRACTICAL							
4.	18EG460	Professional Communication	1	0	2	2	NIL
PRACTICAL							
5.	18EG170	English Laboratory	0	0	2	1	NIL

b. Basic Science 21

S.No	Course Code	Name of the Course	Number of Hours / Week			Credit	Prerequisite
			L	T	P		
THEORY							
1.	18MA110	Engineering Calculus	3	1	0	4	NIL
2.	18PHB20	Physics	3	0	0	3	NIL
3.	18CHB30	Chemistry	3	0	0	3	NIL
4.	18MA210	Matrices and Ordinary Differential Equations	3	0	0	3	NIL
5.	18IT310	Discrete Mathematics	3	0	0	3	NIL
6.	18IT410	Probability and Statistics	3	0	0	3	NIL
THEORY CUM PRACTICAL							
PRACTCIAL							
7.	18PH180	Physics Lab	0	0	2	1	NIL
9.	18CH190	Chemistry Lab	0	0	2	1	NIL

c. Engineering Science 23-26

S.No	Course Code	Name of the Course	Number of Hours / Week			Credit	Prerequisite
			L	T	P		
THEORY							
1.	18ES150	Engineering Exploration	3	0	0	3	NIL
2.	18IT220	Problem Solving Using Computers	3	0	0	3	NIL
3.	18ES390	Design Thinking	1	0	2	2	NIL
THEORY CUM PRACTICAL							
5	18ME160	Engineering Graphics	3	0	2	4	NIL
6	18IT360	IT operations and Management	2	0	2	3	NIL
7	18IT361	IT operations and Management	2	0	2	3	NIL
8.	18IT630	Programming for Internet of Things	2	0	2	3	18IT430
9	18ES590	System Thinking	1	0	1	2	NIL
PRACTCIAL							
10	18IT280	Workshop	0	0	2	1	NIL
11	18ES290	Lateral Thinking	0	0	2	1	NIL

c.1.Engineering Science Electives **(3)**

S.No	Course Code	Name of the Course	Number of Hours / Week			Credit	Prerequisite
			L	T	P		
THEORY							
1.	18ITEA0	Data Analytics	3	0	0	3	NIL
2.	18MTEA0	Integrated Product Development	3	0	0	3	NIL
3.	18MTEB0	Battery Management System	3	0	0	3	NIL
4.	18MEEA0	Total quantity management	3	0	0	3	NIL
5	18CEEA0	Geology	3	0	0	3	NIL
6	18CEEB0	Building Planning and Services	3	0	0	3	NIL
7	18CEEC0	Sustainable Development	3	0	0	3	NIL
8	18CEED0	Energy Science and Engineering	3	0	0	3	NIL
9	18ECEA0	Introduction To MEMS	3	0	0	3	NIL
10	18ECEB0	Foundations FOR Machine Learning	3	0	0	3	NIL
11	18ECEC0	IOT Sensors and Device	3	0	0	3	NIL
12	18ECED0	Blockchain Technology	3	0	0	3	NIL
13	18ECEE0	5G Wireless Networks	3	0	0	3	NIL
14	18ECEA0	Introduction To MEMS	3	0	0	3	NIL
THEORY CUM PRACTICAL							
5	18CSEA0	Data Science using Python	2	0	2	3	NIL

B. Professional Core Courses: **Credits to be earned: 55**

S.No	Course Code	Name of the Course	Number of Hours / Week			Credit	Prerequisite
			L	T	P		
THEORY							
1.	18IT230	Operating Systems	3	0	0	3	NIL
2.	18IT240	Computer Organization and Design	3	0	0	3	NIL
3.	18IT320	Object Oriented Programming	3	0	0	3	NIL
4.	18IT330	Software Engineering	3	0	0	3	NIL
5.	18IT340	Data Structures	3	0	0	3	NIL
6.	18IT420	Algorithm Design Principles	3	0	0	3	NIL
7.	18IT430	Computer Networks	3	0	0	3	NIL
8.	18IT440	Database Management Systems	3	0	0	3	NIL
9.	18IT510	Web Technologies	3	0	0	3	NIL
10.	18IT520	Information Security	3	0	0	3	NIL
11.	18IT530	Data Mining	3	0	0	3	NIL
12.	18IT610	Cloud Computing	3	0	0	3	NIL
13.	18IT710	Human Computer Interaction	3	0	0	3	NIL
THEORY CUM PRACTICAL							
14.	18IT260	Essentials of Information Technology	2	0	2	3	NIL
15.	18IT660	Mobile Application Development	2	0	2	3	18IT320
PRACTCIAL							
16.	18IT270	Python Programming Lab.	0	0	2	1	NIL
17.	18IT370	Object Oriented Programming Lab	0	0	2	1	NIL
18.	18IT380	Data Structures Lab	0	0	2	1	NIL
19.	18IT470	Computer Networks Lab.	0	0	2	1	NIL
20.	18IT480	Database Management Systems Lab	0	0	2	1	NIL
21	18IT570	Web Technologies Lab.	0	0	2	1	NIL
22	18IT580	Information Security Lab	0	0	2	1	NIL
23	18IT670	Cloud Computing Lab	0	0	2	1	NIL
24	18IT770	Virtual Platforms Lab	0	0	2	1	NIL
25	18IT780	Human Computer Interaction Lab	0	0	2	1	NIL

C. Elective Courses: **Credits to be earned: 24-48**

a. Programme Specific Elective **Credits to be earned: 12-24**

S.No	Course Code	Name of the Course	Number of Hours / Week			Credit	Prerequisite
			L	T	P		
Data Engineering							
1.	18ITPA0	Machine Learning	3	0	0	3	18IT530
Distributed System							
2.	18ITPD0	Distributed Application Development	3	0	0	3	NIL
3.	18ITPG0	Service Oriented Computing	3	0	0	3	NIL
Information Security							

4.	18ITPM0	Ethical Hacking	3	0	0	3	18IT430
Mobile Technologies							
5.	18ITPJ0	Wireless and Mobile Communication	3	0	0	3	18IT430
6.	18ITPL0	Cyber Physical Systems	3	0	0	3	NIL
Cognitive Science							
7.	18ITPH0	Computer Vision	3	0	0	3	NIL
Software Design and Development							
8.	18ITPQ0	Software Testing	3	0	0	3	NIL
9.	18ITPR0	C# and .NET FRAMEWORK	3	0	0	3	18IT320
Supported Courses							
10.	18ITPS0	Theory of Computation	3	0	0	3	18IT310
11.	18ITPT0	Principles of Compiler Design	3	0	0	3	18IT310

b. Programme Specific Elective for Expanded Scope **Credits to be earned: 6-12**

S.No	Course Code	Name of the Course	Number of Hours / Week			Credit	Prerequisite
			L	T	P		
Data Engineering							
12.	18ITPB0	Deep Learning	3	0	0	3	NIL
13.	18ITPC0	Information Retrieval	3	0	0	3	NIL
14.	18IT2D0	Data Science And AI Applicatons	2	0	0	2	NIL
Distributed System							
15.	18ITPE0	Fog Computing	3	0	0	3	18IT430 18IT610
16.	18ITPF0	Software Defined Networks	3	0	0	3	18IT430
17.	18CS1C0	Containerization Technologies(COMMON TO IT AND CSE)	1	0	0	1	NIL
Information Security							
18.	18ITPN0	Cyber forensics	3	0	0	3	NIL
19.	18ITPP0	Blockchain Technologies	3	0	0	3	18IT520
20.	18IT2B0	Penetration Testing Methodologies	2	0	0	2	NIL
21.	18IT2C0	Edge And Mobility Network Security Solutions	2	0	0	2	NIL
Mobile Technologies							
22.	18IT2A0	Multiplatform Mobile Application Development	2	0	0	2	NIL

C. General Elective **Credits to be earned: 3-6**

S.No	Course Code	Name of the Course	Number of Hours / Week			Credit	Prerequisite
			L	T	P		
1.	18ITGA0	Database Management System	3	0	0	3	NIL
2.	18ITGB0	Python for Data science	3	0	0	3	NIL
3.	18ITGC0	Object Oriented Programming using Java	3	0	0	3	NIL
4.	18ITGD0	Software Engineering	3	0	0	3	NIL
5.	18ITGE0	Cloud Technologies	3	0	0	3	NIL
6.	18ITGF0	Assistive Technology	3	0	0	3	NIL

d. Foundation Elective **Credits to be earned:3-6**

D. Project,Seminar,Internship in industry or Higher Learning institutions **Credits to be earned: 15**

S.No	Course Code	Name of the Course	Number of Hours / Week			Credit	Prerequisite
			L	T	P		
7.	18ES690	Engineering Design Project	0	0	6	3	-
8.	18ES790	Capstone Design Project	0	0	6	3	-
9.	18IT810	Project	0	0	18	9	-

E. MANDATORY COURSES (Not to be included for CGPA)

S.No	Course Code	Name of the Course	**Number of Hours / Week**			Credit	Semester
			L	T	P		
THEORY							
1.	18CHAA0	Environmental Sciences	1	-	1	-	II
2	18CHAB0	Constitution of India	1	-	1	-	IV
3.	18CHAC0	Essence of Indian Knowledge	1	-	1	-	V

CURRICULUM AND DETAILED SYLLABI

FOR

B.E. / B.Tech. DEGREE PROGRAMME

FIRST SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41
Fax: 0452 2483427

Passed in Board of Studies on 14.07.2018 Approved in 56th Academic Council Meeting on 21.07.2018

Web: www.tce.edu

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E. / B.Tech. Degree Programmes

COURSES OF STUDY
(For the candidates admitted from 2018-19 onwards)

FIRST SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week L	T	P	credits
THEORY						
18MA110	Engineering Calculus	BS	3	1	-	4
18PHA20/ 18PHB20/ 18PHC20	Physics	BS	3	-	-	3
18CHA30/ 18CHB30/ 18CHC30	Chemistry	BS	3	-	-	3
18EG140	English	HSS	2	-	-	2
18ES150	Engineering Exploration	ES	3	-	-	3
THEORY CUM PRACTICAL						
18ME160	Engineering Graphics	ES	3	-	2	4
PRACTICAL						
18EG170	English Laboratory	HSS	-	-	2	1
18PH180	Physics Laboratory	BS	-	-	2	1
18CH190	Chemistry Laboratory	BS	-	-	2	1
Total			**17**	**1**	**8**	**22**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
1 Hour Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2018-19 onwards)

FIRST SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	18MA110	Engineering Calculus	3	50	50	100	25	50
2	18PHA20/ 18PHB20/ 18PHC20	Physics	3	50	50	100	25	50
3	18CHA30/ 18CHB30/ 18CHC30	Chemistry	3	50	50	100	25	50
4	18EG140	English	3	50	50	100	25	50
5	18ES150	Engineering Exploration	3	50	50	100	25	50
THEORY CUM PRACTICAL								
6	18ME160	Engineering Graphics	3	50	50	100	25	50
PRACTICAL								
7	18EG170	English Laboratory	3	50	50	100	25	50
8	18PH180	Physics Laboratory						
9	18CH190	Chemistry Laboratory	3	50	50	100	25	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** Terminal Examination will be conducted for maximum marks of 100 and subsequently be reduced to 50 marks for the award of terminal examination marks

18MA110	ENGINEERING CALCULUS

Category	L	T	P	Credit
BS	3	1	0	4

Preamble

This course aims to convey to the student a sense of the utility of calculus and develop technical competence. This course is designed to implement the calculus through geometrically, numerically, algebraically and verbally. Students will apply the main tools for analyzing and describing the behavior of functions of single and multi variables: limits, derivatives, integrals of single and multi variables to solve complex engineering problems using analytical methods and MATLAB.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the concept of functions, limits and continuity	Understand
CO2	Compute derivatives and apply in solving engineering problems	Apply
CO3	Employ partial derivatives to find maxima minima of functions of multi variables	Apply
CO4	Demonstrate and apply the techniques of integration	Apply
CO5	Apply integrals of multivariable to find areas enclosed between two curves and volume enclosed between surfaces	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M								
CO2	S	S	M	M								
CO3	S	S	S	M								
CO4	S	S	S	M								
CO5	S	S	S	M								
S- Strong; M-Medium; L-Low												

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	10	10	10	0
Understand	30	30	30	30
Apply	60	60	60	70
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1(CO1)

1. Define function and limit.
2. Estimate the value of $\lim\limits_{x\to 0}\dfrac{\sin x}{\sin \pi x}$.
3. If $f(x)$ is continuous on $(-\infty,\infty)$, what can you say about its graph?

Course Outcome 2(CO2)

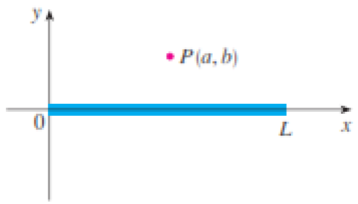
1. What is wrong with this equation $\frac{x^2+x-6}{x-2}=x+3$ and investigate why the equation $\lim\limits_{x\to 2}\dfrac{x^2+x-6}{x-2}=\lim\limits_{x\to 2}(x+3)$ is correct.
2. Between 0^{o}C and 30^{0}C , the volume V (in cubic centimeters) of 1 kg of water at a temperature T is given approximately by the formula V = 999.87 - 0.06426T + $0.0085043T^2$ - $0.0000679T^3$, Compute the temperature at which water has its maximum density.
3. The voltage, *v*, across a capacitor of capacitance*,* in series with a resistor of resistance, *v*, is given by $(t+1)e^{-1000t}$ where *C =1μF, E > 0,* is a constant. Determine *i* where $i=C\frac{dv}{dt}$.

Course Outcome 3(CO3)

1. Define partial derivative of a function of two variables.
2. Suppose that the temperature at a point (x,y,z) in space is given by $T(x,y,z)=\dfrac{80}{1+x^2+2y^2+3z^2}$, where T is measured in degrees Celsius and (x,y,z) in meters. In which direction does the temperature increase fastest at the point $(1,1,-2)$? Identify the maximum rate of increase.
3. Compute the dimensions of the rectangular box with largest volume if the total surface area is given as 64 cm^2 .
4. Show that the Cobb-Douglas production function $P=bL^{\alpha}K^{\beta}$ satisfies the equation $L\dfrac{\partial P}{\partial L}+K\dfrac{\partial P}{\partial K}=\alpha\dfrac{P}{L}$.

Course Outcome 4(CO4)

1. State fundamental theorem of calculus.
2. Find the volume of the solid obtained by rotating the region bounded by $y=x^3$, $y=8$ and $x=0$ about the y axis.
3. A charged rod of length L produces an electric field at point P(a,b) given by $E(P)=\displaystyle\int_{-a}^{L-a}\frac{\lambda b}{4\pi\varepsilon_0(x^2+b^2)^{3/2}}\,dx$ where λ is the charge density per unit length on the rod and ε_0 is the free space permittivity (see the below figure). Evaluate the integral to determine an expression for the electric field E(P).



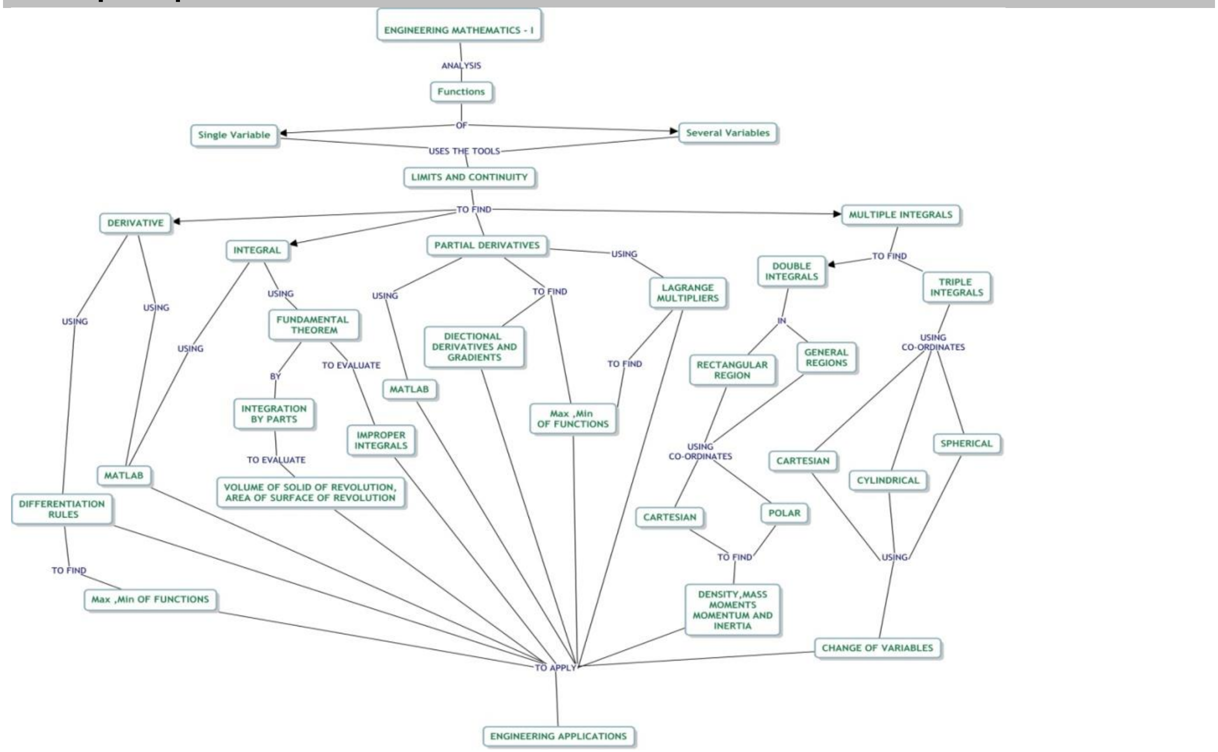
4. A cantilever beam of length L, fixed at one end and deflected by a distance D at the free end has strain energy V given by $V = \frac{EI}{2}\int_0^L \left(\frac{d^2y}{dx^2}\right)^2 dx$ where EI is the flexural rigidity. The deflection y at a distance x from the fixed end is given by $y = D\left[1-\cos\left(\frac{\pi x}{2L}\right)\right]$

   Find V .

Course Outcome 5(CO5)

1. Recall any three properties of double integrals
2. Calculate the static moments of homogeneous lamina with respect to the coordinate axes. The lamina is bounded by lines $\frac{x^2}{9}+\frac{y^2}{4}=1$, $2x+3y-6=0$.
3. Calculate the coordinates of the center of mass of homogeneous solid bounded by surfaces x=0, y = 0, z = 0, x +y = 1, $x^2 + y^2 = 1$.

Concept Map



Syllabus

DIFFERENTIAL CALCULUS **(12 hours)**

Representation of functions - New functions from old functions - Limit of a function - Continuity - Limits at infinity - Derivative as a function - Differentiation rules(formula and problems only) –The mean value theorem - Maxima and Minima of functions of one variable - Application problems in engineering – Application problems using MATLAB.

FUNCTIONS OF SEVERAL VARIABLES (12 hours)

Partial derivatives – Chain rule - Vector functions and their Derivatives - Directional derivatives and gradient vector - Maxima and minima of functions of two variables - Lagrange Multipliers - Application problems in engineering - Application problems using MATLAB.

INTEGRAL CALCULUS (12 hours)

Area under curves - The definite integrals – Fundamental theorem of calculus - Integration by parts - Volume of solid of revolution - Area of surface of revolution - Improper integrals - Application problems in engineering - Application problems using MATLAB

MULTIPLE INTEGRAL (12 hours)

Iterated integrals - Double integrals over general regions - Double integrals in polar coordinates - Applications of double integrals (density, mass, moments & moments of inertia problems only) - Triple integrals - Triple integrals in cylindrical coordinates - Triple integrals in spherical coordinates - Change of variables in multiple integrals - Application problems in engineering

Text Book

1) James Stewart, "Calculus Early Transcendentals", 7e, Cengage Learning, New Delhi, 2017.

DIFFERENTIAL CALCULUS:[Sections: 1.1, 1.3, 2.2,2.5,2.6,2.8, 3.1-3.6,4.1,4.2]
FUNCTIONS OF SEVERAL VARIABLES: Sections: 14.3, 14.5,13.1,13.2,14.6-14.8]
INTEGRAL CALCULUS: [Sections: 5.1-5.4,7.1, 6.2, 8.2 and 7.8]
MULTIPLE INTEGRAL: [Sections: 15.2-15.5, 15.7-15.10]

2) Lecture Notes on Engineering Mathematics-I Application Problems and Solution Manual, Department of Mathematics, Thiagarajar College of Engineering, Madurai.

Reference Books

1) Kuldeep Singh, "Engineering Mathematics Through Appplications",2e, Palgrave Macmillan, 2011.
2) Erwin Kreszig, "Advanced Engineering Mathematics",10th edition, Wiley, 2017.
3) George B. Thomas, " Thomas Calculus: early transcendentals ", Pearson, New Delhi, 2013.
4) R.K.Jain, S.R.K.Iyengar, "Advanced Engineering Mathematics"5e, Narosa Publishing House, 2016.

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**DIFFERENTIAL CALCULUS**	
1.1	Representation of functions, New functions from old functions	1
1.2	Limits of a function	1
1.3	Continuity, Limits at infinity	1
1.4	Tutorial	1
1.5	Derivatives as a function, Differentiation rules	2
1.6	The mean value theorem	1

S.No	Topic	No. of Hours
1.7	Maxima and minima of function of one variable	1
1.8	Tutorial	1
1.9	Application problems in engineering	2
1.10	Application problems using MATLAB(Tutorial)	1
2	**FUNCTIONS OF SEVERAL VARIABLES**	
2.1	Partial derivatives, Chain rule	2
2.2	Vector functions and their derivatives	1
2.3	Tutorial	1
2.4	Directional derivatives, Gradient vector	1
2.5	Maxima and minima of functions of two variables	2
2.6	Lagrange Multipliers	1
2.7	Tutorial	1
2.8	Application problems in engineering	2
2.9	Application problems using MATLAB(Tutorial)	1
3	**INTEGRAL CALCULUS**	
3.1	Area under curves, The definite integrals, fundamental theorem of calculus	2
3.2	Integration by parts	1
3.3	Tutorial	1
3.4	volume of solid of revolution, area of surface of revolution	2
3.5	Improper integrals	2
3.6	Tutorial	1
3.7	Application problems in engineering	2
3.8	Application problems using MATLAB(Tutorial)	1
4	**MULTIPLE INTEGRAL**	
4.1	Iterated integrals	1
4.2	Double integrals over general regions	1
4.3	Double integrals in polar coordinates	1
4.4	Tutorial	1
4.5	Applications of double integrals	1
4.6	Triple integrals	2
4.7	Tutorial	1
4.8	Triple integrals in cylindrical coordinates	1
4.9	Triple integrals in spherical coordinates	1
4.10	Change of variables in multiple integrals	1
4.11	Tutorial	1
	Total	48

Course Designers

1. Dr.V.Gnanaraj - vgmat@tce.edu
2. Dr.S.Jeyabharathi - sjbmat@tce.edu
3. Dr.G.Jothilakshmi - gjlmat@tce.edu

4. Dr.A.Anitha - anithavalli@tce.edu
5. Dr.R.Suresh - suresh080183@tce.edu

18PHA20	PHYSICS (Common to Civil, Mechanical and Mechatronics)	Category	L	T	P	Credit
		BS	3	0	0	3

Preamble

The course work aims in imparting fundamental knowledge of oscillations, waves and optics, and mechanics which are essential in understanding and designing mechanical systems and measuring devices.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Solve for the solutions and describe the behavior of a damped harmonic oscillator and waves	Apply
CO2	Explain the fundamentals of optical phenomena and its application.	Understand
CO3	Use the vector analytical techniques for analysis of forces and moments in mechanical systems	Apply
CO4	Demonstrate ability to utilize principles of vector mechanics to analyze weather systems	Understand
CO5	Explain the fundamental concepts of kinetics and kinematic of rigid bodies for analysis of practical problems.	Understand
CO6	Use the principles of angular velocity to study three dimensional motion of rigid bodies	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	L					L	L		
CO2	M	L	L	-					L	L		
CO3	S	M	L	L					L	L		
CO4	M	L	L	-					L	L		
CO5	M	L	L	-					L	L		
CO6	S	M	L	L					L	L		
S- Strong; M-Medium; L-Low												

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	0
Understand	30	30	30	50
Apply	50	50	50	50
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. A 5.00 × 10^5 kg subway train is brought to a stop from a speed of 0.500 m/s in 0.400 m by a large spring bumper at the end of its track. What is the force constant k of the spring?
2. Show that the wave velocity of deep water waves is twice the group velocity.
3. Derive the law of reflection based on Fermats principle.

Course Outcome 2 (CO2):

1. Consider a lower energy level situated 200 cm^{-1} from the ground state. There are no other energy levels nearby. Determine the fraction of the population found in this level compared to the ground state population at a temperature of 300 K. Boltzmann's constant is equal to 1.38 x 10^{-23} JK^{-1}.The conversion from cm^{-1} to joules is given by: E(J) = 100hC E(cm^{-1}), where h is Planck's constant (6.62 x 10^{-34} Js) and c is the speed of light in a vacuum (3 x 10^8 ms^{-1})
2. Explain the principle, construction and working of Mach-Zehnder interferometer.
3. What is a four level solid state laser? Discuss the principle and operation of Nd:YAG Laser.

Course Outcome 3 (CO3):

1. A 10, 000 lb aircraft is descending on a cylindrical helix. The rate of descent is $\dot{z}$ = −10ft/s, the speed is v = 211 ft/s, and $\dot{\theta}$ = 3^o ≈ 0.05rad/s. This is standard for gas turbine powered aircraft. Find out the force on the aircraft and the radius of curvature of the path
2. Derive Newton's second law of motion in spherical and cylindrical coordinate systems.
3. A particle attached to a string of length 2 m is given an initial velocity of 6 m/s. The string is attached to a peg and, as the particle rotates about the peg, the string winds around the peg. By conservation of angular momentum, find the length of string wound around the peg when the velocity of the particle is 20 m/s?

Course Outcome 4 (CO4):

1. Consider a situation where a cricket player (fielder) slides to a stop on level ground. Using energy considerations (in non conservative forces),calculate the distance the 60 kg cricket player slides, given that his initial speed is 7 m/s and the force of friction against him is a constant 430 N.
2. Compute the centripetal force per unit mass on a spacecraft in an 820 km circular Polar orbit as it flies over the equator and the South pole.
3. Solve Newton's equations of motion in polar coordinates

Course Outcome 5 (CO5):

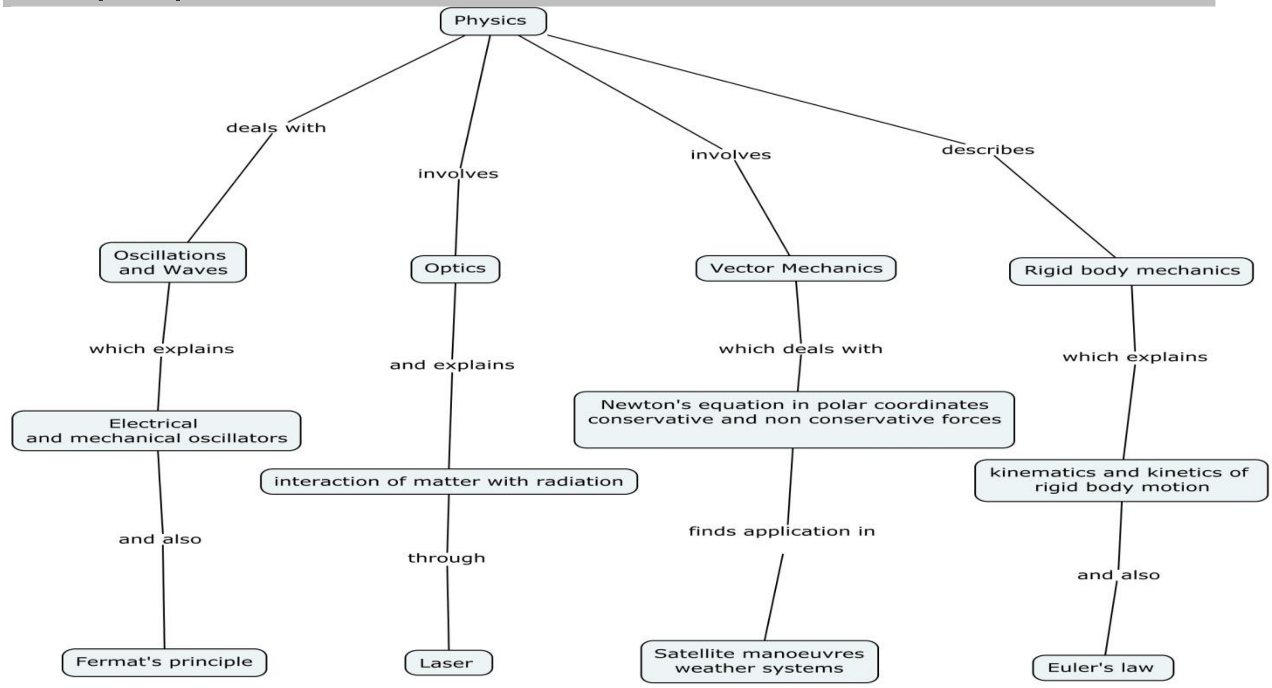
1. A motor shaft attains a velocity of 1500 rpm in 3 seconds starting from rest. Assuming constant angular acceleration, find out the number of full revolution of the shaft during this period.
2. Derive Euler's equations of motion of a rigid body.
3. A cylinder of diameter 500 mm rolls down an inclined plane with uniform acceleration (of the center-of-mass) a = 0.1 m/s^2. At an instant t_0, the mass-center has speed v_0 =

0.5 m/s. (i) Find the angular speed ω and the angular acceleration $\dot{\omega}$ at t_0. (ii) How many revolutions does the cylinder make in the next 2 seconds?

Course Outcome 6 (CO6):

1. A solid right circular cone of base radius *r* and height *h* rolls on a flat surface without slipping. The centre of the circular base moves in a circular path around the z- axis (vertical axis passing through the tip of the cone) with a constant speed *v*. Determine the angular velocity and angular acceleration of the solid cone.
2. Derive an expression for angular velocity and its rate of change for three dimensional motion of a rigid body.
4. Discuss the conical motion of a rod with center of mass fixed.

Concept Map



Syllabus

Oscillations and Waves

Simple harmonic motion - Mechanical and Electrical simple harmonic oscillators - energy decay in a damped harmonic oscillator - Non-dispersive transverse and longitudinal waves in one dimension - Waves with dispersion - water waves- Acoustic waves- superposition of waves - wave groups and group velocity – Rayleigh criteria for limit of resolution and its applications to imaging.

Optics

Fermat's principle of stationary time - reflectance and transmittance - evanescent wave. Mach-Zehnder interferometer - Fraunhofer diffraction from a single slit and a circular aperture - Einstein's theory of matter radiation interaction and A and B coefficients –CO_2 – Nd-YAG lasers - applications of lasers.

Vector Mechanics of Particles

Transformation of scalars and vectors under Rotation transformation - Forces in Nature - Newton's laws and its completeness in describing particle motion - Solving Newton's equations of motion in polar coordinates -Conservative and non-conservative forces - curl of a force field -Conservation of Angular Momentum - Energy equation and energy diagrams – circular and elliptical orbits.- Applications to Satellite manoeuvres

Rigid Body Mechanics

Motion of a rigid body in the plane - Rotation in the plane - Kinematics in a coordinate system rotating and translating in the plane - Angular momentum about a point of a rigid body in planar motion - Euler's laws of motion - their independence from Newton's laws - Two-dimensional motion in terms of angular velocity vector, and its rate of change – Difference between 2D & 3D motion.

Text Book

1. Ian G.Main, Vibrations and waves in Physics -3rd edition, Cambridge University, Press, 1994.
2. M.K.Verma, Introduction to Mechanics, CRC Press, 2009.
3. JL Meriam and L.G. Kraige, Engineering Mechanics – Dynamics - 7th edition, Wiley,2015.
4. D. Kleppner and R. Kolenkow, An Introduction to Mechanics – 1st edition, McGraw Hill, 2009.

Reference Books

1. M.K.Harbola, Engineering Mechanics-2nd edition, Cengage Learning, 2012.
2. JL Synge & BA Griffiths, Principles of Mechanics, McGraw-Hill Book company Inc, 1949.
3. WT Thomson, Theory of Vibrations with Applications,-3rd edition, CBS Publishers, 2002.

Course Contents and Lecture Schedule

S No.	Topic	No. of Hours
1.	**Oscillations & Waves**	
1.1	Simple harmonic motion – Mechanical and Electrical simple harmonic oscillators.	2
1.2	Energy decay in a damped harmonic oscillator – Non-dispersive transverse and longitudinal waves in one dimension.	2
1.3	Waves with dispersion – water waves- Acoustic waves – superposition of waves – wave groups and group velocity.	1
1.4	Rayleigh criteria for limit of resolution and its applications to imaging	1
2	**Optics**	
2.1	Fermat's principle of stationary time - reflectance and transmittance - evanescent wave. Mach-Zehnder interferometer.	2
2.2	Fraunhofer diffraction from a single slit and a circular aperture .	1
2.3	Einstein's theory of matter radiation interaction and A and B coefficients .	1
2.4	CO_2 Laser.	1
2.5	Nd-YAG lasers Applications of lasers.	1
3.	**Vector Mechanics of Particles**	
3.1	Transformation of scalars and vectors under rotation transformation	2
3.2	Forces in Nature, Newton's laws and its completeness in describing particle motion	2
3.3	Solving Newton's equations of motion in polar coordinates	2
3.4	Conservative and non-conservative forces, curl of a force field, Conservation of angular momentum	2

S No.	Topic	No. of Hours
3.5	Energy equation and energy diagrams, circular and elliptical orbits	2
3.6	Applications to Satellite manoeuvres	2
4.	**Rigid Body Mechanics**	
4.1	Motion of a rigid body in the plane, Rotation in the plane	2
4.2	Kinematics in a coordinate system rotating and translating in the plane	2
4.3	Angular momentum about a point of a rigid body in planar motion	2
4.4	Euler's laws of motion, their independence from Newton's laws	2
4.5	Two-dimensional motion in terms of angular velocity vector, and its rate of change.	2
4.6	Distinction between 2D & 3D motion	2
	Total	**36**

Course Designers

1. Dr. M.Mahendran mmphy@tce.edu
2. Dr. N. Sankara Subramanian nssphy@tce.edu
3. Dr. R. Kodipandyan rkp@tce.edu
4. Dr. A. Karuppasamy akphy@tce.edu

18PHB20	PHYSICS (Common to EEE and ECE)	Category	L	T	P	Credit
		BS	3	0	0	3

Preamble

The course work aims in imparting fundamental knowledge of oscillations and waves and electromagnetic theory which are essential in understanding and explaining engineering devices.

Prerequisite

Basic course (No prerequisite)

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Solve for the solutions and describe the behavior of a damped harmonic oscillator and waves	Apply
CO2	Explain the fundamentals of optical phenomena and its application.	Understand
CO3	Understand the fundamentals of electrostatics and Calculation of electric field and electrostatic potential for a charge distribution	Apply
CO4	Explain bound charges due to electric polarization and estimation of vector potential through concepts of magneto statics.	Understand
CO5	Describe and make calculations of plane electromagnetic waves in homogeneous media and derive Poynting theorem	Understand
CO6	Learn the propagation of EM waves and its applications by solving physical problems and Energy and Momentum carried by electromagnetic waves through linear media.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	L					L	L		
CO2	M	L	L	-					L	L		
CO3	S	M	L	L					L	L		
CO4	M	L	L	-					L	L		
CO5	M	L	L	-					L	L		
CO6	S	M	L	L					L	L		
S- Strong; M-Medium; L-Low												

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyse	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Assuming a car is 900 kg and has a suspension system that has a force constant $6.5x10^4$ N/m. The car hits a bump and bounces with an amplitude of 0.100 m. What is its maximum vertical velocity if no damping occurs?
2. Establish the connection between quality factor, width of response and energy dissipation.
3. State the Rayleigh's criteria for limit of resolution.

Course Outcome 2 (CO2):

1. Differentiate between laser light and ordinary light.
2. Predict the working of the CO2 laser without Helium gas in the mixture.
3. Explain the construction and working of Nd-YAG Laser

Course Outcome 3 (CO3):

1. Discuss the Continuous charge distribution and the electric field produced by it.
2. Derive Laplace's and Poisson's equation
3. Deduce Gauss' law.

Course Outcome 4 (CO4):

1. Summarize physical interpretation of bound charges
2. Define vector potential and give its significance.
3. Explain the magnetic field of a steady current and hence obtain Bio-Savart law .

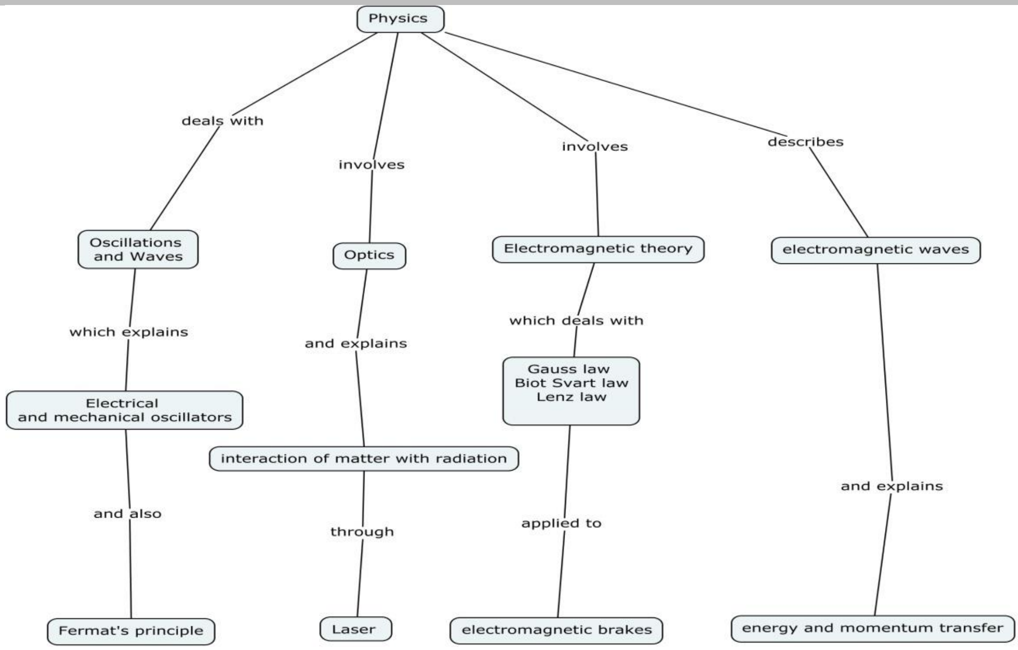
Course Outcome 5 (CO5):

1. Derive and interpret Continuity equation for current densities.
2. Write and explain the importance of Poynting vector
3. Deduce Faraday's law of electromagnetic from the Maxwell's equation

Course Outcome 6 (CO6):

1. Discuss the propagation of EM waves through vacuum.
2. Define and obtain expressions for transmission and reflection coefficients
3. Find the reflection and transmission coefficients of an electric field wave travelling in wave and incident normally on a boundary between air and a dielctric having Permeability µ0 and permittivity 4.74.

Concept Map



Syllabus

Oscillations and Waves **(6 hours)**

Simple harmonic motion - Mechanical and Electrical simple harmonic oscillators - energy decay in a damped harmonic oscillator - Non-dispersive transverse and longitudinal waves in one dimension - Waves with dispersion - water waves –Acoustic waves - superposition of waves - wave groups and group velocity – Rayleigh criteria for limit of resolution and its applications to imaging

Optics **(6 hours)**

Fermat's principle of stationary time - reflectance and transmittance - evanescent wave. Mach-Zehnder interferometer - Fraunhofer diffraction from a single slit and a circular aperture - Einstein's theory of matter radiation interaction and A and B coefficients –CO_2 – Nd-YAG lasers - applications of lasers.

Electromagnetic Theory **(12 Hours)**

Electrostatics: Introduction, Calculation of electric field and electrostatic potential for a charge distribution - Gauss' law, Divergence and curl of electrostatic field, Application: Faraday's cage and coffee-ring effect(qualitative only). Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; Solving simple electrostatics problems in presence of dielectrics.

Magnetostatics: Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem. Lenz's law; Electromagnetic breaking (qualitative only)

Electromagnetic waves **(12 hours)**

Continuity equation for current densities- Modifying equation for the curl of magnetic field – Energy in an electromagnetic field - Flow of energy and Poynting vector - Maxwell's equations- The wave equation- Plane electromagnetic waves in Vacuum– their transverse nature and Polarization ; relation between electric and magnetic fields of an electromagnetic wave -Energy and Momentum carried by electromagnetic waves, Propagation through linear media-Normal incidence - problems.

Text Books

1. Ian G.Main, Vibrations and waves in Physics -3rd edition, Cambridge University Press,1994.
2. David J. Griffiths, Introduction to Electrodynamics, Prentice Hall, Second Indian edition,1981.
3. Paul Lorrain , Dale R. Corson , Francois Lorrain, Electromagnetic Fields and Waves, 3rd Edition, W.H. Freeman, 1990.
4. A.A. Rangwala,A.S. Mahajan, Electricity and Magnetism – 1st edition , McGraw Hill Education, 2004.

Reference

1. Halliday Resnick Krane, Physics Volume 2, Fifth edition, Wiley Publications, 2002.
2. W. Saslow, Electricity, Magnetism and light, Academic press 2005.
3. WT Thomson, Theory of Vibrations with Applications,-3rd edition, CBS Publishers, 2002.

Course Contents and Lecture Schedule

S No.	Topic	No. of Hours
1.	**Oscillations & Waves**	
1.1	Simple harmonic motion – Mechanical and Electrical simple harmonic oscillators.	2
1.2	Energy decay in a damped harmonic oscillator – Non-dispersive transverse and longitudinal waves in one dimension.	2
1.3	Waves with dispersion – water waves – Acoustic waves – superposition of waves – wave groups and group velocity.	1
1.4	Rayleigh criteria for limit of resolution and its applications to imaging.	1
2	**Optics**	
2.1	Fermat's principle of stationary time - reflectance and transmittance - evanescent wave. Mach-Zehnder interferometer.	2
2.2	Fraunhofer diffraction from a single slit and a circular aperture .	1
2.3	Einstein's theory of matter radiation interaction and A and B coefficients	1
2.4	CO_2 Laser	1
2.5	Nd-YAG lasers Applications of lasers.	1
3	**Electromagnetic Theory**	
3.1	Electrostatics: Introduction, Calculation of electric field and electrostatic potential for a charge distribution - Gauss' law – work done- Electric potential problems. Divergence and curl of electrostatic field	4
3.2	Applications: Faraday's cage and coffee-ring effect. Electrostatic field and potential of a dipole.	2
3.3	Bound charges due to electric polarization; Electric displacement; Solving simple electrostatics problems in presence of dielectrics.	2
3.4	Magnetostatics: Bio-Savart law, Divergence and curl of static magnetic field	2
3.5	vector potential and calculating it for a given magnetic field using Stokes'	2

S No.	Topic	No. of Hours
	theorem. Lenz's law; Electromagnetic breaking (qualitative only)	
4	**Electromagnetic waves**	
4.1	Continuity equation for current densities- Modifying equation for the curl of magnetic field –	2
4.2	Energy in an electromagnetic field - Flow of energy and Poynting vector - Maxwell's equations- The wave equation-	3
4.3	Plane electromagnetic waves in Vacuum– their transverse nature and Polarization	2
4.4	Relation between electric and magnetic fields of an electromagnetic wave	2
4.5	Energy and Momentum carried by electromagnetic waves, Propagation through linear media- Reflection and Transmission coefficients, problems.	3
	Total	**36**

Course Designers

1. Dr.S.Rajathi srphy@tce.edu
2. Dr. V.Gayathri vgphy@tce.edu
3. Dr.M.Senthamizh selvi mssphy@tce.edu
4. Dr. A.L.Subramaniyan alsphy@tce.edu

18PHC20	PHYSICS (Common to CSE and IT)

Category	L	T	P	Credit
BS	3	0	0	3

Preamble

The course work aims in imparting fundamental knowledge of oscillations and waves and optics and quantum mechanics which are essential in understanding and explaining engineering devices.

Prerequisite

Basic course (No prerequisite)

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Solve for the solutions and describe the behavior of a damped harmonic oscillator and waves	Apply
CO2	Explain the fundamentals of optical phenomena and its application.	Understand
CO3	Explain the basic principles of Quantum mechanic	Understand
CO4	Use the principles of quantum mechanics to calculate observables on known wave functions	Apply
CO5	Solve Schrodinger equation for simple potentials ,scattering and related phenomena	Understand
CO6	identify and relate the Eigen value problems for energy, momentum, angular momentum and explain the idea of spin	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	L					L	L		
CO2	M	L	L	-					L	L		
CO3	M	L	L	-					L	L		
CO4	S	M	L	L					L	L		
CO5	M	L	L	-					L	L		
CO6	S	M	L	L					L	L		
S- Strong; M-Medium; L-Low												

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyze	0	0	0	0
Evaluate	0	0	0	0
Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1)

1. Assuming a car is 900 kg and has a suspension system that has a force constant $6.5x10^4$ N/m. The car hits a bump and bounces with an amplitude of 0.100 m. What is its maximum vertical velocity if no damping occurs?
2. Establish the connection between quality factor, width of response and energy dissipation.
3. State the Rayleigh's criteria for limit of resolution.

Course Outcome 2 (CO2)

1. Find the ratio of population of two energy states in a Laser the transition between which is responsible for the emission of photons of wavelength6893A at a temperature of 300K.Comment on the type of emission based on the ration of population.
2. Analyze the role of mixture of gases for a CO_2 laser and predict the working of the laser without Helium gas in the mixture.
3. Differentiate between CO_2 laser and Nd-YAG Laser with respect to their construction and energy level diagram.

Course Outcome 3 (CO3)

1. List the properties of wave function.
2. Set up the time independent Schrodinger wave equation and explain the Eigen functions and Eigen values.
3. Describe an experiment to verify the uncertainty principle.

Course Outcome 4 (CO4)

1. Calculate the expectation value of the position of a particle trapped in a box of length 10A° wide.
2. Compute the smallest possible uncertainty in position of an electron moving with a Velocity of $3x10^7$ m.
3. An electron is constrained to a one dimensional box of side 1nm.Calculate the first four Eigen values in electron volt.

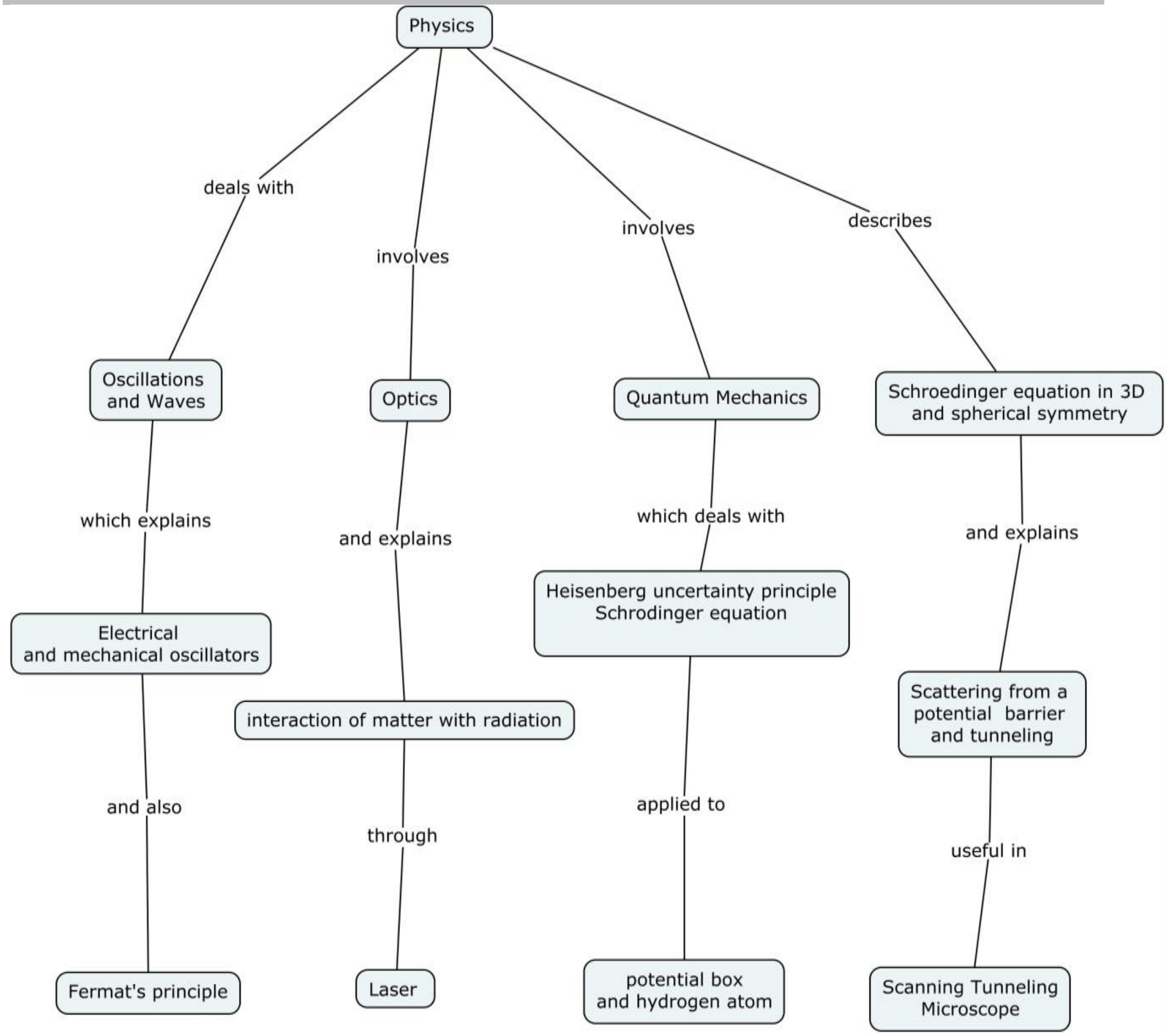
Course Outcome 5 (CO5)

1. Assuming the time independent Schrödinger wave equation, discuss the solution for a particle in a three dimensional potential well of infinite height.
2. Discuss the barrier tunneling phenomenon for a rectangular finite potential barrier of height $V_{o.}$
3. State the principle of STM and describe its working.

Course Outcome 6 (CO6)

1. Identify the degeneracies in hydrogen atom energy level based on the principle of quantum numbers.
2. Illustrate the vector model of orbital angular momentum
3. Given $\psi(x) = A\sin(kx)$. Find the Eigen values of the operator $O = \partial^2/\partial x^2$. Identify whether $\partial/\partial x$ is an Eigen operator

Concept Map



Syllabus

Oscillations and Waves: Simple harmonic motion - Mechanical and Electrical simple harmonic oscillators - energy decay in a damped harmonic oscillator - Non-dispersive transverse and longitudinal waves in one dimension - Waves with dispersion - water waves – Acoustic waves - superposition of waves - wave groups and group velocity – Rayleigh criteria for limit of resolution and its applications to imaging.

Optics : Fermat's principle of stationary time - reflectance and transmittance - evanescent wave. Mach-Zehnder interferometer - Fraunhofer diffraction from a single slit and a circular aperture - Einstein's theory of matter radiation interaction and A and B coefficients –CO_2 – Nd-YAG lasers - applications of lasers.

Introduction to Quantum mechanics

Wave nature of Particles, Time-dependent and time independent Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free-particle wave function and wave-packets, Uncertainty principle – Derivation & Experiment. Solution of stationary-state Schrodinger equation for one dimensional problems– particle in a box, Square-well potential, linear harmonic oscillator.

Applying the Schrodinger equation

Numerical solution of stationary-state - Schrodinger equation for three dimensional problems for different potentials and related examples - Angular momentum operator - Hydrogen atom ground-state, orbitals - interaction with magnetic field, spin. Scattering from a potential barrier and tunneling; related examples like alpha-decay, field ionization Schrodinger equation for spherically symmetric potentials and scanning tunneling microscope.

Text Books

1. Ian G. Main, Vibrations and waves in Physics -3rd edition, Cambridge University press, ,1994.
2. David .J. Griifiths, Introduction to quantum mechanics -2nd edition, Cambridge University press, 2017.
3. P M Mathews, K.Venkatesan, Quantum mechanics, 2 nd edition, Tata McGraw-Hill Education, 2010.

Reference

1. http.//nptel.ac.in/courses/115106066/Quantum mechanics Prof. S. Lakshmi Bala, IIT Madras.
2. http://nptel.ac.in/courses/115101010/ Quantum mechanics Prof. S. H.Patil, IIT Bombay.
3. http://nptel.ac.in/courses/115104096/ Introduction to quantum mechanics, Prof Manoj K.Harbola, IIT Kanpur

Course Contents and Lecture Schedule

S No.	Topic	No. of Hours
1.	**Oscillations & Waves**	
1.1	Simple harmonic motion – Mechanical and Electrical simple harmonic oscillators.	2
1.2	Energy decay in a damped harmonic oscillator – Non-dispersive transverse and longitudinal waves in one dimension.	2
1.3	Waves with dispersion – water waves – Acoustic Waves – superposition of waves – wave groups and group velocity.	1
1.4	Rayleigh criteria for limit of resolution and its applications to imaging.	1
2	**Optics**	
2.1	Fermat's principle of stationary time - reflectance and transmittance - evanescent wave. Mach-Zehnder interferometer.	2
2.2	Farunhofer diffraction from a single slit and a circular aperture.	1
2.3	Einstein's theory of matter radiation interaction and A and B coefficients.	1
2.4	CO_2 Laser.	1
2.5	Nd-YAG lasers -Applications of lasers.	1
3	**Introduction to Quantum mechanics**	
3.1	Wave nature of Particles, Time-dependent and time independent Schrodinger equation for wave function.	3
3.2	Born interpretation, probability current, Expectation values.	3

S No.	Topic	No. of Hours
3.3	Free-particle wave function and wave-packets, Uncertainty principle – Derivation & Experiment.	3
3.4	Schrodinger equation for one dimensional problems– particle in a box, square-well potential, linear harmonic oscillator.	3
4	**Applying the Schrodinger equation**	
4.1	Numerical solution of stationary-state	1
4.2	Schrodinger equation for one dimensional problem for different potentials and related examples.	3
4.3	Angular momentum operator, Hydrogen atom ground-state, orbitals, interaction with magnetic field , spin	3
4.4	Scattering from a potential barrier and tunneling; related examples like alpha-decay, field ionization	3
4.5	Schrodinger equation for spherically symmetric potentials	1
4.6	Scanning tunneling microscope.	1
	Total	**36**

Course Designers

1. Dr. M.Mahendran mmphy@tce.edu
2. Mr. V.Veeraganesh vvgphy@tce.edu
3. Dr. A.L.Subramaniyan alsphy@tce.edu
4. Dr.T.Manichandran stmanichandran@tce.edu

18CHA30	**CHEMISTRY** (COMMON TO CIVIL, MECHANICAL AND MECHATRONICS)

Category	L	T	P	Credit
BS	3	0	0	3

Preamble

The objective of this course is to bestow a better understanding of basic concepts of chemistry and its applications on Civil, Mechanical and Mechatronics domain. It also imparts knowledge on properties of water and its treatment methods, spectroscopic techniques for material characterization, corrosion and protection of metals. This course also highlights preparation, properties and applications of polymer and composite materials. It also gives basic idea about adhesives and lubricants and their mechanisms.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify the properties of water and its treatment methods	Understand
CO2	Summarize the Principles and Instrumentations of Spectroscopic techniques	Understand
CO3	Select the appropriate spectroscopic techniques for characterization of materials	Apply
CO4	Adapt the customized corrosion control methods	Apply
CO5	Dramatize the preparation, properties and applications of Engineering materials	Understand
CO6	Describe the mechanism of adhesion and lubrication	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1.	M	-	-	-	-	-	-	-	-	-	M	-
2.	M	L	L	-	-	-	-	-	-	-	-	-
CO3.	S	S	M	M	-	-	-	-	-	-	-	-
CO4.	S	S	M	M	-	-	L	-	-	-	L	-
CO5.	M	M	M	-	-	-	L	-	-	-	-	-
CO6.	M	-	L	-	-	-	-	-	-	-	-	-
S- Strong; M-Medium; L-Low												

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	40	40	40	40
Apply	40	40	40	40
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Course Level Assessment Questions

Course Outcome 1 (CO1):

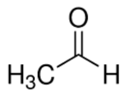
1. Distinguish between scale and sludge.
2. 100 ml of given water sample consumed 48 ml of EDTA during titration using EBT indicator. 35 ml of same EDTA consumed by 100 ml of standard hard water containing 1 mg of pure $CaCO_3$ per ml. Calculate the permanent, temporary and total hardness of given water sample in $CaCO_3$ equivalents.
3. Outline the steps involved in the waste water treatment process.

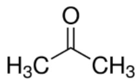
Course Outcome 2 (CO2):

1. State Beer-Lambert law.
2. Write the selection rule in absorption spectroscopy.
3. Explain the procedure involved in finding the metals present in an alloy sample using ICP-OES.

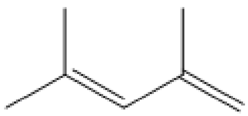
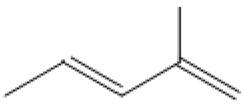
Course Outcome 3 (CO3):

1. Compare the stretching frequencies of carbonyl functional groups in the following compounds

   i) 

   (ii) 

2. Following Woodward-Fiesher- scott rules, it has been observed that the following compounds have absorption maximum at (i) 225 nm, (ii) 220 (iii) 230. Explain which is which.

   a).  b).  c). 

3. Describe the function of different magnets available to generate magnetic field in MRI scanner.

Course Outcome 4 (CO4)

4. Illustrate the different forms of corrosion with appropriate mechanism
5. Dramatize suitable methods to prevent corrosion of iron bar used in construction.
6. Discuss in detail about the constituents and functions of paint.

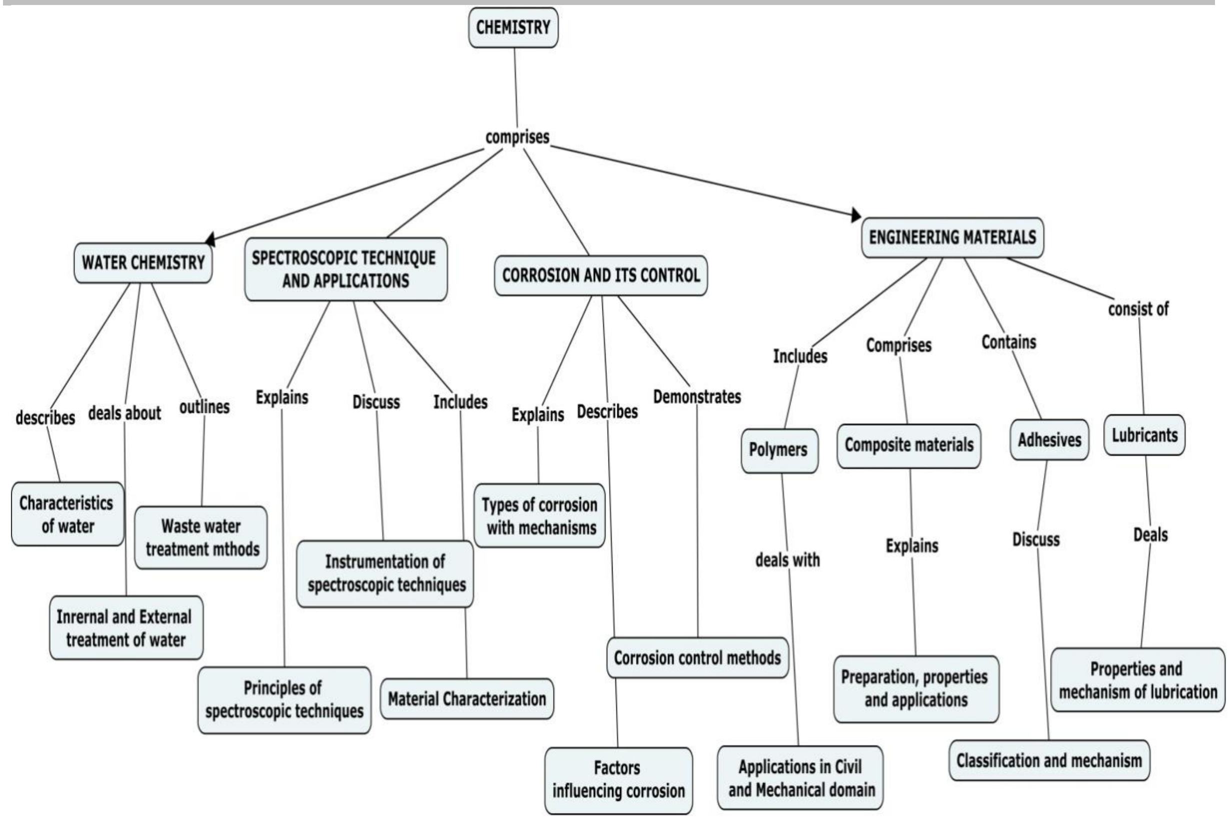
Course Outcome 5 (CO5)

1. Explain the application of composite materials in automobile engineering.
2. Demonstrate the applications of polymer in the enhancement of concrete properties.
3. Summarize the properties and application of reinforced composite materials.

Course Outcome 6 (CO6)

1. List the types of lubricant materials.
2. Identify the factors which influence the action of adhesive.
3. Discuss the mechanism of lubrication.

Concept Map



Syllabus

Water Chemistry : Water- sources-Hardness of water-types-Estimation of hardness of water by EDTA method. Disadvantages of hardwater -Boiler troubles- scale & sludge. Internal treatment methods. External treatment methods- zeolite, ion exchange. Desalination process- reverse osmosis, electrodialysis, multi stage flash distillation. Waste water treatment processes.

Spectroscopic technique and applications-Principles of spectroscopy and selection rules-Electronic spectroscopy, Fluorescence- applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules- Applications. Nuclear magnetic resonance and magnetic resonance imaging. Atomic Absorption Spectroscopy and Inductively Coupled Plasma-Optical Emission Spectroscopy- Principle, instrumentation and applications.

Corrosion and its prevention-Corrosion- causes- factors- types- chemical, electrochemical corrosion (galvanic, differential aeration), Corrosion of steel in various environments. Rate of corrosion. Corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Coatings – Metallic – Chromate conversion coating, electroplating – precious metal coating. Paints- constituents and function.

Engineering materials – Polymers - Introduction-classification-properties –applications in construction and manufacturing processes. Composite Materials: Introduction-Classification – Preparation, properties and applications. Fiber-Reinforced Composites-preparation, properties and applications..Adhesives- Introduction-classification-fundamental aspects – mechanism of adhesion- factors influencing adhesive action. Lubricants-introduction-classification-properties-functions-mechanism of lubrication.

Text Book

1. P.C. Jain and Monica Jain, A Textbook of Engineering Chemistry, DhanpatRai publications, New Delhi, 16th edition, 2015.
2. C. N. Banwelland E.M. McCash, “Fundamentals of Molecular Spectroscopy”, Tata McGraw-Hill (India), 5th Edition, 2013.

Reference Books

1. S.S. Dara and S.S.Umare, “A Textbook of Engineering Chemistry”, S.Chand & Company, 12th Edition, Reprint, 2013.
2. Shashi Chawla, “ A text book of Engineering Chemistry”, Dhanpat Rai & Co.(pvt) ltd, 3rd edition, reprint 2011.

Course Contents and Lecture Schedule

S. No.	Topic	No. of hours
1.0	**Water Chemistry**	
1.1	Introduction -Water- sources-Hardness of water-types	1
1.2	Estimation of hardness of water by EDTA method	2
1.3	Disadvantages of hard water -Boiler troubles- scale & sludge.	1
1.4	Internal treatment methods	1
1.5	External treatment methods- zeolite, ion exchange	1
1.6	Desalination process- reverse osmosis, electrodialysis, multi stage flash distillation	1
1.7	Waste water treatment processes	2
2.0	**Spectroscopic technique and applications**	
2.1	Introduction	1
2.2	Principles of spectroscopy and selection rules	1
2.3	Electronic spectroscopy, Fluorescence- applications in medicine.	1
2.4	Vibrational and rotational spectroscopy of diatomic molecules-Applications	2
2.5	Nuclear magnetic resonance and magnetic resonance imaging	2
2.6	Atomic Absorption Spectroscopy and Inductively Coupled Plasma-Optical Emission Spectroscopy- Principle, instrumentation and applications.	2
3.0	**Corrosion and its prevention**	
3.1	Corrosion- causes- factors-	1
3.2	types- chemical, electrochemical corrosion (galvanic, differential aeration), Corrosion of steel in various environments (Marine)	2
3.3	Rate of corrosion	1
3.4	Corrosion control - material selection and design aspects	1
3.5	electrochemical protection – sacrificial anode method and impressed current cathodic method	1
3.6	Coatings – Metallic - Chromate conversion coating, electroplating – precious metal coating.	2
3.7	Paints- constituents and function.	1
4.0	**Engineering materials**	

S. No.	Topic	No. of hours
4.1	Polymers - Introduction-classification-properties	1
4.2	Applications in construction and mechanical domains	1
4.3	Composite Materials: Introduction-Classification – Preparation, properties and applications of Polymer Matrix Composites,	1
4.4	Metal Matrix Composites, Ceramic Matrix Composites Carbon-Carbon Composites	2
4.5	Fiber-Reinforced Composites- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide fibers and nature-made composites, and applications.	2
4.6	Adhesives- Introduction-classification-fundamental aspects – mechanism of adhesion- factors influencing adhesive action	1
4.7	Lubricants-introduction-classification-properties-functions-mechanism of lubrication.	1
	Total	**36**

Course Designers:

1.	Dr. M.Kottaisamy	hodchem@tce.edu
2	Dr.(Mrs).K.Radha	krchem@tce.edu
2.	Dr.S.Rajkumar	rajkumarsubramanium@tce.edu
3.	Dr.M.Velayudham	mvchem@tce.edu

18CHB30	CHEMISTRY (Common to EEE and ECE)

Category	L	T	P	Credit
BS	3	0	0	3

Preamble

This course work aims in imparting fundamental knowledge of materials and their applications in electrical, electronics and communication engineering. This course provides exposure to the students regarding the characterization of materials by spectroscopic methods. This course also deals with the selection of materials based on their properties for application in energy storage, energy conversion and electronic devices. It also extends the importance of water and gives better understanding of Water treatment processes.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1.	Identify the properties of water and its treatment methods	Understand
CO2.	Summarize the Principles and Instrumentations of Spectroscopic Techniques	Understand
CO3.	Select the appropriate spectroscopic techniques for characteristics of materials	Apply
CO4.	Outline the importance of industrial electrochemical processes and protective coating	Understand
CO5.	Indicate the materials best suited for the construction of energy storage devices for different applications	Apply
CO6.	Identify the implications of material properties in the performance of electronic devices.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	L	-	-	-	-	-	-	-	-	L
CO2	M	M	L	-	-	-	-	-	-	-	-	-
CO3	S	S	L	-	-	-	-	-	-	-	-	-
CO4	M	M	M	M	-	-	L	-	-	-	-	L
CO5.	S	S	M	M	-	-	M	-	-	-	-	L
CO6	S	S	M	M	-	-	M	-	-	-	-	L
S- Strong; M-Medium; L-Low												

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	30	30	30	30
Apply	50	50	50	50
Analyze	_	_	_	_
Evaluate	_	_	_	_
Create	_	_	_	_

Course Level Assessment Questions

Course Outcome 1 (CO1):

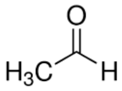
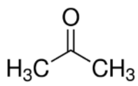
1. Distinguish between scale and sludge.
2. 100 ml of given water sample consumed 48 ml of EDTA during titration using EBT indicator. 35 ml of same EDTA consumed by 100 ml of standard hard water containing 1 mg of pure $CaCO_3$ per ml. Calculate the permanent, temporary and total hardness of given water samples in $CaCO_3$ equivalents.
3. Outline the steps involved in the waste water treatment process.

Course Outcome 2 (CO2):

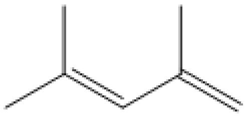
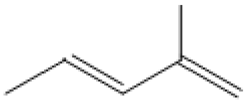
4. State Beer-Lambert law.
5. Write the selection rule in absorption spectroscopy.
6. Explain the procedure involved in finding the metals present in an alloy sample using ICP-OES.

Course Outcome 3 (CO3):

1. Compare the stretching frequencies of carbonyl functional groups in the following compounds

i)  (ii) 

2. Following Woodward-Fiesher- scott rules, it has been observed that the following compounds have absorption maximum at (i) 225 nm, (ii) 220 (iii) 230. Explain which is which.

a).  b).  c). 

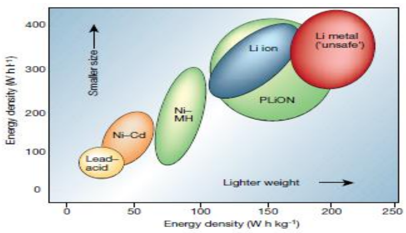
3. Describe the function of different magnets available to generate magnetic field in MRI scanner.

Course Outcome 4 (CO4)

1. Explain the drawbacks of gold electroplating.
2. Name the different types of electrolyte used in platinum electroplating.
3. Write the equations for hydrogen generation by electrolysis process under acidic and alkaline conditions.

Course Outcome 5 (CO5)

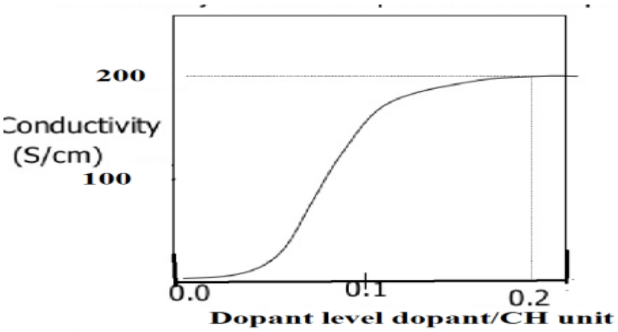
1. Illustrate the working principle, charging and discharging reactions in Lead acid battery.
2. With the help of comparative chart of different battery types, justify the reason for considering Lithium ion batteries as future power source.



3. Illustrate H_2-O_2 fuel cell construction and explain associated electrochemical reactions.

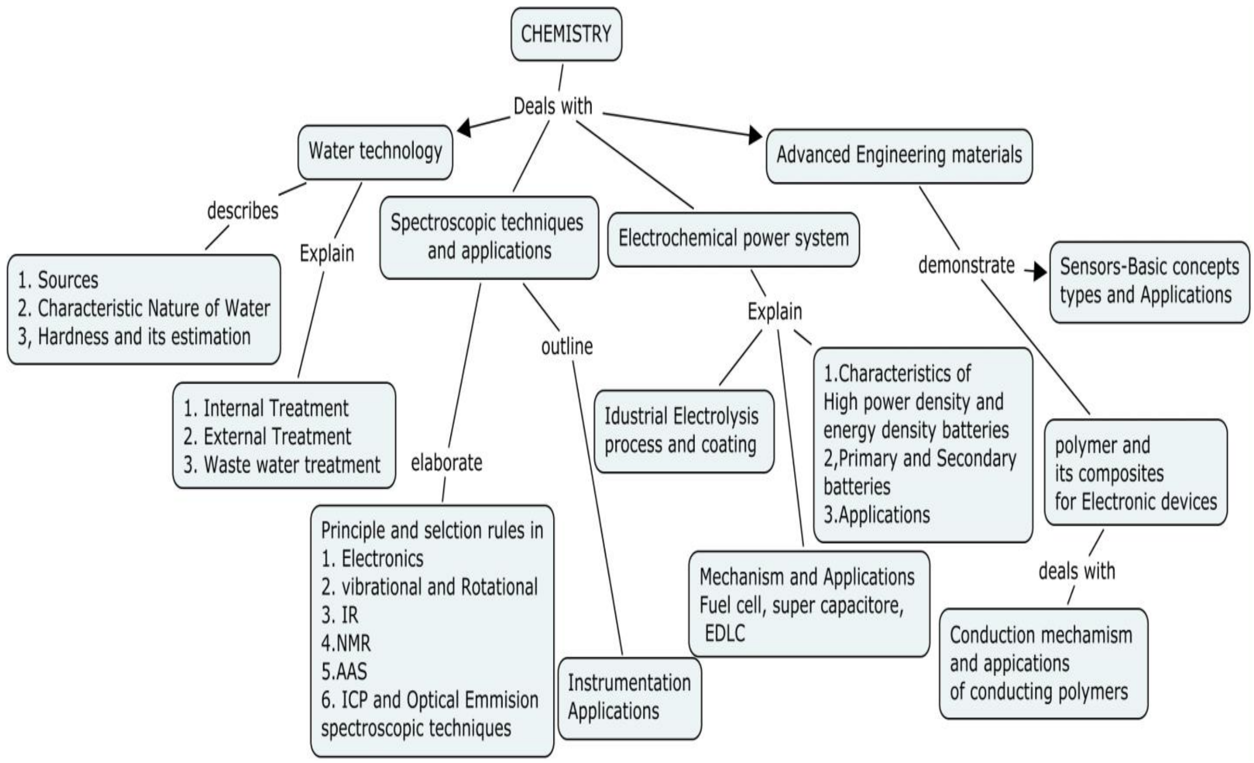
Course Outcome 6 (CO6)

1. Explain the conduction mechanism of polyaniline as a host for enzyme in biosensor.
2. In the following profile, identify the reason why the conductivity of polymer has been increased with dopant level.



3. Identify the suitable bio sensing materials for the detection of glucose in human blood serum.

Concept Map



Syllabus

Water Chemistry: Water- sources-Hardness of water-types-Estimation of hardness of water by EDTA method. Disadvantages of hardwater -Boiler troubles- scale & sludge.Internal treatment methods. External treatment methods- zeolite, ion exchange. Desalination process- reverse osmosis, electrodialysis, multi stage flash distillation. Waste water treatment processes.

Spectroscopic technique and applications -Principles of spectroscopy and selection rules- Electronic spectroscopy, Fluorescence- applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules- Applications. Nuclear magnetic resonance and magnetic resonance imaging. Atomic Absorption Spectroscopy and Inductively Coupled Plasma-Optical Emission Spectroscopy- Principle, instrumentation and applications.

Electrochemical power system-Electrochemistry–Basics - Industrial electrolytic process – Water electrolysis – Hydrogen generator- Electroplating - Decorative and functional coating- Value added coatings and Electroless process of making printed circuit board- Materials for Energy storage: Batteries **-** High energy density and Power density batteries -Operational characteristics – Primary and Secondary batteries– Fuel cells – Basic concept and types - Advantages and Disadvantages of fuel cell-Hydrogen Economy-Hydrogen storage- Super capacitors.

Advanced Engineering materials: Polymers and its composites for Electronic devices - Dielectric, mechanical and electrical properties-chemical methods for tailoring the properties- Conducting polymers – principle and preparation method-conduction mechanism–application of polymer and its composites in communication and flexible electronic devices - Frequency selective surfaces-Sensing properties of materials-concept-Applications

Text Book

1. P.C. Jain and Monica Jain, A Textbook of Engineering Chemistry, DhanpatRai publications, New Delhi, 16th edition, 2015.
2. C. N. Banwell and E.M. McCash, Fundamentals of Molecular Spectroscopy, TataMcGraw-Hill (India), 5th Edition, 2013.

Reference Books

1. A.J. Bard and L.R. Faulkner, Electrochemical Methods, Fundamentals and Application. Wiley,2001
2. 2.Y.R.Sharma, Elementary Organic Spectroscopy, S. Chand, 2007.
3. 3.ShashiChawla, A text book of Engineering Chemistry, Dhanpat Rai& Co.(pvt) Ltd, 3rd Edition, reprint 2013

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1.0	**Water Chemistry**	
1.1	Introduction -Water- sources-Hardness of water-types	1
1.2	Estimation of hardness of water by EDTA method	2
1.3	Disadvantages of hard water -Boiler troubles- scale & sludge.	1
1.4	Internal treatment methods	1
1.5	External treatment methods- zeolite, ion exchange	1
1.6	Desalination process- reverse osmosis, electrodialysis, multi stage flash distillation	1
1.7	Waste water treatment processes	2
2.0	**Spectroscopic technique and applications**	
2.1	Introduction	1
2.2	Principles of spectroscopy and selection rules	1
2.3	Electronic spectroscopy, Fluorescence- applications in medicine.	1

S.No	Topic	No. of Hours
2.4	Vibrational and rotational spectroscopy of diatomic molecules- Applications	2
2.5	Nuclear magnetic resonance and magnetic resonance imaging	2
2.6	Atomic Absorption Spectroscopy and Inductively Coupled Plasma-Optical Emission Spectroscopy- Principle, instrumentation and applications.	2
3.0	**Electrochemical power system**	
3.1	Industrial electrolytic process – Water electrolysis – Hydrogen generator-Decorative and functional coating-Electroplating Protective coating (Zn and Ni);	**2**
3.2	Value added coatings (Au, Pt).and Electroless process of making printed circuit board	**1**
3.3	High energy density and Power density batteries-Operational characteristics – Primary (Zn/MnO_2 or Zn/Ag_2O) and Secondary batteries (Pb- acid and Lithium ion/polymer batteries)	**2**
3.4	Fuel cells – Basic concept and types Proton exchange membrane FC-Methanol FC-solid oxide FC- (principle only)	**2**
3.5	Advantages and Disadvantages of fuel cell-Hydrogen Economy-Hydrogen storage- Super capacitors – EDLC and Hybrid type (principle only)	**2**
4.0	**Advanced Engineering materials**	
4.1	Dielectric, mechanical and electrical properties-chemical methods for tailoring the properties-Doping-Functionalization-core/shell nanostructure	**2**
4.2	Conducting polymers – principle and preparation method-conduction mechanism-(conjugated polymers- conjugated doped polymers)	**2**
4.3	application of polymer and its composites in sensors, light emitting diodes. telecommunications, power transmissions	**2**
4.4	antistatic coatings, conducting adhesives, artificial nerves - EMI shielding, Frequency selective surfaces	**1**
4.5	Sensing properties of materials-concept-Applications- Electronic sensors in Environmental monitoring process	**2**
	Total	**36**

Course Designers:

1. Dr.M.Kottaisamy hodchem@tce.edu
2. Dr..J.Shanmugapriya shanmugapriya@tce.edu
3. Dr.S.Balaji Sbalaji@tce.edu

18CHC30	CHEMISTRY (Common to CSE and IT)

Category	L	T	P	Credit
BS	3	0	0	3

Preamble

The objective of this course is to bestow the better understanding of basic concepts of chemistry and its applications in Computer Science and Engineering and Information Technology. This course provides exposure on corrosion and its protection in computer components. It also imparts knowledge on properties and application of nano-materials in data storage devices. Besides, it highlights properties of water and its treatment methods, spectroscopic techniques for material characterization, properties and applications of polymers.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO 1.	Identify the properties of water and its treatment methods	Understand
CO 2.	Summarize the principles and instrumentations of spectroscopic techniques	Understand
CO 3.	Select the appropriate spectroscopic techniques for characteristics of materials	Apply
CO 4.	Adapt the suitable corrosion control methods	Apply
CO 5.	Describe the preparation, properties and applications of polymers and nanomaterials.	Understand
CO 6.	Discuss the significance of nanomaterials in computer peripherals and data storage devices	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	-	-	-	-	-	-	-	-	-	L	-
CO2	M	L	L	-	-	-	-	-	-	-	-	-
CO3.	S	S	M	M	-	-	-	-	-	-	-	-
CO4.	S	S	M	M	-	-	L	-	-	-	L	-
CO5.	M	M	M	M	-	-	L	-	-	-	-	-
CO6.	M	M	M	M	L	-	M	-	-	-	-	-
S- Strong; M-Medium; L-Low												

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	20	20	20	20
Understand	40	40	40	40
Apply	40	40	40	40
Analyze	-	-	-	-
Evaluate	-	-	-	-

Create	-	-	-	-

Course Level Assessment Questions

Course Outcome 1 (CO1):

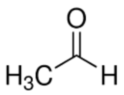
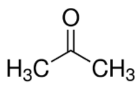
1. Distinguish between scale and sludge.
2. 100 ml of given water sample consumed 48 ml of EDTA during titration using EBT indicator. 35 ml of same EDTA consumed by 100 ml of standard hard water containing 1 mg of pure $CaCO_3$ per ml. Calculate the permanent, temporary and total hardness of given water samples in $CaCO_3$ equivalents.
3. Outline the steps involved in the waste water treatment process.

Course Outcome 2 (CO2):

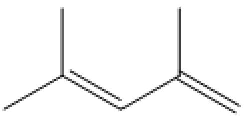
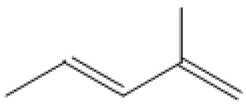
1. State Beer-Lambert law.
2. Write the selection rule in absorption spectroscopy.
3. Explain the procedure involved in finding the metals present in an alloy sample using ICP-OES.

Course Outcome 3 (CO3):

1. Compare the stretching frequencies of carbonyl functional groups in the following compounds

   i)  (ii) 

2. Following Woodward-Fiesher- scott rules, it has been observed that the following compounds have absorption maximum at (i) 225 nm, (ii) 220 (iii) 230. Explain which is which.

   a).  b).  c). 

3. Describe the function of different magnets available to generate magnetic field in MRI scanner.

Course Outcome 4 (CO4):

1. Linear polarisation of steel specimen (0.1 x 0.1 cm^2) kept in 4% aqueous NaCl solution is studied. It gives corrosion current I_{corr} = 50 μA/cm^2.Equivalent weight and density of steel are 55.85 g/mol and 8.05 g/ cm^3 respectively. Calculate the rate of corrosion of steel in mm/year.
2. Demonstrate causes and control measures of corrosion in computer peripherals and electronic devices.
3. Explain the factors influencing rate of corrosion.

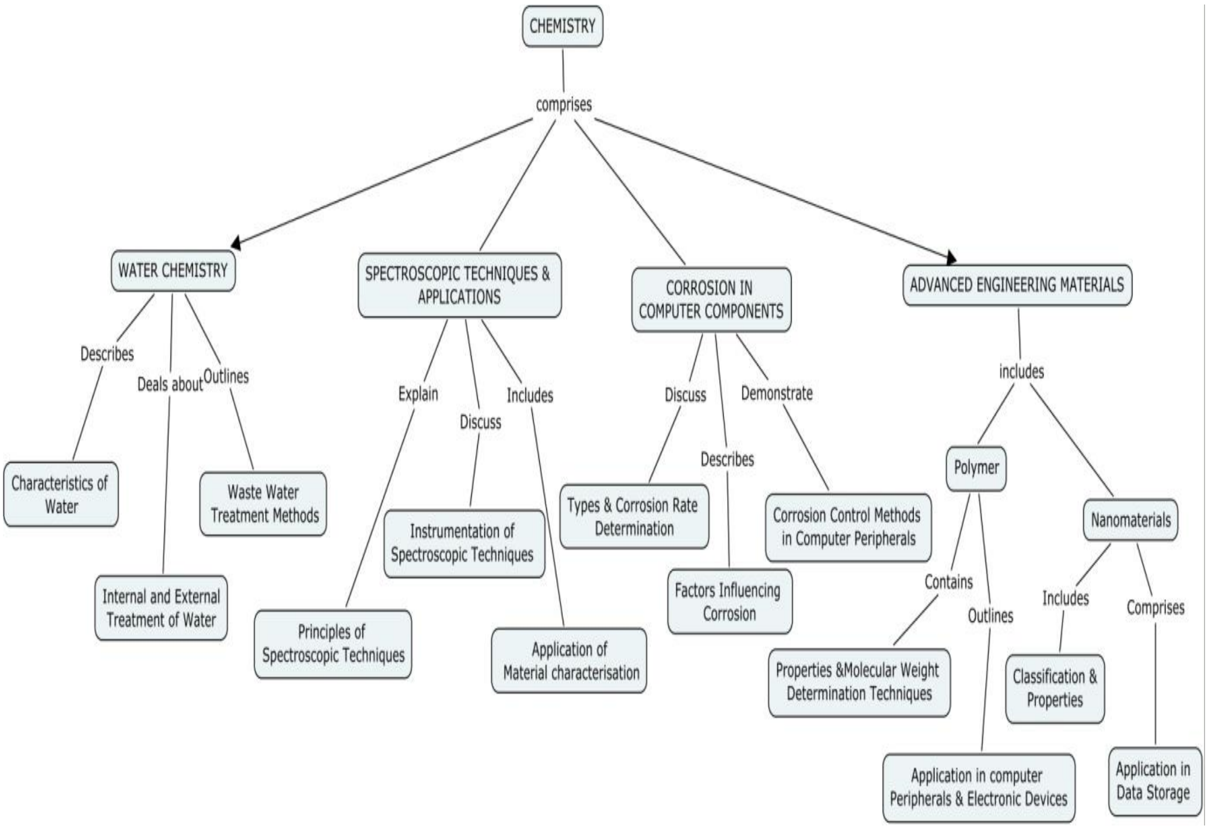
Course Outcome 5 (CO5):

1. Demonstrate the mechanism of conducting polymer of poly acetylene.
2. Explain the application of polymer material application in display devices.
3. Compare OLED vs LCD in display properties.

Course Outcome 6 (CO6):

1. Recall the classification of nanomaterials
2. Explain size dependent properties on nanomaterials
3. Describe the role of nanomaterials in data storage devices.

Concept Map



Syllabus

Water Chemistry:

Water- sources-Hardness of water-types-Estimation of hardness of water by EDTA method. Disadvantages of hardwater -Boiler troubles- scale & sludge. Internal treatment methods. External treatment methods- zeolite, ion exchange. Desalination process- reverses osmosis, electrodialysis, multi stage flash distillation. Waste water treatment processes.

Spectroscopic technique and applications:

Principles of spectroscopy and selection rules- Electronic spectroscopy, Fluorescence-applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules-Applications. Nuclear magnetic resonance and magnetic resonance imaging. Atomic Absorption Spectroscopy and Inductively Coupled Plasma-Optical Emission Spectroscopy-Principle, instrumentation and applications.

Corrosion in computer components:

Introduction -types of corrosion-electrochemical analysis-Polarization and Impedance - Rate of corrosion determination- influencing factors in corrosion-corrosion degradation in computer peripherals, electronic devices -control measures-self protecting corrosion products –Pilling Bed worth rule- precious metal coating and impact-salt spray- electroless plating-Printed Circuit Board (PCB) manufacturing.

Advanced Engineering Materials:

Polymers – introduction – structure- property relationship of polymer -conducting polymers – properties and applications in biosensors, organic light emitting diodes.Polymers in telecommunications, power transmission and liquid crystalline display devices, flexible electronic devices. Polymer composite–classification and applications in computer components. **Nanomaterials**: Difference between nano and bulk materials- classifications- size dependent properties. Data storage materials – properties and applications.

Text Book

1. P.C. Jain and Monica Jain, A Textbook of Engineering Chemistry, DhanpatRai publications, New Delhi, 16th edition, 2015.
2. C. N. Banwelland E.M. McCash, "Fundamentals of Molecular Spectroscopy", Tata McGraw-Hill (India), 5th Edition, 2013.

Reference Books

1. Shashi Chawla, " A text book of Engineering Chemistry", Dhanpat Rai & Co.(pvt) ltd 3rd edition, reprint 2011.
2. Mars Fontana, "Corrosion Engineering, Mc Graw Hill Education 3rd edition reprint, 2017.R.V.Gadag, A. Nityananda Shetty "Engineering Chemistry" I.K. international Publishing Pvt Ltd. 3rd edition 2014.

Course Contents and Lecture Schedule

S. No.	Topic	No. of hour
1.0	**Water Technology**	
1.1	Introduction -Water- sources-Hardness of water-types	1
1.2	Estimation of hardness of water by EDTA method	2
1.3	Disadvantages of hardwater -Boiler troubles- scale & sludge.	1
1.4	Internal treatment methods	1
1.5	External treatment methods- zeolite, ion exchange	1
1.6	Desalination process- reverse osmosis, electrodialysis, multi stage flash distillation	1
1.7	Waste water treatment processes	2
2.0	**Spectroscopic techniques and applications**	
2.1	Introduction	1
2.2	Principles of spectroscopy and selection rules	1
2.3	Electronic spectroscopy, Fluorescence- applications in medicine.	1
2.4	Vibrational and rotational spectroscopy of diatomic molecules- Applications	2
2.5	Nuclear magnetic resonance and magnetic resonance imaging	2
2.6	Atomic Absorption Spectroscopy and Inductively Coupled Plasma- Optical Emission Spectroscopy- Principle, instrumentation and applications.	2
3.0	**Corrosion in computer components**	
3.1	Types of corrosion, Electrochemical analysis – polarisation and impedance	2
3.2	Rate of corrosion determination	1
3.3	Factors influencing corrosion-local heat generation	2
3.4	Corrosion in computer peripherals and electronic devices	1
3.5	Corrosion control methods and precious metal coating	2

S. No.	Topic	No. of hour
3.6	Printed Circuit Board Manufacturing	1
4.0	**Advanced Engineering Materials**	
4.1	Polymers - Structure property relationship of polymer	2
4.2	Conducting polymers – synthesis, properties and applications in biosensors and OLED	3
4.3	Polymer composites – classification and applications in computer components.	1
4.4	Nanomaterials – classification and size dependent properties	1
4.5	Properties of Data storage nanomaterials	2
	Total	**36**

Course Designers:

1. Dr. M. Kottaisamy hodchem@tce.edu
2. Dr. V. Velkannan velkannan@tce.edu
3. Dr. S. Sivailango drssilango@tce.edu

18EG140	ENGLISH	Category	L	T	P	Credit
		HSS	2	0	0	2

Preamble

The course aims at developing communication skills in English essential for understanding and expressing the ideas in different academic, social, and professional contexts. The students acquire the skills of listening, speaking, reading, and writing competencies in English language, making them employable in the globalised scenario.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Recall the basics of language in terms of vocabulary, grammar, pronunciation, syntax and semantics.	Remember
CO2	Understand the grammatical nuances and use them accordingly in respective contexts.	Understand
CO3	Read and comprehend the content in English in general and technical contexts as well.	Understand
CO4	Write with coherence and cohesion effectively.	Apply
CO5	Apply the language in established structure with precision in social and professional contexts.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.										S		S
CO2.										S		M
CO3.										S		S
CO4.										S		S
CO5.										S		S
S- Strong; M-Medium; L-Low												

Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	-	-	-	-
Understand	15	15	30	30
Apply	35	35	70	70
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-

Course Level Assessment Questions

Course Outcomes 1, 2 and 3

1. Rewrite as directed.

    a) Write a basic definition of a " mobile".

    b)Combine the following sentences to bring out the "Purpose and Function".

    The coal gas is compressed. Condensation in the gas mains can be avoided.

    c) Expand the following nominal compounds: i) car race ii) race car

    d) Combine the following sentences using a relative clause.

    Smart meters are small computers. They provide real-time information on how much electricity is being used by each customer.

    e) Combine the following sentences to bring out the "Cause and Effect"

    Sand is mixed with the cement. It prevents the excessive shrinkage during drying.

    f) Give the words for the following transcriptions

    i) /tekˈnɒl.ə.dʒi/ **ii)** /prəˌnʌn*t*.siˈeɪ.ʃən/

    g) Write down the phonetic symbols of the letters underlined. i).**Th**ick ii) Plea**s**ure

    h) Syllabify the word and underline the stressed syllable: Communication

    i) Frame question tags for the following sentence: Don't open your books

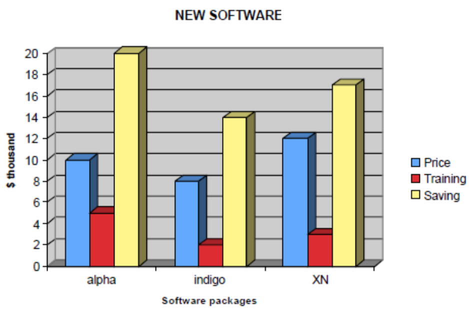
    j) Fill in the blank with the correct form of the verb given in brackets.

    Tamil Nadu's share of students in the IITs and NITs ________ (register) a considerable drop in the recent years.

2. Read the following passage and answer the following (different types of) questions**.**
    - Descriptive questions for eliciting short answers
    - True or false
    - Sentence Completion
    - Synonyms/meaning of the words in the text

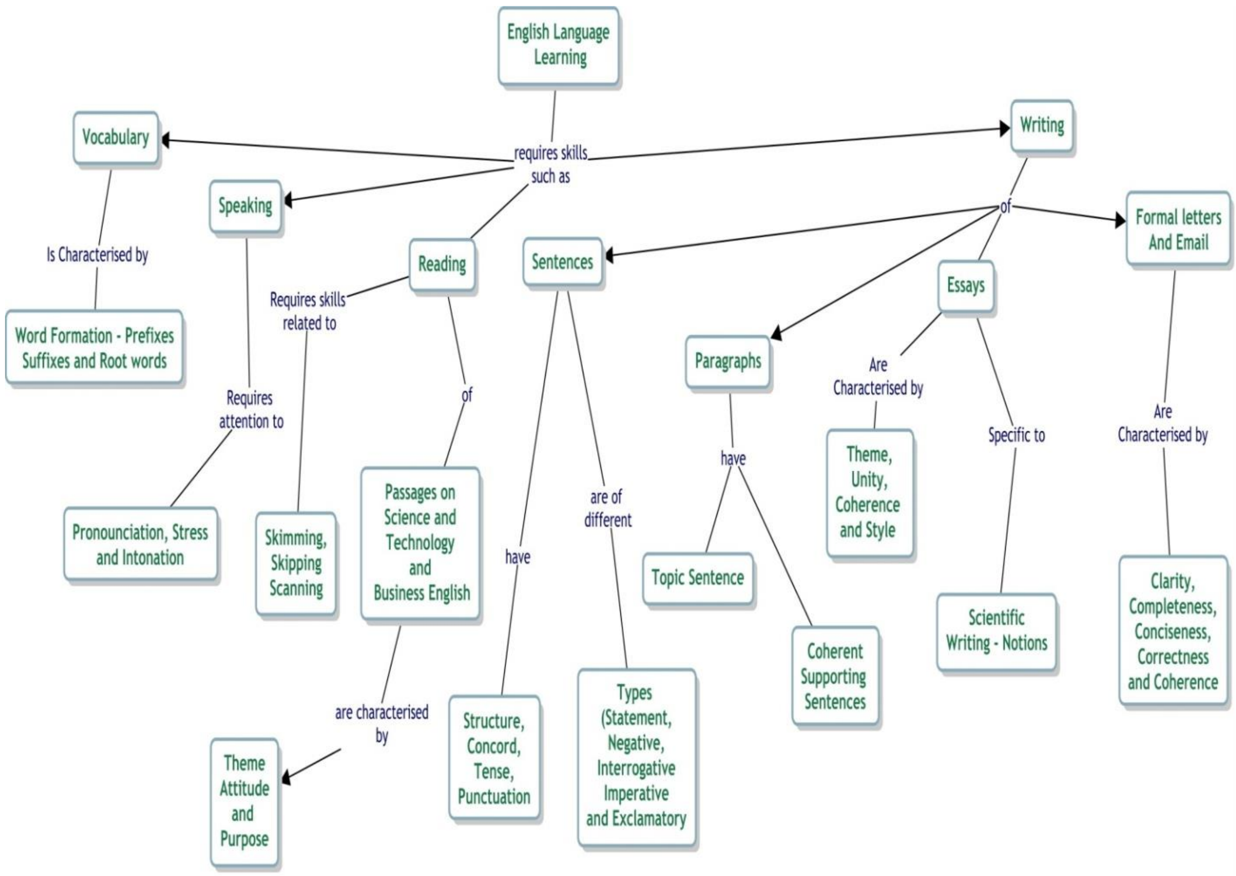
Course Outcomes 4 & 5

1. Write a paragraph in about 100-150 words on E-learning
2. Write a paragraph in about 100-150 words on Plastics
3. Write an e-mail to a company requesting permission to attend in-plant training for a fortnight.
4. Draft a letter to a company requesting you to undergo in-plant training there, inventing necessary details, in proper format.
5. Prepare a set of 10 instructions on how to draw money from an ATM.
6. Prepare a set of 12 recommendations to keep our environment clean.
7. Make notes of the passage given in appropriate format with a title andsummarize in about 100 words.
8. Interpret the following graphic data in about 150 words



9. Write an essay in about 250 words on 'The Impact of Technology on Nature'
10. Write an essay in about 250 words on 'Green Engineering')

Concept Map:



Syllabus:

MODULE- I

Basics of language – Phonetics - Phonemes, Syllables and Stress, Vocabulary – Word Analysis, Prefix, Suffix, Roots, Parts of Speech, Sentence Patterns.

MODULE- II

Basics of grammar – Tenses, Subject-Verb Agreement, Impersonal Passive Voice, Relative Clauses; Notions for Technical English – Noun Compounds, Classifications and Definitions, Cause and Effect, Purpose and Function, Numerical Adjectives, Reading Comprehension – Skimming, Scanning, Skipping (as tested in BEC Vantage Level)

MODULE-III

Writing with coherence and cohesion, Summarizing, Note-Making, Interpretation of Graphics, Writing Instructions and Recommendations, Paragraph and Essay Writing.

MODULE-IV

Writing with correct spelling, punctuation and grammar, Blog writing, E-mail Writing (BEC Vantage Writing-Unit I) – Formal Letters by students for Bonafide Certificate/Permission.

Suggested Reading:

Books:

1. Murphy, Raymond, English Grammar in Use with Answers; Reference and Practice for Intermediate Students, Cambridge: CUP, 2004
2. Jones, Daniel. An English Pronouncing Dictionary, Cambridge: CUP, 2006
3. Brook-Hart,Guy. Cambridge English- Business Benchmark-Upper Intermediate, CUP,2014.
4. Dhanavel, S.P. English and Communication Skills for Students of Science & Engineering, Orient BlackSwan, Chennai: 2016.
5. Swan, Michael. Practical English Usage.4th Edn. OUP. 2016.

Websites:

1. http://www.englishclub.com
2. http://owl.english.purdue.edu
3. https://www.oxfordonlineenglish.com
4. www.bbclearningenglish.com

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1.	Introduction	1
2.	Sentence Patterns	1
3.	Tenses	2
4.	Subject-Verb Agreement	1
5.	Phonetics – Consonants, Vowels, Dipthongs	1
6.	Phonetics – Syllable and Stress	1
7.	Word Formation – Prefixes, Suffixes and Root Words	1
8.	Reading Comprehension - I (Skipping, Skimming, and Scanning)	1
9.	Note-Making and Summarizing	1
10.	Writing Instructions and Recommendations	1
11.	Tutorials	1
12.	Defining and Non-Defining Relative Clauses	1
13.	Impersonal Passive Voice	2
14.	Notions of Technical English – Noun Compounds, Definitions, Cause & Effect, Purpose and Function, Numerical Adjectives	1
15.	Paragraph / Essay Writing- Topic and Supporting Sentences, Coherence	2
16.	E-Mail Writing – (BEC Vantage Writing Task I)	1
17.	Formal Letters by students for Bonafide Certificate/Permission	1
18.	Interpretation of Graphics	1
19.	Reading Comprehension – II (As tested in BEC Writing Task III)	2
20.	Tutorials	1
Total		**24**

Course Designers:

1	Dr. S. Rajaram	sreng@tce.edu
2	Dr.A.Tamilselvi	tamilselvi@tce.edu
3	Mr. R. Vinoth	vino@tce.edu

18ES150	ENGINEERING EXPLORATION

Category	L	T	P	Credit
ES	1	2	-	3

Preamble

The course Engineering Exploration provides an introduction to the engineering field. It is designed to help the student to learn about engineering and how it affects our everyday lives. On the successful completion of the course, students will be to explain how engineering is different from science and technology and how science, mathematics and technology are an integral part of engineering design.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1. Explain technological & engineering development, change and impacts of engineering	Understand
CO2. Draw a product in enough detail that others can accurately build it and write specification sheet for a given product	Apply
CO3. Complete initial steps (Define a problem, list criteria and constraints, brainstorm potential solutions and document the ideas) in engineering design process	Apply
CO4. Draw sketches to a design problem and provide a trade-off matrix	Apply
CO5. Communicate possible solutions through drawings and prepare project report	Apply
CO6. Use reverse engineering to suggest improvements in a tool design	Apply
CO7. Apply the concept of engineering fundamentals in Civil, Mechanical, Electrical and Computer Engineering	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	M	L	-	-	-	-	-	-	-	-	-	-
C02	S	M	L	-	-	-	-	-	-	-	-	-
C03	S	M	L	-	-	-	-	-	-	-	-	-
C04	S	M	L	-	-	-	-	-	-	-	-	-
C05	S	M	L	-	-	-	-	-	-	-	-	-
C06	S	M	L	-	-	-	-	-	-	-	-	-
C07	S	M	L	-	-	-	-	-	-	-	-	-

S- Strong; M-Medium; L-Low

Assessment Pattern

S.No	Bloom's category	Continuous Assessment Tests			End Semester Examinations
		1	2	3	
1	Remember	20	20	20	20

2	Understand	20	20	20	20
3	Apply	60	60	60	60
4	Analyze	0	0	0	0
5	Evaluate	0	0	0	0
6	Create	0	0	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. What is the role of Engineer?
2. How do you believe the growth of engineering has impacted the product that we have today?
3. Select an engineering product, list the specifications and constraints that must be considered when designing the product. Make a list of tradeoff.

Course Outcome 2 (CO2):

1. List the steps of a design problem.
2. Identify the problem you see in the product you used in your daily life.
3. Determine the design constraint and criteria for a problem.
4. Create an isometric drawing of a design.

Course Outcome 3 (CO3):

1. List the five factors when considering development problem.
2. Imagine you have noticed the car you are riding is making a squeaking noise from the engine compartment. Define the problem with your vehicle. Classify the potential problem.
3. Imagine you are hired by your local city to develop a new public transportation.
    a. Define the problem.
    b. List the criteria and constraint.
    c. List the potential solution.

Course Outcome 4 (CO4):

1. Imagine you are an engineer who is designing a portable sitting device; you need to design a chair that will be portable that will fit in the trunk of the car which hold 100 kg individual and will be easily produced. Create sketches using a four step process to this design problem.
2. Imagine you are an engineer who develops method to automatically sort books at college library. Develop possible sketches and list potential solution and give the tradeoff matrix.
3. How can your research improve the design?

Course Outcome 5 (CO5):

1. What details are able to show with the perspective drawing?
2. What is the difference between mockup and prototype?
3. List five different question engineers must ask about function of the design.

Course Outcome 6 (CO6):

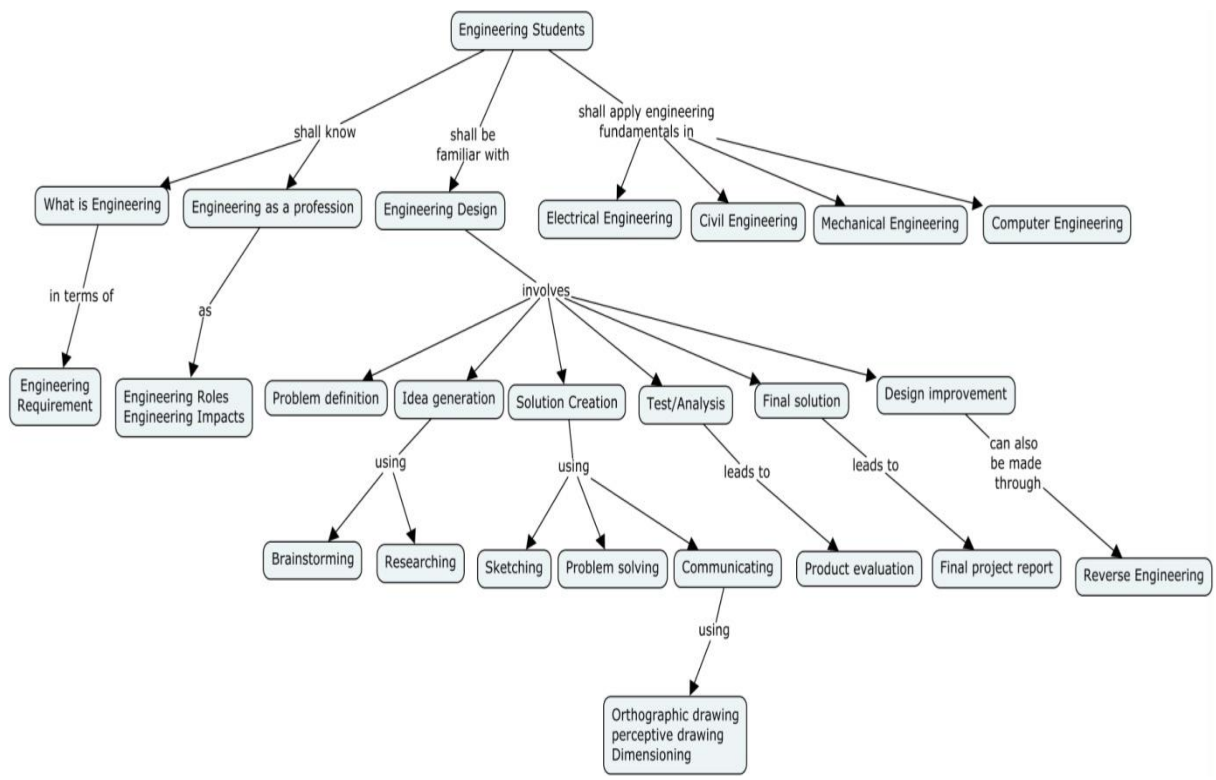
1. Select a product to analyze with respect to function, fit, aesthetics, safety and environment impact. Write a summary on evaluation of the product. If you would like make changes to the design list the changes.

2. What design components should be reconsidered in reverse engineering processes? Why?
3. What are the benefits of reverse engineering?

Course Outcome 7 (CO7):

1. Explain ohms law and list the related formulas.
2. What role do you think the range selection plays in the accuracy of the measurements?
3. Why it is important for a civil engineer to study structural forces?
4. Describe the differences between fluids used in hydraulics and pneumatics.

Concept Map



Syllabus

What is Engineering: Engineering Requirement, Knowledge within Engineering disciplines, Engineering advancements **Engineering Design:** Problem definition, idea generation through brainstorming and researching, solution creation through evaluating and communicating, text/analysis, final solution and design improvement. **Defining problems and Brainstorming:** Researching design, sketching problem solving **Communicating solution**: Dimensioning orthographic drawing, perspective drawing **Modeling and Testing final output:** Product evaluation, reverse engineering, final project report. **Civil Engineering:** Structural forces structural analysis, bridge design components, structural design **Mechanical Engineering:** Types of motion, mechanical power system, mechanical power formula, mechanical design. **Electrical Engineering:** Reading analog multimeter, measuring current, voltage and resistance, electricity from chemicals, solar cells, magnets, Ohms law and watts law, circuit identification and circuit calculation, resistor color code, continuity **Computer Engineering:** Logic gates, algorithms, computer architecture, binary code

Reference Books

1. Ryan A.Brown, Joshua W.Brown and Michael Berkihiser: "Engineering Fundamentals: Design, Principles, and Careers", Goodheart-Willcox Publisher, Second Edition, 2014.
2. Saeed Moaveni ,"Engineering Fundamentals: An Introduction to Engineering", Cengage learning, Fourth Edition, 2011.

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1.	**What is Engineering**	
1.1	Engineering Requirement	1
1.2	Knowledge within Engineering disciplines,	1
1.3	Engineering advancements	1
2	**Engineering Design**	
2.1	Problem definition,	1
2.2	idea generation through brainstorming and researching	1
2.3	solution creation through evaluating and communicating,	1
2.4	text/analysis	1
2.5	final solution and design improvement	1
3	**Defining problems and Brainstorming:**	
3.1	Researching design	1
3.2	sketching problem solving	2
4	**Communicating solution**	
4.1	Dimensioning orthographic drawing	1
4.2	perspective drawing	1
5	**Modeling and Testing final output**	
5.1	Product evaluation	1
5.2	reverse engineering	1
5.3	final project report	1
6	**Civil Engineering**	
6.1	Structural forces structural analysis	2
6.2	bridge design components	2
6.3	structural design	1
7	**Mechanical Engineering**	
7.1	Types of motion	2
7.2	mechanical power system	1
7.3	mechanical power formula	1
7.4	mechanical design	1
8	**Electrical Engineering:**	
8.1	Reading analog multimeter, measuring current, voltage and resistance	1
8.2	electricity from chemicals, solar cells, magnets,	1
8.3	Ohms law and watts law, circuit identification and circuit calculation	1
8.4	resistor color code, continuity	2

No.	Topic	No. of Lectures
9	**Computer Engineering**	
9.1	Logic gates, algorithms,	1
9.2	computer architecture,	2
9.3	binary code	2
	Total	36

Course Designers:

1. Dr.S.J. Thiruvengadam sjtece@tce.edu
2. Dr. S.Baskar sbeee@tce.edu

18ME160	ENGINEERING GRAPHICS	Category	L	T	P	Credit
		ES	3	0	2	4

Preamble

Engineering Graphics is referred as language of engineers. An engineer needs to understand the physical geometry of any object through its orthographic or pictorial projections. The knowledge on engineering graphics is essential in proposing new product designs through drawings and in reading or understanding existing drawings. This course covers orthographic and pictorial projections, sectional views, development of surfaces and use of computer aided drafting tools.

Prerequisite

NIL

Course Outcomes

On successful completion of the course, students will be able to

CO1	Draw conic Sections such as ellipse, parabola, hyperbola and rectangular hyperbola.	Apply
CO2	Draw the orthographic projections (Elevation and Plan) of straight lines inclined to both reference planes.	Apply
CO3	Draw the orthographic projections (Elevation, Plan and End view) of plane surfaces inclined to both reference planes	Apply
CO4	Draw the orthographic projections (Elevation and Plan) of regular solids (Prisms, Pyramids, Cylinder and Cone) with axis inclined to any one reference plane.	Apply
CO5	Draw the orthographic projections (Elevation and Plan) of sectioned solids (Prisms, Pyramids, Cylinder and Cone) with axis perpendicular to horizontal plane and true shape of the sections.	Apply
CO6	Draw the development of surfaces (base and lateral) of sectioned regular solids (Prisms, Pyramids, Cylinder and Cone).	Apply
CO7	Draw the isometric projections of regular solids and combined solids (Prisms, Pyramids, Cylinder, Cone and sphere) and of solid parts from the orthographic views.	Apply
CO8	Develop computer-aided 3D models for the given part drawing (2D/3D) and draw orthographic views for the 3D model with appropriate dimensioning using CAD package. (Continuous Assessment only)	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	M	S	M	M	_	_	_	M	M	_	_
CO2.	S	M	S	M	M	_	_	_	M	M	_	_
CO3.	S	M	S	M	M	_	_	_	M	M	_	_
CO4.	S	M	S	M	M	_	_	_	M	M	_	_
CO5.	S	M	S	M	M	_	_	_	M	M	_	_
CO6.	S	M	S	M	M	_	_	_	M	M	_	_
CO7.	S	M	S	M	M	_	_	_	M	M	_	_
CO8.	S	M	S	M	S	_	_	_	M	M	_	_

Assessment Pattern

Bloom's Category	Continuous Assessment Test	Terminal Examination
Remember	0	0
Understand	0	0
Apply	100	100
Analyse	0	0
Evaluate	0	0
Create	0	0

Course Level Assessment Questions

Course Outcome 1 (CO1)

1. Draw an ellipse if the distance of focus from the directrix is 70 mm and the eccentricity is ¾.
2. Draw a parabola if the distance of focus from the directrix is 60 mm.

Course Outcome 2 (CO2)

2. One end "A" of a straight line AB 85 mm long is 10 mm above HP and 15 mm in front of VP. The line is inclined to HP at 40° and inclined to VP at 30°. Draw the projections.
3. A line CD has its end "C" 20 mm above HP and 25 mm in front of VP. The other end "D" is 45 mm above HP and 40 mm in front of VP. The distance between the end projectors is 60 mm. Draw its projections and find its true length.

Course Outcome 3 (CO3)

1. A semi circular plate of 80 mm diameter has its straight edge on V.P and inclined at 30° to H.P. The surface of the plate is inclined at 45° to V.P. Draw the projections of the plate.
2. A thin rectangular plate of 60 x 40 mm size has its shorter edge on H.P and inclined 30° to V.P. Draw the projections of the plate when its top view is a square of 40 mm side.

Course Outcome 4 (CO4)

1. A hexagonal prism of side of base 35 mm and axis length 80 mm rests on HP on one of its rectangular faces such that its axis is inclined to VP by 45°. Draw its elevation and plan.
2. A square pyramid of base side 40 mm and axis 75 mm long is resting on one of its base edges in such a way that one of its triangular faces is perpendicular to both HP and VP. Draw its front view and top view.

Course Outcome 5 (CO5)

1. A cone of base 75 mm diameter and axis 80 mm long is resting on its base on H.P. It is cut by a section plane perpendicular to VP, inclined at 45° to H.P and cutting the axis at a point 35 mm from the apex. Draw the front view, sectional top view and true shape of the section.
2. A hexagonal pyramid, base 30 mm side and axis 65 mm long is resting on its base on HP with two edges of the base parallel to V.P. It is cut by a section plane perpendicular to V.P and inclined 45° to H.P, intersecting the axis at a point 25 mm

above the base. Draw the front view, sectional top view and true shape of the section.

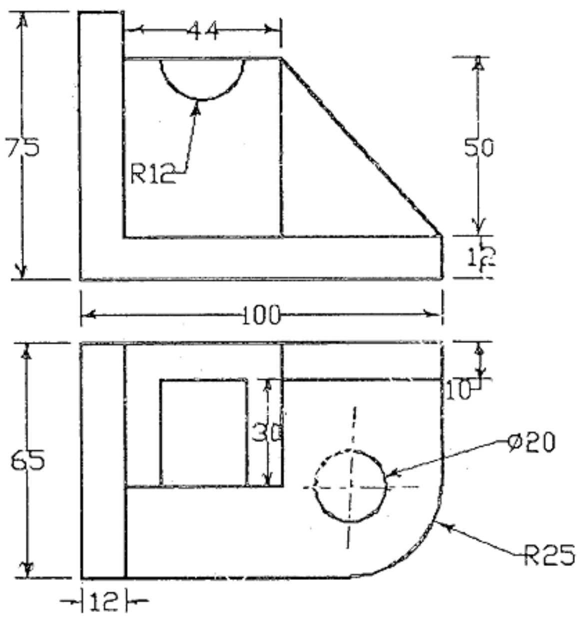
Course Outcome 6 (CO6)

1. A cone of base diameter 60 mm and axis 70 mm long is resting on its base on H.P. A section plane perpendicular to H.P and V.P cuts the cone at a distance of 10 mm from the axis. Draw the development of the cut solid.

2. A pentagonal prism of base side 30 mm and axis height 75 mm is resting on its base on HP such that rectangular face is parallel to V.P. It is cut by a cutting plane perpendicular to V.P and 30° inclined to H.P. It meets the axis 15 mm below the top base. Draw the development of the cut prism.

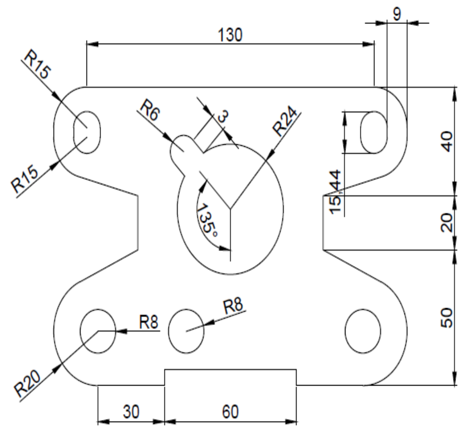
Course Outcome 7 (CO7)

1. Draw the isometric projection of hexagonal prism of base side 40 mm and height 60 mm with a right circular cone of base diameter 50 mm and altitude 50 mm resting on its top such that the axes of both solids are collinear and vertical.
2. Draw the isometric view of the part with the following orthographic views.

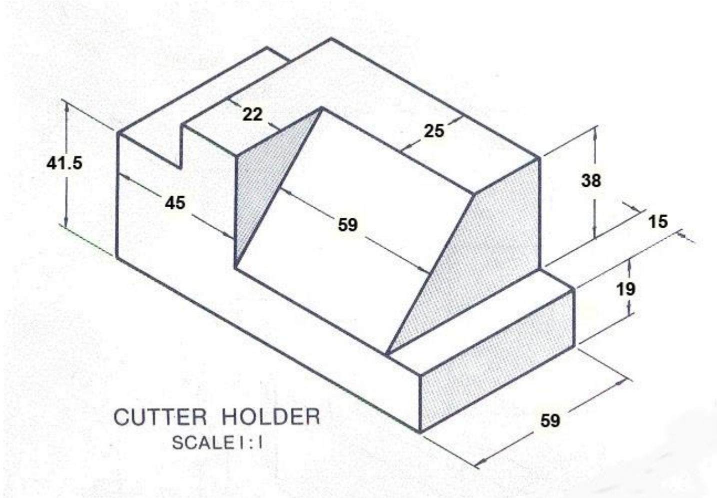


Course Outcome 8 (CO8)

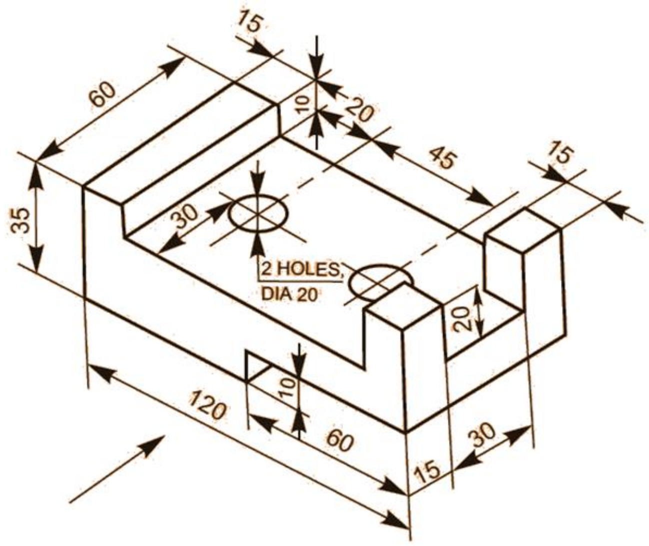
1. Develop a 2D model using CAD package for the given figure.



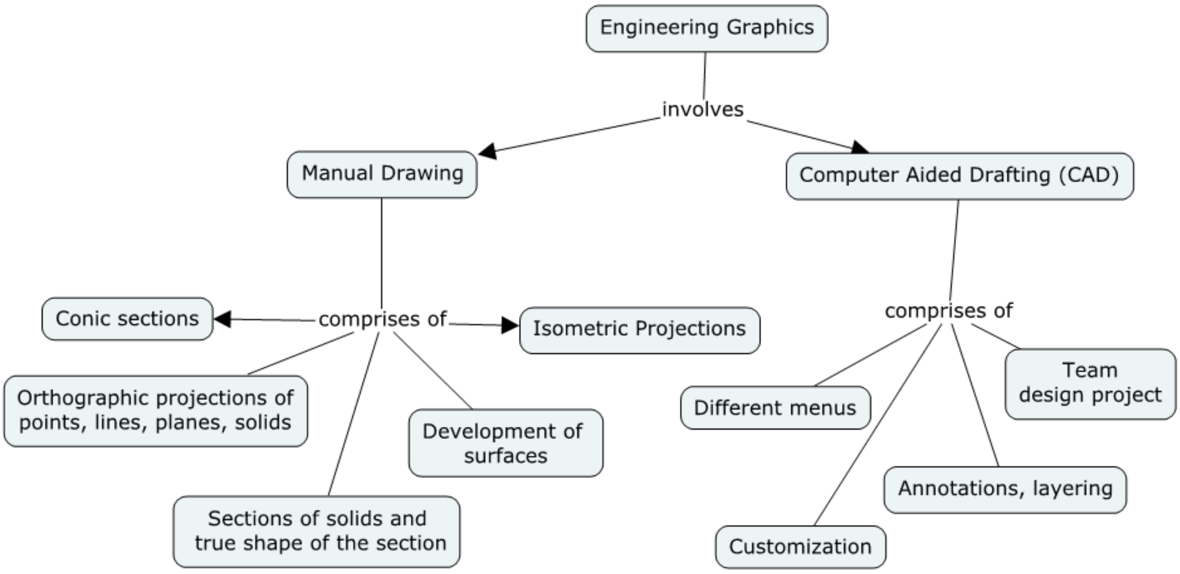
2. Develop a 3D model using CAD package for the given part drawing.



2. Draw the orthographic views for the given 3D model with appropriate dimensioning using CAD package.



Concept Map



Syllabus

Introduction- Significance of engineering graphics, Use of drawing instruments –Standards, Lettering, numbering and dimensioning, Principles of orthographic projections, First angle projection, Scales.

Conic Sections - Construction of ellipse, parabola, hyperbola (Eccentricity Method only) and rectangular hyperbola.

Projection (Elevation and Plan) of points located in all quadrants.

Projection (Elevation and Plan) of straight lines inclined to both reference planes - Determination of true lengths and true inclinations by rotating line method.

Projection (Elevation, Plan and End view) of planes inclined to both reference planes by rotating object method.

Projection (Elevation and Plan) of regular solids (Prisms, Pyramids, Cylinder and cone) by rotating object method when the axis is inclined to one of the reference planes.

Projection (Elevation and Plan) of sectioned solids (Prisms, Pyramids, Cylinder and cone) and true shape of the sections, when the axis of the solid is perpendicular to horizontal plane.

Development of surfaces (base and lateral) **of sectioned regular solids** (Prisms, Pyramids, Cylinder and Cone).

Isometric projection – Principle, isometric scale, Isometric views and Isometric projections of single solid and combined solids (Prisms, Pyramids, Cylinder, Cone and sphere) when the axis is vertical. **Conversion of orthographic projections** (Elevation, Plan and End view) of solid parts / engineering components into isometric view.

Computer Aided Drafting (For Continuous Assessment only)**:**

Overview of Computer Graphics, list of computer technologies, impact on graphical communication. Demonstrating knowledge of the theory of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area

(Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects. Setting up of units and drawing limits.
Drawing geometric entities such as lines, arcs and circles in isometric views. Development of 3D wire-frame and shaded models. Dimensioning – Guidelines – ISO and ANSI standards for coordinate dimensioning - Defining local coordinate systems – Dimensioning in iso-metric and orthographic views.

Text Book

1. Bhatt N.D., Panchal V.M. and Ingle P.R., (2014) "Engineering Drawing", Charotar Publishing House.

Reference Books

1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008
3. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
4. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
5. Shah M.B, and Rana B.C (2008) "Engineering Drawing and Computer Graphics", Pearson Education.
6. (Corresponding set of) CAD Software Theory and User Manuals.

Course Contents and Lecture Schedule

Sl.No	Topic	Lecture Hours	Practice Hours
1	**Introduction**- Significance of engineering graphics, Use of drawing instruments –Standards, Lettering, numbering and dimensioning, Principles of orthographic projections, First angle projection, Scales.	2	1
2	**Conic Sections** - Construction of Ellipse, Parabola, hyperbola and rectangular hyperbola (Eccentricity Method only).	2	3
3	**Projection (Elevation and Plan) of points** located in all quadrants.	2	1
4	**Projection (Elevation and Plan) of straight lines** inclined to both reference planes - Determination of true lengths and true inclinations by rotating line method.	4	2
5	**Projection (Elevation, Plan and End view) of planes** inclined to both reference planes by rotating object method.	5	2
6	**Projection (Elevation and Plan) of regular solids** (Prisms, Pyramids, Cylinder and cone) by rotating object method when the axis is inclined to one of the reference planes.	5	3
7	**Projection (Elevation and Plan) of sectioned solids** (Prisms, Pyramids, Cylinder and cone) and true shape of the sections, when the axis of the solid is perpendicular to horizontal plane.	4	2
8	**Development of surfaces** (base and lateral) **of sectioned regular solids** (Prisms, Pyramids, Cylinder and Cone).	4	2

9	**Isometric projection** – Principle, isometric scale, Isometric views and Isometric projections of single solid and combined solids (Prisms, Pyramids, Cylinder, Cone and sphere) when the axis is vertical. **Conversion of orthographic projections** (Elevation, Plan and End view) of solid parts / engineering components into isometric view.	4	2
10	**Computer Aided Drafting** (For Continuous Assessment only)**:** **10.1** Overview of Computer Graphics, list of computer technologies, impact on graphical communication. Demonstrating knowledge of the theory of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects. Setting up of units and drawing limits.	1	1
	10.2 Drawing geometric entities such as lines, arcs and circles in isometric views. Development of 3D wire-frame and shaded models. Dimensioning – Guidelines – ISO and ANSI standards for coordinate dimensioning - Defining local coordinate systems – Dimensioning in iso-metric and orthographic views.	3	5
	TOTAL	**36**	**24**

Question Pattern for Terminal Examination

Question Number	Description	Type	Marks
1	Conic sections	Either or type	10
2	Projection of lines	Either or type	15
3	Projection of planes	Either or type	15
4	Projection of solids	Either or type	15
5	Section of solids	Either or type	15
6	Development of surfaces	Either or type	15
7	Isometric projections of combined solids Or Orthographic views to isometric view	Either or type	15
Total			**100**

Marks Allocation for Continuous Assessment:

Sl. No	Description	Marks
1	Plates (Drawing sheets) submission	20
2	Computer Aided Drafting (CAD) Exercises	15
3	Continuous Assessment Test (CAT)	15
Total		**50**

Note:

1. One test or two tests will be conducted locally by respective faculty-in- charge during regular class hours to account for continuous assessment test (CAT) marks.

2. Terminal examination (3 hrs) will be conducted centrally by the office of controller of examinations.

Course Designers

1. Dr. A.Samuel Raja samuel1973@tce.edu
2. Prof. M.Kannan mknmech@tce.edu

18EG170	ENGLISH LABORATORY	Category	L	T	P	Credit
		HSS	0	0	2	1

Preamble

This practical course enables the students to develop and evaluate their basic English language skills in Language Lab, equipped with English Software, through individualized learning process and immediate feedback, and facilitates students with the need-based student-centric presentation sessions in a multi-media driven classroom environment.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Pronounce words intelligibly through listening and watching contents on social, technical and day-to-day conversations and respond to questions related to them	Apply
CO2	Apply appropriate lexicon in various contexts, by differentiating variations pertaining to spelling, pronunciation, meaning and grammar	Apply
CO3	Comprehend passages on various topics like general, business and science at various levels	apply
CO4	Read texts in newspapers, magazines, and articles on a variety of issues with clarity to understand and to be understood	Apply
CO5	Prepare and present on a topic to a group of audience with ICT and other educational aids	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										**S**		**S**
CO2										**S**		**M**
CO3										**S**		**S**
CO4										**S**		**M**
CO5										**S**		**S**

Assessment Pattern

Internal: No Continuous Assessment Test will be conducted

Students' performance will be assessed in the classroom as given below

- Spoken Task - General / Technical Presentation / BEC Speaking Tests II: 25 Marks
- Listening Task - Answering questions : 25 Marks

External: Tested on Phonetics, Grammar, and Vocabulary in the lab for 1 hour : 80 Marks

Submission of Students Record on Practical Tasks in the Class and Lab : 20 Marks

List of Experiments

S.No	Topic	Hours
	LAB ACTIVITES	
1	Listening	2
2	Vocabulary	2
3	Grammar	2
4	Phonetics	2
5	Reading Comprehension – I (General)	2
6	Reading Comprehension – II (BEC Vantage Level)	2
	CLASSROOM ACTIVITIES	
7	Reading Practice (Extensive Reading)	2
8	English through Audios & Videos (Note-Taking & answering questions)	2
9	Presentation - I	2
10	Presentation - II	2
11	Revision	2
12	Model Test	2
	Total	24

Software Used:

1. Business English Certificate-Vantage- Practice Software
2. English Software

Extensive Reading: (Not for Terminal Exam, Prescribed only for Spoken Tasks)

1. Khera, Shiv, You Can Win, Macmillan Books, New York, 2003.

Teaching Resources and Websites:

1. Oxford / Cambridge Online English Videos
2. Free Video Downloads from Youtube
3. https://learningenglish.voanews.com/
4. https://www.ted.com/talkshttp://
5. www.esl-galaxy.com/video.htm

Course Designers:

1	Dr. S. Rajaram	sreng@tce.edu
2	Dr.A.Tamilselvi	tamilselvi@tce.edu
3	Mr. R. Vinoth	vino@tce.edu
4	Dr. R. K. Jaishree Karthiga	jai@tce.edu

18PH180	PHYSICS LABORATORY	Category	L	T	P	Credit
		BS	0	0	2	1

Preamble

This course ensures that students learn to apply the basic physics concepts and carry out the experiments to determine the various physical parameters related to the material

- Learn the necessary theory to understand the concept involved in the experiment.
- Acquire the skills to carry out the experiment.
- Tabulate the observed data and use the formula to evaluate the required quantities.
- Plot the data in a graph and use it for calculation.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Analyze mechanical ,electrical oscillations and determine their resonance frequency	Apply
CO2	Analyze the diffraction and interference patterns for characterization	Apply
CO3	Determine the numerical aperture and bending loss in optical fiber	Apply
CO4	Determine the Planck's constant by using LEDs	Apply
CO5	Plot the VI characteristics of solar cell	Apply
CO6	Determine the time constant of an RC circuit	Apply
CO7	Determine the reversibility of classical and quantum logic gates	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	-	-	-	-	-	-	-	-
CO2	S	S	S	S	-	-	-	-	-	-	-	-
CO3	S	S	S	S	-	-	-	-	-	-	-	-
CO4	S	S	S	S	-	-	-	-	-	-	-	-
CO5	S	S	S	S	-	-	-	-	-	-	-	-
CO6	S	S	S	S	-	-	-	-	-	-	-	-
CO7	S	S	S	S	-	-	-	-	-	-	-	-
S- Strong; M-Medium; L-Low												

List of Experiments

OSCILLATIONS AND WAVES

1. Torsion pendulum- Determination of Moment of inertia of a disc
2. Compound pendulum –Determination of acceleration due to gravity

OPTICS

3. Spectrometer-Determination of Refractive index of the material of the prism.
4. Laser Diffraction – Determination of wavelength of Laser and particle size in a thin film.
5. Air wedge –Determination of diameter of wire by interference principle.
6. Fiber optics-Determination of numerical aperture and bending losses.

QUANTUM MECHANICS

7. Photoelectric effect-Determination of Planck's constant
8. Solar cell-Plotting and studying of V-I characteristic
9. Study of Classical and quantum Logic gates.

ELECTROMAGNETIC THEORY

10. RC circuit –Determination of time constant
11. LCR Circuit- Determination of resonant frequency

Course Designers:

1. Dr. R. Vasuki rvphy@tce.edu
2. Dr. M.Mahendran mmphy@tce.edu
3. Mr. V.Veeraganesh vvgphy@tce.edu
4. Dr. A.L.Subramaniyan alsphy@tce.edu
5. Dr.D.Ravindran drphy@tce.edu

18CH190	CHEMISTRY LABORATORY

Category	L	T	P	Credit
BS	0	0	2	1

Preamble

This course aims to provide the students, a basic practical knowledge in chemistry. The objective of this course is to develop intellectual and psychomotor skills of the students by providing hands on experience in quantitative, electrochemical and photo-chemical analysis.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Estimate the chemical water quality parameters of sample water	Apply
CO2	Demonstrate the rate of corrosion of steel by weight loss method	Apply
CO3	Estimate the strength of acidic solution and pH of soil by conductometric and pH metric titrations	Apply
CO4	Illustrate the strength of oxidisable materials present in given sample by potentiometric method	Apply
CO5	Adapt colorimetric method for determination of iron in water	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	-	-	-	L	-	L	-	-	-
CO2	S	S	M	-	-	-	L	-	L	-	-	-
CO3	S	S	M	-	-	-	L	-	M	-	-	-
CO4	S	M	-	-	-	-	-	-	-	-	-	-
CO5	S	S	M	-	-	-	L	-	-	-	-	-

List of Experiments

A. Quantitative analysis

1. Estimation of Total hardness of water
2. Estimation of Ca^{2+} and Mg^{2+} individual hardness of water samples
3. Estimation of alkalinity of water sample
4. Estimation of COD of industrial effluent
5. Estimation of Chloride in a water sample
6. Estimation of rate of corrosion of steel by weight loss method

B. Electrochemical and photochemical analysis

1. Conductometry Titration (Strong acid vs Strong base)
2. Potentiometric redox Titration ($K_2Cr_2O_7$ vs FAS, $KMnO_4$ vs FAS)
3. Determination of pH of soil by pH metric titration
4. Estimation of iron content of water sample using colorimeter

Course Designers:

Dr. M. Kottaisamy	hodchem@tce.edu
Dr. K. Radha	krchem@tce.edu
Dr. J. Shanmugapriya	shanamugapriya@tce.edu
Dr. S. Rajkumar	rajkumarsubramanian@tce.edu
Dr. S. Balaji	sbalaji@tce.edu
Dr. V. Velkannan	velkannan@tce.edu
Dr. S. Sivailango	drssilango@tce.edu
Dr. M. Velayudham	mvchem@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH. INFORMATION TECHNOLOGY DEGREE PROGRAMME

SECOND SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A GOVERNMENT AIDED ISO 9001:2008 CERTIFIED
AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY)
MADURAI – 625 015, TAMILNADU

PHONE: 0452 – 2482240, 41
FAX: 0452 2483427
WEB: WWW.TCE.EDU

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2018-19 onwards)

SECOND SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
18MA210	Matrices and Ordinary Differential Equations.	BS	3	-	-	3
18IT220	Problem Solving Using Computers	ES	3	-	-	3
18IT230	Operating Systems	PC	3	-	-	3
18IT240	Computer Organization and Design	PC	3	-	-	3
THEORY CUM PRACTICAL						
18IT260	Essentials of Information Technology	PC	2	-	2	3
PRACTICAL						
18IT270	Python programming lab	PC	-	-	2	1
18IT280	Workshop	ES	-	-	2	1
18IT290	Lateral Thinking	ES	-	-	2	1
AUDIT COURSES						
18CHAA0	Environmental Sciences	AC	1	-	1	-
Total			**15**	**-**	**9**	**18**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective
AC :Audit Course

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
2 Hours Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

Scheme of Examinations
(For the candidates admitted from 2018-19 onwards)

SECOND SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	18MA210	Matrices and Ordinary Differential Equations.	3	50	50	100	25	50
2	18IT220	Problem Solving Using Computers	3	50	50	100	25	50
3	18IT230	Operating Systems	3	50	50	100	25	50
4	18IT240	Computer Organization and Design	3	50	50	100	25	50
THEORY CUM PRACTICAL								
5	18IT260	Essentials of Information Technology	3	50	50	100	25	50
PRACTICAL								
7	18IT270	Python programming lab	3	50	50	100	25	50
8	18IT280	Workshop	3	100	0	100	0	50
9	18IT290	Lateral Thinking	-	50	50	100	25	50
AUDIT COURSES								
10	18CHAA0	Environmental Science	-	50	50	100	25	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** Terminal Examination will be conducted for maximum marks of 100 and subsequently be reduced to 50 marks for the award of terminal examination marks

18MA210	MATRICES AND ORDINARY DIFFERENTIAL EQUATIONS

Category	L	T	P	Credit
BS	3	0	0	3

Preamble

In engineering, particularly Solid Mechanics, Aerodynamics, Fluid Flow, Heat Flow and Robotics have application that requires an understanding of Vector Calculus and Differential Equations. Also Mathematical tool Laplace Transforms is very much essential to solve ordinary differential equations that occur in the above areas. Eigen values and Eigenvectors are extremely important while creating engineering models in control systems, designing bridges, communication systems and searching algorithms. The course is designed to impart the knowledge and understanding of the above concepts to all Engineers and apply them in their areas of specialization.

Prerequisite

18MA110 Engineering Calculus

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Compute the Laplace transform and inverse Laplace transform of different functions	10%
CO2	Solve the given initial value problem using Laplace transform	15%
CO3	Apply matrix algebra techniques for transformations of conic sections into principle axes	25%
CO4	Solve the model developed for the given system using ordinary differential equation	25%
CO5	Compute divergence and curl of vector functions	10%
CO6	Apply the concepts of vector differentiation and vector integration to fluid flow and heat transfer problems	15%

CO Mapping with CDIO Curriculum Framework

CO	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components
		Cognitive	Affective	Psychomotor	
CO1	TPS2	K2	A2	-	1.1
CO2	TPS3	K3	A3	-	1.1
CO3	TPS3	K3	A3	-	1.1
CO4	TPS3	K3	A3	-	1.1
CO5	TPS2	K2	A2	-	1.1
CO6	TPS3	K3	A3	-	1.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	S	M			-	-	-	-		-	-	
CO2.	S	S	S		-	-	-	-	M	-	-	M
CO3.	S	S		S	-	-	-	-		-	-	S
CO4.	S	S	S	S	-	-	-	-	M	-	-	M
CO5.	S	M										
CO6.	S	S	S									

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	10	10	10				10
Understand	30	30	30				20
Apply	60	60	60	100	100	100	70
Analyse	00	00	00				00
Evaluate	00	00	00				00
Create	00	00	00				00

Sample Questions for Course Outcome Assessment**

Course Outcome 1

1. Show that Laplace transform of $\frac{1}{\sqrt{t}}$ is $\frac{\sqrt{\pi}}{s}$.
2. Identify the inverse Laplace transform of $\log\left(\frac{s^2+1}{(s-1)^2}\right)$.
3. Discuss any three properties of Laplace transforms.

Course Outcome 2

1. Apply Laplace transform solve $y''+9y=\delta\left(t-\frac{\pi}{2}\right)$, $y(0)=2,\ y'(0)=0$.
2. By using Laplace transform, solve $x''(t)+3x'(t)+2x(t)=2(t^2+t+1)$; with $x(0)=2, x'(0)=0$.
3. Apply convolution theorem, Solve the Voltera integral equation of the second kind $y(t)-\int_0^t y(\tau)\sin(t-\tau)d\tau=t$.

Course Outcome 3

1. An elastic membrane in the $x_1\,x_2$ plane with boundary circle $x_1{}^2+x_2{}^2=1$ is stretched so that a point $P;(x_1,x_2)$ goes over into the point $Q;(y_1,y_2)$ given by
   $y_1=5x_1+3x_2$
   $y_2=3x_1+5x_2$
   Find the principal directions that is the directions of the position vector X of P for which the direction of the position vector Y of Q is the same or exactly opposite. Predict the boundary circle take under this deformation?
2. Discover the type of conic section the following quadratic form represents and transform it to principal axes: $Q=17x_1^2-30x_1x_2+17x_2^2=128$.
3. Diagonalize the matrix $\begin{bmatrix} 6 & 0 & 0 \\ 12 & 2 & 0 \\ 21 & -6 & 9 \end{bmatrix}$

Course Outcome 4

1. Reduce to first order and solve $y''-y'=0$
2. Compute the general solution for $y''+y'+(\pi^2+1/4)y=e^{-x/2}\sin\pi x$
3. Solve $(x^2D^2-4xD-6)y=c$

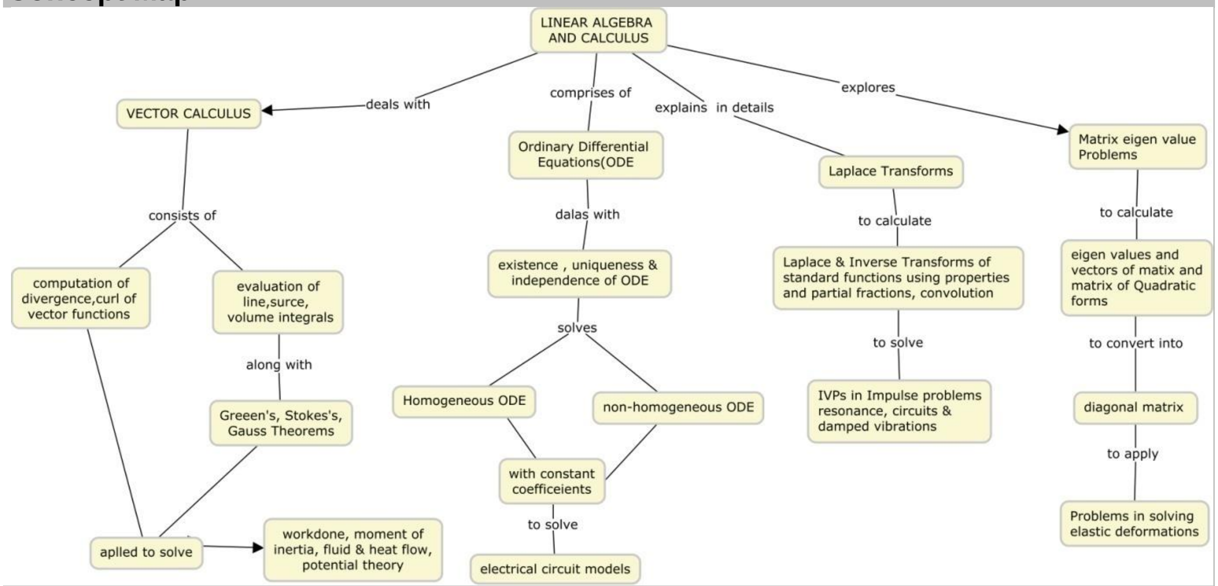
Course Outcome 5

1. Predict the value of $div(curl\vec{F})$.
2. If ϕ_1 and ϕ_2 are scalar point functions and $\vec{F}$ is a vector point function such that $\phi_1 \vec{F} = \nabla \phi_2$ then identify $\vec{F}.curl\,\vec{F}$.
3. Estimate $curl\,\vec{v}$, where $\vec{v} = \left[e^{-z^2}, e^{-x^2}, e^{-y^2}\right]$.

Course Outcome 6

1. Predict the work done by the force $\vec{F} = [y^2, -x^2]$ acting on a particle in $y = 4x^2$ from (0,0) to (1,4).
2. Compute the amount of fluid that crosses the surface in a flow per unit time at any one instant, if the velocity field is $\vec{v} = y\vec{i} + x\vec{j} + z\vec{k}$ over the boundary of the region enclosed by the paraboloid $z = 1 - x^2 - y^2$ and the plane z = 0.
3. Apply Stokes theorem to compute $\int_C \vec{F}.\vec{r}'ds$ where $\vec{F} = [y, xz^3, -zy^3]$ and C is circle $x^2 + y^2 = 4, z = -3$.

Concept Map



Syllabus

LAPLACE TRANSFROMS: Laplace transform, Linearity, First Shifting theorem – Transforms of derivatives and integrals, ODEs – Unit step function, Second shifting theorem – Short Impulses, Dirac's delta function, partial fractions – Convolution, Integral Equations – Differentiation and integration of transforms. **MATRIX EIGEN VALUE PROBLEM:** The Matrix Eigen value Problem, Determining Eigenvalues and Eigenvectors – Some Applications of Eigen value Problems – Symmetric, Skew symmetric and orthogonal matrices – Eigen bases, Diagonalization, Quadratic forms. **ORDINARY DIFFERENTIAL EQUATION:** Homogeneous Linear ODEs of second order – Homogeneous Linear ODEs with constant coefficients – Euler Cauchy Equation – Existence and uniqueness of solutions, Wronskian - Nonhomogeneous ODE – Modelling: Electric Circuits- Solution by Variation of Parameters. **VECTOR CALCULUS:** Divergence of a Vector Field- Curl of a Vector Field- Line Integrals- Path independence of line integrals- Green's Theorem in the plane- Surface Integrals- Triple Integrals, Divergence Theorem of Gauss- Applications of the Divergence Theorem- Stoke's Theorem.

Learning Resources

1. Erwin Kreszig, "Advanced Engineering Mathematics",10th edition, Wiley, 2017.
    a. Laplace transforms : [sections 6.1,6.2,6.3,6.4,6.5,6.6]
    b. Matrix eigen value problem : [sections 8.1,8.2,8.3,8.4]
    c. Ordinary differential equations : [sections 2.1,2.2,2.5,2.6,2.7,2.9,2.10]
    d. Vector calculus : [sections 9.8.9.9,10.1,10.2,10.4,10.6, 10.7,10.8,10.9]
2. Peter V.O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2017.
3. Glyn James, “Advanced Modern Engineering Mathematics”, Pearson Education, New Delhi, 2016.
4. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 3rd Edition, 2007.
5. Made Easy Team, Engineering Mathematics, Made Easy Publications, 2018.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**LAPLACE TRANSFORMS**		
1.1	Laplace Transform. Linearity. First Shifting Theorem (*s*-Shifting)	2	CO1
1.2	Transforms of Derivatives and Integrals. ODEs	2	CO2
1.3	Unit Step Function (Heaviside Function). Second Shifting Theorem (*t*-Shifting)	1	CO1
1.4	Short Impulses. Dirac’s Delta Function. Partial Fractions	1	CO1
1.5	Convolution. Integral Equations	2	CO2
1.6	Differentiation and integration of transforms	1	CO1
2	**MATRICES EIGEN VALUE PROBLEMS**		
2.1	Determining Eigenvalues and Eigenvectors	2	CO3
2.2	Some Applications of Eigenvalue Problems	1	CO3
2.3	Symmetric, Skew-Symmetric, and Orthogonal Matrices	2	CO3
2.4	Eigenbases. Diagonalization.	2	CO3
2.5	Quadratic Forms	2	CO3
3	**ORDINARY DIFFERENTIAL EQUATION**		
3.1	Homogeneous Linear ODEs of Second Order	2	CO4
3.2	Homogeneous Linear ODEs with Constant Coefficients	1	CO4
3.3	Euler–Cauchy Equations	1	CO4
3.4	Existence and Uniqueness of Solutions. Wronskian	1	CO4
3.5	Nonhomogeneous ODEs	2	CO4
3.6	Solution by Variation of Parameters	2	CO4
4	**VECTOR CALCULUS**		
4.1	Divergence and Curl of a Vector Field	2	CO5
4.2	Line Integrals	2	CO6
4.3	Green’s Theorem in the Plane	1	CO6
4.4	Surface Integrals	1	CO6
4.5	Triple Integrals. Divergence Theorem of Gauss	1	CO6
4.6	Applications of the Divergence Theorem	1	CO6
4.7	Stoke’s Theorem	1	CO6
	TOTAL No. of Hours	36	

Course Designers

1. Dr.V.Gnanaraj - vgmat@tce.edu
2. Dr.S.Jeyabharathi - sjbmat@tce.edu
3. Dr.G.Jothilakshmi - gjlmat@tce.edu
4. Dr.C.S.Senthil kumar - kumarstays@tce.edu
5. Dr.R.Suresh - suresh080183@tce.edu

18IT220	PROBLEM SOLVING USING COMPUTERS	Category	L	T	P	Credit
		ES	3	0	0	3

Preamble

The course on problem solving using computers is intended to introduce the students about computational thinking, the methodology of programming with emphasis on modularity and the coding of computer programs. Upon completion of the course, the students would be able to master the principles of interpreted high-level programming and demonstrate significant experience in problem solving

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Practice the following terms in the context of problem solving by a computer: Problem specification, input-output analysis, algorithm, flowchart, pseudo-code, High level language, assembly language, machine language, and compilation and execution.	10
CO2	Solve the given problem statement using programming concepts such as objects, data types, expression statements, looping and string evaluation	19
CO3	Apply problem solving strategies such as divide and conquer, merging, solving by analogy etc in design of simple applications	19
CO4	Make use of functions, scoping and abstraction in development of simple applications.	11
CO5	Demonstrate mutability and higher order functions using file I/O and exception handling in python.	19
CO6	Take part in software engineering principles like analysis, design, coding, testing and maintenance for the development of engineering applications using python programming.	22

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO6	TPS4	Analyse	Organise	Complex Overt Responses	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.4.1, 4.5.1, 4.5.3, 4.5.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L									M	M		L
CO2	S	M	L									M	M		L
CO3	S	M	L									M	M		L
CO4	S	M	L									M	M		L
CO5	S	M	L									M	M		L
CO6	S	S	M	L	L			S	S	S	L	M	S	L	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	20	20	10	-	-	-	10
Understand	40	30	30	-	-	-	30
Apply	40	50	60	80	60	30	60
Analyse	0	0	0	20	40	70	0
Evaluate	0	0	0	0	0	0	0
Create	0	0	0	0	0	0	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Assignment/Practical Component
Perception	-
Set	20
Guided Response	20
Mechanism	40
Complex Overt Responses	20
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):
1. Differentiate a compiler and interpreter.
2. Draw the flowchart for generation of Fibonacci sequence.
3. Develop the algorithm for exchange of two variables.

Course Outcome 2 (CO2):
1. Show the memory model of variables in python.
2. Write a python program to check whether a given number is prime or not using for-else statement.
3. Write a python program to read the string with punctuations and print the same string without punctuations.
4. Illustrate the steps that python follows in creating a object.

Course Outcome 3 (CO3):
1. A company needs a program to figure its weekly payroll. The input data, consisting of each employee's identification number, pay rate, and hours worked, is in the file datafile.dat in secondary storage. The program should input the data for each employee, calculate the weekly wages, save the input information for each employee along with the weekly wages in a file, and display the total wages for the week on the screen, so that the payroll clerk can transfer the appropriate amount into the payroll account. Discuss the problem solving approach you would follow to develop the program.
2. Design an algorithm using factoring technique to establish all the primes in first n positive integers.
3. In the Company Payroll Program, use means-ends analysis to develop the algorithm for calculating pay. What are the ends in the analysis? What information did we start with and what information did we want to end up with?

Course Outcome 4 (CO4):
1. Write a python program to multiply all the numbers in a list.
2. Write a python program to calculate the factorial of a number (a non-negative integer). The function accepts the number as an argument.
3. Write a python program that Accepts a string and calculate the number of upper case letters and lower case letters.

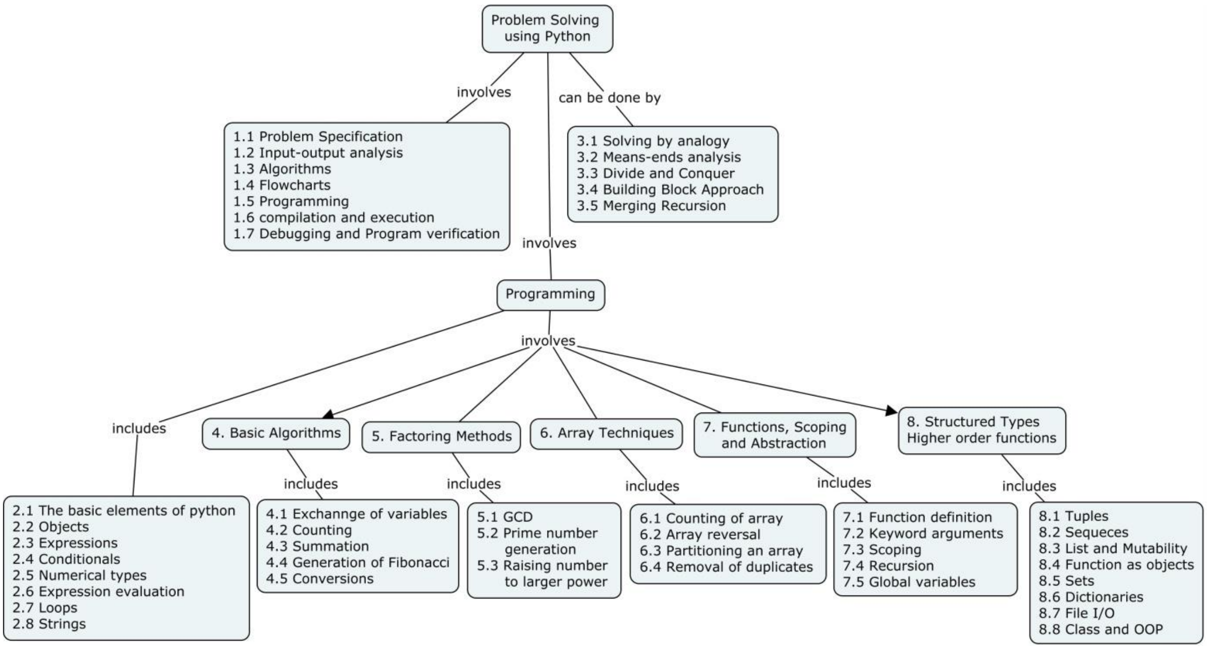
Course Outcome 5 (CO5):
1. Write a python program to read the contents of a text file and to write into another file.
2. Show the difference between lists and string in python programming with an example.
3. Write a python program to read a word and print the number of letters, vowels, and percentage of vowels in the word using dictionary.
4. Store the following data in a list, in a set and in a dictionary

India	USA	UK	Japan
99	1	5	60

Course Outcome 6 (CO6):
Design and Development of applications like
  a. Encryptor/ Decryptor
  b. Physics problem solver
  c. Sudoku solver
  d. Hospital management system
  e. Random number generator
  f. Electric circuit solver etc.
  g. Scientific Calculator

Mini Project Details: (Team size: 3)
- Problem identification.
- Problem Analysis and Modular design.
- Develop algorithm/pseudo code and draw the flowchart – module wise individually.
- Develop programs module level, test and debug individually.
- Integrate the modular programs and present the results in a team.
- Document the above process as a report.

Concept Map



Syllabus

Introduction to Problem Solving – Problem Specification, input-output analysis, Algorithms – Design and Analysis, Implementation of Algorithms, Flowcharts, Programming – High level languages, language translators, syntax, semantics, compilation and execution, Debugging and Program verification.

Fundamentals of Python – The basic elements of python – objects – expressions – assignment statement – arithmetic operators – operator precedence – boolean expression – conditionals – numerical types – expression evaluation – float representation – loops – for loop – nested loops – break and continue – strings – indexing and slicing strings

Problem Solving Techniques – Solving by analogy, Means-ends analysis, Divide and Conquer, Building Block Approach – Merging Recursion

Basic Algorithms – Exchange of variables, Counting, Summation of set of numbers, Generation of Fibonacci sequence, Number to character conversion.

Factoring Methods – Greatest Common Divisor of two integers, Generation of Prime numbers, raising number to larger power

Array Techniques – Counting of array elements, array reversal, partitioning an array, removal of duplicates in an array

Functions, scoping and Abstraction – Function definition – keyword arguments and default values – scoping – specifications – recursion – Fibonacci numbers – palindromes – global variables.

Structured types, Mutability and Higher order functions – tuples – sequences and multiple assignments – list and mutability – mutable sequence – list comprehension – functions as objects – sets – dictionaries – file I/O – exceptions – Classes and Object Oriented Programming

Learning Resources

1. John V.Guttag, " Introduction to Computation and Programming Using Python : With Application to Understanding Data", Prentice-Hall International publishers, Second Edition, 2017.
2. R.G.Dromey, "How to solve it by Computers", Pearson Education India , First Edition, 2008
3. ReemaThareja, "Python Programming using problem solving Approach", Oxford University, Higher Education Oxford University Press, First edition, 2017.
4. E. Bala gurusamy, "Introduction to Computing and Problem Solving using Python", Mcgraw Higher Ed, First Edition, 2016.
5. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Updated for Python 3, Shroff/O'Reilly Publishers, Second Edition, 2016.
6. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., First Edition, 2016.
7. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming", O'Reilly, Shroff Publishers and Distributors, Fifth Edition, 2013.
8. Mark Pilgrim, "Dive into Python 3", Apress, 2009

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**Introduction to Problem Solving**		CO1
1.1	Problem Specification	1	
1.2	Input-output analysis		
1.3	Algorithms – Design and Analysis, Implementation of Algorithms	1	
1.4	Flowcharts		
1.5	Programming – High level languages, language translators, syntax, semantics	1	
1.6	Compilation and execution	1	
1.7	Debugging and Program verification	1	
2.	**Fundamentals of Python**		CO2
2.1	The basic elements of python	1	
2.2	Objects		
2.3	Expressions – assignment statement – arithmetic operators – operator precedence – Boolean expression	2	
2.4	Conditionals	1	
2.5	Numerical types – expression evaluation – float representation	1	
2.6	Loops – for loop – nested loops – break and continue	2	
2.7	Strings – indexing and slicing strings	1	
3.	**Problem Solving Techniques**		CO3
3.1	Solving by analogy	1	
3.2	Means-ends analysis	1	
3.3	Divide and Conquer	1	
3.4	Building Block Approach		
3.5	Merging Recursion	1	

Module No.	Topic	No. of Hours	Course Outcome
4.	**Basic Algorithms**		
4.1	Exchange of variables	1	
4.2	Counting		
4.3	Summation of set of numbers	1	
4.4	Generation of Fibonacci sequence		
4.5	Number to character conversion		
5.	**Factoring Methods**		
5.1	Greatest Common Divisor of two integers	1	
5.2	Generation of Prime numbers	1	
5.3	Raising number to larger power	1	
6.	**Array Techniques**		
6.1	Counting of array elements	3	
6.2	Array reversal		
6.3	Partitioning an array		
6.4	Removal of duplicates in an array		
7.	**Functions, scoping and Abstraction**		CO4
7.1	Function definition	2	
7.2	Keyword arguments and default values		
7.3	Scoping – specifications	1	
7.4	Recursion – Fibonacci numbers – palindromes	1	
7.5	Global variables		
8	**Structured types, Mutability and Higher order functions**		CO5
8.1	Tuples	1	
8.2	Sequences and multiple assignments	1	
8.3	List and mutability – mutable sequence – list comprehension	2	
8.4	Functions as objects	1	
8.5	Sets		
8.6	Dictionaries	1	
8.7	File I/O – exceptions		
8.8	Classes and Object Oriented Programming	1	
Total Lecture Hours		36	

Course Designers:

1. A.Sheik Abdullah asait@tce.edu
2. M.Thangavel mtit@tce.edu

18IT230	Operating Systems	Category	L	T	P	Credit
		PC	3	0	0	3

Preamble

The major objective of this course is to introduce basic concepts and principles of Windows, Linux, and Unix operating systems which include memory management, device management, process management, and file management. The students will able to understand the insights about the security issues and advancements.

Prerequisite

- NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Describe the Structure, Process creation, Thread management, Security measures and advancements in OS.	22
CO2	Experiment the multiprogramming and time sharing behaviour with various scheduling strategies.	14
CO3	Identify the various classical synchronization problems with its implementation.	19
CO4	Illustrate the deadlock mechanism in resource sharing and infer memory management using paging algorithms.	31
CO5	Interpret the mechanisms adopted for I/O and file systems in distributed applications.	14

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	-	1.2,2.3.1,2.3.2
CO2	TPS3	Apply	Value	Guided Response	1.2,2.3.1,2.3.2,2.3.3 ,2.3.4,4.3.2 4.3.3
CO3	TPS3	Apply	Value	Guided Response	1.2,2.3.1,2.3.2,2.3.3 ,2.3.4,3.2.4,4.3.2 4.3.3
CO4	TPS3	Apply	Value	Guided Response	1.2,2.3.1,2.3.2,2.3.3 ,2.3.4,3.2.4,4.3.2 4.3.3
CO5	TPS2	Understand	Respond	-	1.2,2.3.1,2.3.2

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		M				S	S		M	M	L	M
CO3	S	M	L		M				S	S		M	M	L	M
CO4	S	M	L		M				S	S		M	M	L	M
CO5	M	L										M	L		L

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	-	-	-	-	-	-	10
Understand	50	40	30	20	20	20	30
Apply	50	60	70	80	80	80	60
Analyse	0	0	0	-	-	-	0
Evaluate	0	0	0	-	-	-	0
Create	0	0	0	-	-	-	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	30
Guided Response	70
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

** (2 to 3 at the cognitive level of course outcome)

Course Outcome1 (CO1):

1. List out three main purposes of an operating system?
2. State the purpose of system calls.
3. Illustrate the working principles of OS System calls with an example.

Course Outcome2 (CO2):

1. Consider the following set of process, with the length of the CPU-burst time given in milliseconds:

Process	Burst time	Arrival time	Priority
P1	5	3	3
P2	7	1	2
P3	3	2	0
P4	4	4	1

Sketch Gantt charts for the above processes using FCFS, SJF, shortest-remaining-time-first and RR (quantum=1) scheduling and choose the optimized scheduling algorithms.

2. Consider the following set of process, with the length of the CPU-burst time given in milliseconds:

Process	Burst Time
P1	5
P2	7
P3	3
P4	4

Sketch the Gantt charts for the above processes using FCFS, SJF, shortest-remaining-time-first and RR (quantum=1) scheduling. Judge the effects of average waiting time of all algorithms.

3. Show which scheduling algorithm is best for the following input, P1 (BT 3), P2 (BT 6), P3 (BT 7) arrival Time same for all the above.

Course Outcome3 (CO3):

1. Construct a monitor that implements semaphore for Dining Philosopher problem.
2. Consider a system with three chef processes and one *agent* process. Each chef continuously prepares a dish. But to prepare a dish, the chef needs three ingredients: SPICE(S), WATER (W), and VEGETABLES (V). One of the chef processes has S, another has W, and the third has V. The agent has an infinite supply of all three ingredients. The agent places two of the ingredients on the table. The chef who has the remaining ingredient then makes the dish, signalling the agent on completion. The agent then puts out another two of the three ingredients, and the cycle repeats. Develop a pseudo code to synchronize the agent and the chef.
3. Develop the algorithm for any classical Synchronization Problem with semaphore.

Course Outcome4 (CO4):

1. Assume the snapshot, Find the need and safe state if process requests P1(0,1,0) P2(1,0,0) P3(0,0,0) and estimate whether the requests are granted/denied.

P	**Max**	**Current**	**Availability**
P 1	5,3,2	2,3,0	3,2,2
P 2	1,4,3	1,2,1	
P 3	6,1,2	3,0,1	

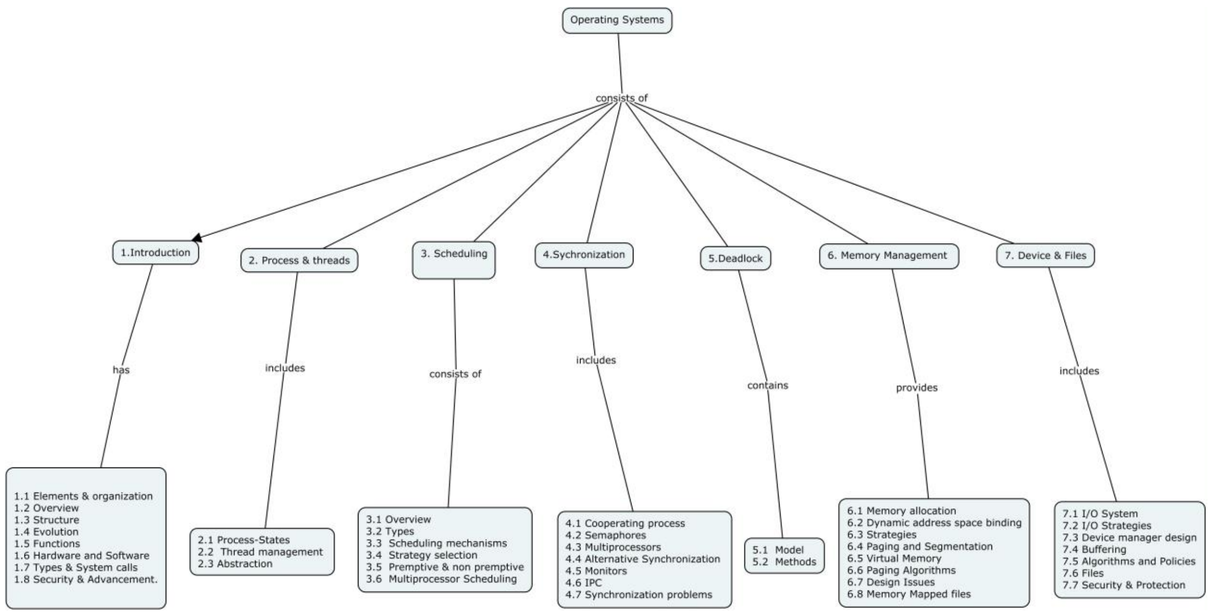
2. Suppose the head of moving-head disk with 250 tracks, numbered 0 to 249 is currently serving a request at track 50. If the queue of requests is kept in the order 190, 240,43, 110, 15, 132, 72, 68,210.Identify the total head movement to satisfy these requests for FCFS,SSTF,C-SCAN disk scheduling algorithms?
3. Consider the following page reference string 1,2,3,4,2,1,5,6,1,2,3,7,6,3,1,4,2,3 . Identify the page faults which occur for the following page replacement algorithms assuming three and four frames? (Hint: all frames are initially empty).

   (i) FIFO
   (ii) LRU
   (iii) OPTIMAL.

Course Outcome 5 (CO5):

1. Illustrate the I/O mechanism involved (polling & Interrupt) in the device driver when invoking the statement fp = fopen(“c:\test.txt”,”r/w”) where fp is the FILE pointer.
2. Illustrate Hardware Buffering need in Device Management.
3. Explain the implications of virtualization for disaster recovery.

Concept Map



Syllabus

Introduction: Computer System – Elements and Organization, Operating System Overview- Structure, Evolution, Functions, Hardware and Software Support for OS, kernel Types, System Calls, Security measures and Advancements in OS.

Process and Threads: Process - States, Thread management - Unix & Windows, Process and Thread abstraction.

Scheduling: Overview, Multiprogramming and Time Sharing, Scheduling mechanisms, Strategy selection, Non-pre-emptive and Pre-emptive strategies, Multiprocessor Scheduling. Case Study: Implementing the scheduler in UNIX and Windows using scripting, Thread Scheduling (example using POSIX threads).

Synchronization: Cooperating process, Semaphores, Shared memory multiprocessors, Alternative Synchronization primitives, Monitors, Inter-process Communication, Classical Synchronization problems, Case Study: Implementation - Bounded Buffer Problem, Reader's Writer's Problem, Dining Philosopher's Problem.

Deadlock: System Deadlock Model, Prevention, Avoidance, Detection and Recovery.

Memory Management: Memory allocation, Dynamic address space binding ,memory management strategies-Paging and Segmentation, Virtual Memory, Static and dynamic paging algorithms, Design Issues of Paging Systems, Memory Mapped files.

Device and File Management: - I/O System, I/O Strategies, Device manager design, Buffering, Disk Scheduling Algorithms and Policies, File – Files Overview, Directories, Implementing Directories, Security and Protection mechanism.

Learning Resources

- Silberschatz, Greg Gagne, Peter B. Galvin, "Operating System Concepts", 8th Edition, Wiley, 2014.
- Garry Nutt, Nabenduchaki, SarmistaNeogy, "Operating Systems", 3rd Edition, Pearson Education, 2009.
- William Stallings, "Operating systems Internal and Design Principles", 6th Edition, Pearson Education, 2009.

- Randal Bryant, “Computer Systems: A Programmer's Perspective”, 3rd Edition, David O’Halloran, Prentice Hall, 2016.
- Andrew Tanenbaum, “Modern Operating Systems”, 4th Edition, Addison Wesley, 2015.
- H M Deitel, P J Deitel and D R Choffnes, “Operating Systems”, 3rd Edition, Pearson Education, 2004.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Introduction**		
1.1	Computer System – Elements and Organization	1	CO1
1.2	Operating System Overview		
1.3	Structure	1	
1.4	Evolution		
1.5	Functions		
1.6	Hardware and Software Support for OS		
1.7	kernel Types, System calls	1	
1.8	Security measures and Advancements in OS	1	
2	**Process and Threads**		
2.1	Process-States	1	CO1
2.2	Thread management - Unix & Windows	1	
2.3	Process and Thread abstraction	2	
3	**Scheduling**		
3.1	Overview	1	CO2
3.2	Multiprogramming and Time Sharing		
3.3	Scheduling mechanisms	1	
3.4	Strategy selection	1	
3.5	Non-pre-emptive and Pre-emptive strategies	1	
3.6	Multiprocessor Scheduling		
	Case Study: Implementing the scheduler in Unix and Windows using scripting, Thread Scheduling (example using POSIX threads).	1	
4	**Synchronization**		
4.1	Cooperating process	1	CO3
4.2	Semaphores	2	
4.3	Shared memory multiprocessors		
4.4	Alternative Synchronization primitives		
4.5	Monitors		
4.6	Inter-process Communication		
4.7	Classical Synchronization problems	1	
	Case Study: Implementation - Bounded Buffer Problem, Reader’s Writer’s Problem, Dining Philosopher’s Problem	3	
5	**Deadlock**		
5.1	System Deadlock Model	2	CO4
5.2	Prevention, Avoidance, Detection and Recovery.	3	
6	**Memory Management**		
6.1	Memory allocation	2	CO4
6.2	Dynamic address space binding		
6.3	Memory management strategies		
6.4	Paging and Segmentation		
6.5	Virtual Memory	1	
6.6	Static and dynamic paging algorithms	1	

6.7	Design Issues of Paging Systems	1	
6.8	Memory Mapped files.	1	
7	**Device and File Management**		
7.1	I/O System	1	CO5
7.2	I/O Strategies		
7.3	Device manager design	1	
7.4	Buffering		
7.5	Disk Scheduling Algorithms and Policies	2	
7.6	File – Files Overview, Directories, Implementation		
7.7	Security and Protection mechanism	1	
	Total Lectures	**36**	

Course Designers:

1. C.Santhiya csit@tce.edu
2. K.Indira kiit@tce.edu

18IT240	COMPUTER ORGANIZATION AND DESIGN

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

The main objective of this course is to make the students understand the basic building blocks of computers, logic gates, combinational and sequential circuits and to conceptualize the basics of computer organizational and architectural issues.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Describe representation of numbers and characters in a computer.	8
CO2	Apply Combinational and Sequential circuit design procedure for a given scenario with the knowledge of Boolean expression and Logic gates.	34
CO3	Explain the basic structure of a computer, instruction types and addressing modes.	17
CO4	Apply MIPS instruction set to write an Assembly level language program for simple applications	11
CO5	Identify the type of hazard in a given sequence of instructions and the methods to overcome it.	16
CO6	Describe storage and retrieval of information from memory and hard drives.	14

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2,2.3.2
CO2	TPS3	Apply	Value	Mechanism	1.2,2.3.1,3.1.1,3.2.4
CO3	TPS2	Understand	Respond	Guided Response	1.2,2.3.1,
CO4	TPS3	Apply	Value	Mechanism	1.2, 3.1.1,3.2.4,4.5.3
CO5	TPS3	Apply	Value	Mechanism	1.2,2.3.4
CO6	TPS2	Understand	Respond	Guided Response	1.2

Mapping with Programme Outcomesand Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	M	L											L		
CO2	S	M	L					M	M	M			M		L
CO3	M	L											L		
CO4	S	M	L		L			M	M	M			M	L	L
CO5	S	M	L										M		
CO6	M	L											L		

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	20	20	20	-	-	-	10
Understand	30	30	30	-	-	-	40
Apply	50	50	50	100	100	100	50
Analyse	0	0	0	-	-	-	0
Evaluate	0	0	0	-	-	-	0
Create	0	0	0	-	-	-	0

AssessmentPattern: Psychomotor

Psychomotor Skill	**Miniproject/Assignment/Practical Component**
Perception	20
Set	20
Guided Response	60
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

** (2 to 3 at the cognitive level of course outcome)

Course Outcome1 (CO1):

1. Do the following conversions

$(934.89)_{10}$ to Binary

$(101.111)_2$ to decimal

$(939AB)_{16}$ to decimal

$(86.37)_{10}$ into octal

2. Describe Binary codes
3. Show that Excess-3 code and 2421 code are self-complementing

Course Outcome2 (CO2):

1. Simplify the following Boolean Expression using K Map
F(a,b,c,d) = ∑ (1, 2, 4, 5, 6, 7,8, 11, 12, 14) + ∑ (3, 10, 13)
2. Simplify the following Boolean Expression using Boolean theorems and postulates and construct the logical circuit.

F(p,q,r,s) = pqrs + p‟qrs+ pq‟rs‟+ pq‟rs + p‟q‟rs‟ + pqrs‟ + pqr‟s + p‟q‟r‟s‟

3. Simplify the following using QuineMc-Cluskymethod.. Construct the logic circuit for the expression
F(*w*, *x*, *y*, *z)*=∑0,1,2,4,5,7,9,12,14,15.

Course Outcome3 (CO3):

1. Describe the different addressing modes.

2. Explain the steps involved in the execution of a complete instruction.
3. Distinguish between different Instruction formats.

Course Outcome 4 (CO4):
1. Apply MIPS instruction set and write a simple Assembly level language program for finding the factorial of a number.
2. write a MIPS program for doing addition of n floating point numbers.
3. Convert the following code to assembly language program.

```
For (i = 1; i <= n; ++i)
   {  printf("%d, ", t1);
nextTerm = t1 + t2;
        t1 = t2;
       t2 = nextTerm;       }
```

Course Outcome 5 (CO5):
1. Illustrate how the pipelining improves the performance of computers.
2. Identify the type of hazard in executing the following sequence of instructions and determine the ways to overcome that.

```
DIV R1, R2, R6
ADD R1, R2, R3
SUB R3, R4, R5
```

3. Demonstrate Instruction Hazard with an example.

Course Outcome6 (CO6):
1. A byte addressable computer has a small data cache capable of holding 8 32-bitwords.Eaach cache block consists of one 32-bit word. When a given program is executed the processor reads data from the following sequence of hex addresses:200,204,208,2FO,200,204,218,21C,24C

a. Show the contents of the cache at the end of each pass through this loop if a directly mapped cache is used. Compute the hit ratio.

b. Repeat the problem for an associative-mapped cache that uses the LRU replacement algorithm.

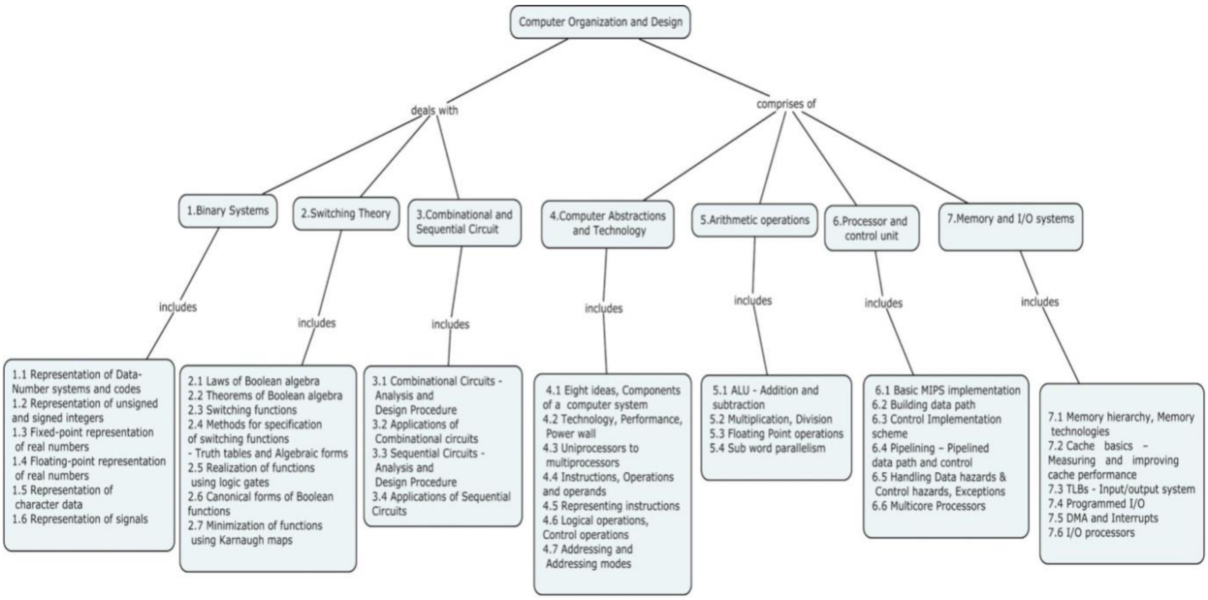
c. Repeat the problem for a four-way-set-associative cache.

2. A block-set-associative cache consists of a total of 64 blocks divided into 4-block sets. The main memory contains 4096 blocks, each consisting of 128 words.

   a. How many bits are there in the main memory address?
   b. How many bits are there in each of the TAG, SET and WORD fields?

3. Explain data transfer using DMA.

Concept Map



Syllabus

Binary Systems: Representation of Data- Number systems and codes, Representation of unsigned and signed integers, Fixed-point representation of real numbers, Floating-point representation of real numbers, Representation of character data, Representation of signals.

Switching Theory: Laws of Boolean algebra, Theorems of Boolean algebra, Switching functions, Methods for specification of switching functions – Truth tables and Algebraic forms, Realization of functions using logic gates. Simplification of Boolean Expressions and Functions: Algebraic methods, Canonical forms of Boolean functions, Minimization of functions using Karnaugh maps.

Combinational and Sequential Circuits: Analysis and Design procedure of Combinational and Sequential Circuits, Applications of Combinational and Sequential Circuits.

Computer Abstractions and Technology: Eight ideas, Components of a computer system, Technology, Performance, Power wall, Uniprocessors to multiprocessors, Instructions, Operations and operands, Representing instructions, Logical operations, Control operations, Addressing and Addressing modes.

Arithmetic operations: ALU – Addition and subtraction, Multiplication, Division, Floating Point operations, Sub word parallelism.

Processor and Control Unit: Basic MIPS implementation, Building data path, Control Implementation scheme. **Pipelining** – Pipelined data path and control, Handling Data hazards & Control hazards, Exceptions. Multicore processors.

Memory and I/O Systems: Memory hierarchy, Memory technologies, Cache basics – Measuring and improving cache performance. Input/output system, Programmed I/O,DMA and Interrupts, I/O processors

Case Study on Recent Processors

Learning Resources

1. Morris Mano M. “Digital Design:with an Introduction to Verilog HDL :”, Pearson Education, Fifth Edition,2013

2. David A. Patterson and John L. Hennessey, "Computer Organization and Design", Morgan Kaufmann, Elsevier, Fifth edition, 2014.
3. https://www.coursera.org/learn/digital-systems
4. http://nptel.ac.in/courses/106103068/Course Name: Computer Organization and Architecture

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Binary Systems**		CO1
1.1	Representation of Data- Number systems and codes	1	
1.2	Representation of unsigned and signed integers	1	
1.3	Fixed-point representation of real numbers		
1.4	Floating-point representation of real numbers		
1.5	Representation of character data	1	
1.6	Representation of signals		
2	**Switching Theory**		CO2
2.1	Laws of Boolean algebra		
2.2	Theorems of Boolean algebra	1	
2.3	Switching functions	1	
2.4	Methods for specification of switching functions – Truth tables and Algebraic Forms	1	
2.5	Realization of functions using logic gates		
2.6	Simplification of Boolean Expressions and Functions :Algebraic methods	1	
2.7	Canonical forms of Boolean functions	1	
2.8	Minimization of functions using Karnaugh maps	1	
3	**Combinational and Sequential Logic**		
3.1	Combinational Circuits – Analysis and Design Procedure	2	
3.2	Applications of Combinational circuits	1	
3.3	Sequential Circuits – Analysis and Design Procedure	2	
3.4	Applications of Sequential circuits	1	
4	**Computer Abstractions and Technology**		CO3
4.1	Eight ideas, Components of a computer system	1	
4.2	Technology, Performance, Power wall		
4.3	Uniprocessors to multiprocessors	1	
4.4	Instructions, Operations and operands	1	
4.5	Representing instructions	1	
4.6	Logical operations, Control operations	1	
4.7	Addressing and Addressing modes	1	
5	**Arithmetic operations**		CO4
5.1	ALU – Addition and subtraction	1	
5.2	Multiplication, Division	1	
5.3	Floating Point operations	1	
5.4	Sub word parallelism	1	
6	**Processor and control unit**		CO5
6.1	Basic MIPS implementation	1	
6.2	Building data path		
6.3	Control Implementation scheme	1	
6.4	Pipelining – Pipelined data path and control	1	
6.5	Handling Data hazards & Control hazards, Exceptions	2	
6.6	Multicore Processors	1	
7	**Memory and I/O systems**		
7.1	Memory hierarchy, Memory technologies	1	

7.2	Cache basics – Measuring and improving cache performance	1	CO6
7.3	TLBs – Input/output system	1	
7.4	Programmed I/O	1	
7.5	DMA and Interrupts	1	
7.6	I/O processors		
	Total Lectures	36	

Course Designers:

1. D.Tamilvelvi dtamilselvi@tce.edu
2. K.V.Uma kvuit@tce.edu
3. R.Parkavi rpit@tce.edu

18IT260	**ESSENTIALS OF INFORMATION TECHNOLOGY**	Category	L	T	P	Credit
		PC	2	0	2	3

Preamble

The course outlines the emerging computing technologies for building enterprise applications. The course introduces basic web design concepts using HTML, Javascript and PHP scripting techniques

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Summarize the need of Computing for Business Organizations and the use of various software and hardware interfaces	8
CO2	Explain the architecture and uses of different computing technologies	13
CO3	Describe the licensing and Copyright Laws for Software Applications	4
CO4	Practice HTML and CSS for designing simple web pages	25
CO5	Develop and demonstrate simple Web Applications with client side scripting	25
CO6	Develop and execute simple Web Applications with server side scripting	25

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2, 3.1.1, 3.2.1-3.2.6
CO2	TPS2	Understand	Respond	Guided Response	1.2, 3.1.1, 3.2.1-3.2.6
CO3	TPS2	Understand	Respond	Guided Response	1.2, 2.5.1
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO6	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L				L			S	S			L	L	L
CO2	M	L							S	S			L		L
CO3	M	L						S					L		L
CO4	S	M	L		L	L		L	S	S		S	M	L	M
CO5	S	M	L		L	L		L	S	S		S	M	L	M
CO6	S	M	L		L	L		L	S	S		S	M	L	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Model Examination	Practical Component/ Observation	Terminal Examination
	1	2	3			
Remember	10	10	10	0	0	10
Understand	30	30	30	0	20	30
Apply	60	60	60	100	80	60
Analyse	0	0	0	0	0	0
Evaluate	0	0	0	0	0	0
Create	0	0	0	0	0	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini-project/Practical Component/Observation
Perception	-
Set	20
Guided Response	30
Mechanism	50
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):
1. Discuss the use of Information Systems for an Enterprise Application
2. Explain the Electronic Data Interchange process across systems
3. Describe Transaction Processing of an Enterprise Application

Course Outcome 2 (CO2):
1. Explain different types and topology of Networks
2. Discuss different wired and wireless technologies
3. Compare and contrast Client-Server and Distributed Computing

Course Outcome 3 (CO3):
1. Discuss Information Technology Act formed by India

2. Explain IT Policies and Standards required for Enterprise Applications
3. Differentiate Copyright and Licensing

Course Outcome 4 (CO4):

1. Design simple web document using text formatting HTML elements and attributes
2. Develop simple website using HTML Tags and CSS
3. Design your bio-data using suitable HTML tags

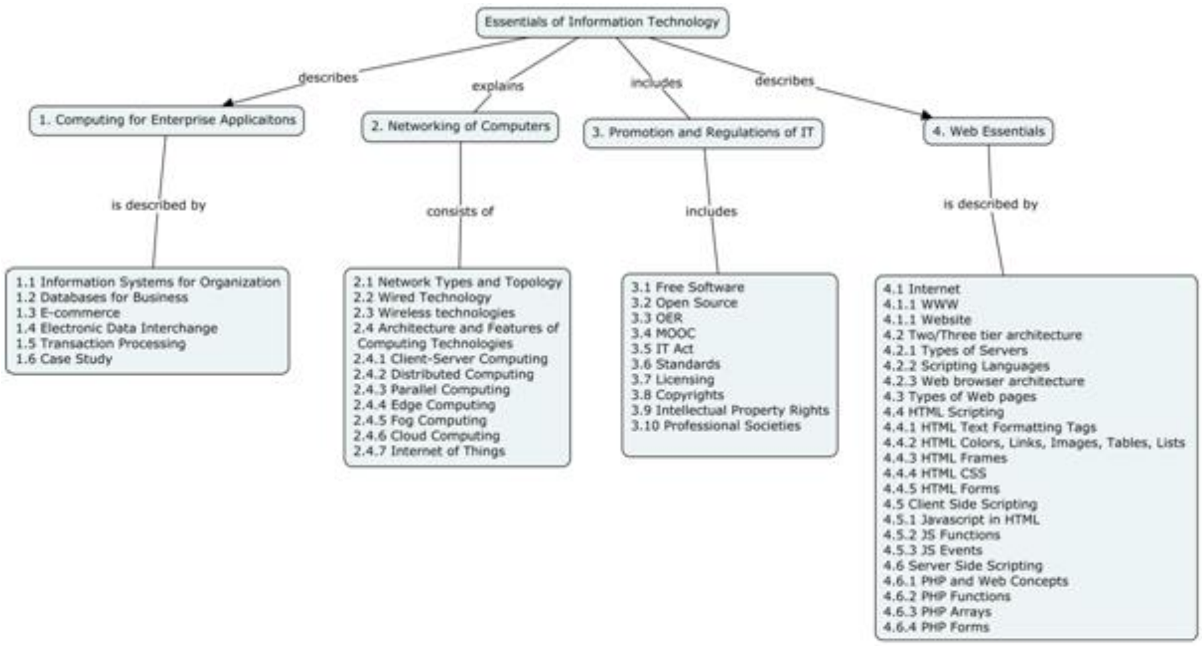
Course Outcome 5 (CO5):

1. Write Javascript program for input form validations
2. Write Javascript event handling function to check whether the page is loaded or not
3. Write Javascript event handling function to check whether the button is clicked or not

Course Outcome 6 (CO6):

1. Design simple web application using suitable HTML, Javascript and PHP scripting
2. Write PHP function to print the values present in the array in tabular format
3. Design simple information retrieval system using HTML, Javascript and PHP

Concept Map



Syllabus

Computing for Enterprise Applications: Information Systems for Organization – Databases for Business – E-commerce – Electronic Data Interchange – Transaction Processing –**Case Study**– Enterprise Applications in Healthcare, Finance, Transport, Education, Society, Agriculture, Governance

Networking of Computers: Network – Types, Topology, Wired, Wireless technologies – Bluetooth, WiFi, ZigBee, GPS, GSM **Architecture and Features of Computing Technologies** – Client-Server Computing, Distributed Computing, Parallel Computing, Edge Computing, Fog Computing, Cloud Computing, Internet of Things

Promotion and Regulations of IT: Free Software – Open Source Software – Open Educational Resources (OER) – Massive Open Online Courses (MOOC) – IT Act – Standards – Licensing – Copyrights – Intellectual Property Rights – Professional Societies

Web Essentials: Internet – WWW – Website – Two/Three tier architecture – Types of Servers – Application Server, Web Server, Database Server – Scripting Languages – Web browser architecture – Types of Web pages – static and dynamic –**HTML Scripting** – Elements, Attributes, Headings, Paragraphs, Text Formatting, Colors, Links, Images, Tables, Lists, Frames – CSS – inline, internal, external – Forms **Client Side Scripting** –Javascript in HTML – Functions, Events, Forms **Server Side Scripting** PHP and Web Concepts – Functions – Arrays – Forms

Learning Resources

1. V.Rajaraman, “Introduction to Information Technology”, PHI Learning, 3^{rd} edition, 2018
2. Robin Nixon, “Learning PHP, MySQL &Javascript with jQuery, CSS, HTML5”, 4^{th} edition, O’Reilly, 2015.
3. Kenneth Laudon, “Essentials of MIS: Computer Science, Information Technology”, Study Guide, 10^{th} edition, Content Technologies Inc, 2017
4. Timothy O’Leary, Linda O’Leary, Daniel O’Leary, “Computing Essentials”, 26^{th} Edition, McGraw Hill Education, 2017.
5. Online Course: Information Technology Essentials –https://www.udemy.com/information-technology-essentials/
6. Website Reference MariaDB: https://mariadb.org/

Course Contents and Lecture Schedule

Module No	Topic	No. of Hours	Course Outcome
1	**Computing for Enterprise Applications**		
1.1	Information Systems for Organization	1	CO1
1.2	Databases for Business		
1.3	E-commerce		
1.4	Electronic Data Interchange	1	
1.5	Transaction Processing		
1.6	Case Study		
2	**Networking of Computers**		
2.1	Network Types and Topology	1	CO2
2.2	Wired Technology		
2.3	Wireless Technology (Bluetooth, WiFi, Zigbee, GPS, GSM)	1	
2.4	Architecture and Features of Computing Technologies	1	
2.4.1	Client Server Computing		
2.4.2	Distributed Computing		
2.4.3	Parallel Computing		
2.4.4	Edge Computing	1	
2.4.5	Fog Computing		
2.4.6	Cloud Computing		
2.4.7	Internet of Things		
3	**Promotion and Regulations of IT**		
3.1	Free Software	1	CO3
3.2	Open Source Software		

3.3	Open Educational Resources (OER)		
3.4	Massive Open Online Courses (MOOC)		
3.5	IT Act	1	
3.6	Standards		
3.7	Licensing		
3.8	Copyrights		
3.9	Intellectual Property Rights		
3.10	Professional Societies		
4	**Web Essentials**		
4.1	Internet	1	CO4
4.1.1	WWW		
4.1.2	Website		
4.2	Two/Three tier Architecture		
4.2.1	Types of Servers – Application, Web, Database	1	
4.2.2	Scripting Languages		
4.2.3	Web Browser Architecture		
4.3	Types of Web pages – Static, Dynamic		
4.4	HTML Scripting		
4.4.1	HTML Text Formatting tags	1	
4.4.2	HTML Lists, Tables, Images, Links		
4.4.3	HTML Forms, Frames		
4.4.4	HTML CSS	2	
4.5	Client Side Scripting		
4.5.1	Javascript in HTML	1	CO5
4.5.2	JS Functions	2	
4.5.3	JS Events	2	
4.6	Server Side Scripting		
4.6.1	PHP – Web Concepts	2	CO6
4.6.2	PHP Functions		
4.6.3	PHP Arrays	2	
4.6.4	PHP Forms	2	
	Total No. of Lecture Hours	24	

List of Experiments for Practical Hours

S.No	Description	No. of Hours	Course Outcome
1.	(a). Study of three tier architecture applications (like Online banking, Railways, Healthcare, Facebook, …) (b). Study of integrated systems (like ATM machine, Biometric Attendance Systems, Skype, …) (c) Study of Web and Mobile Applications (like Mobile banking, WhatsApp,FingerPrint matching App, ….)	4	CO1,CO2
2.	HTML Web Document Design using Text Formatting, Tables, Lists, Links, Images elements and attributes	2	CO4
3.	(a). HTML Web Document Design using CSS and Graphics (b). HTML Web Document Design using Media and API	2	
4.	Simple Javascript programs	2	CO5
5.	Javascript forms and Validations	2	

6.	Javascript Event Handling functions	2	
7.	Simple PHP scripts	2	CO6
8.	Design simple PHP forms with validation	2	
9.	Mini-Project Design simple information retrieval system using web, PHP and PostgreSQL/MariaDB	6	CO4, CO6
	Total Hours	**24**	

Course Designers:

1. P.Karthikeyan karthikit@tce.edu
2. A.M.Abirami abiramiam@tce.edu

18IT270	PYTHON PROGRAMMING LAB

Category	L	T	P	Credit
PC	0	0	2	1

Preamble

The purpose of this course is to introduce to students to the field of programming using Python language. The students will be able to enhance their analysing and problem solving skills and use the same for writing programs in Python.

Prerequisite

- None

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Make use of Branching, Looping, String, and Functions concepts to develop Python programs for the given problem.	20
CO2	Apply structured types, and file handling to design a solution for a problem of moderate complexity.	18
CO3	Develop simple applications by applying problem solving strategies such as divide and conquer, merging, solving by analogy etc…	18
CO4	Examine the given problem to Implement, test and debug the solution using Python programming language.	22
CO5	Interpret the usage of packages and libraries in python programming for problem solving by reducing time and space complexity	22

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO4	TPS4	Analyse	Organise	Complex Overt Responses	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.4.1, 4.5.1, 4.5.3, 4.5.5
CO5	TPS4	Analyse	Organise	Complex Overt Responses	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.4.1, 4.5.1, 4.5.3, 4.5.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		L			S				M	M	L	L
CO2	S	M	L		L			S				M	M	L	L
CO3	S	M	L		L			S				M	M	L	L
CO4	S	S	M	L	L			S				M	S	L	L
CO5	S	S	M	L	L			S	S	S	L	M	S	L	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	-	-
Understand	-	-
Apply	60	60
Analyse	40	40
Evaluate	0	0
Create	0	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Practical Component/Observation
Perception	-
Set	10
Guided Response	20
Mechanism	40
Complex Overt Responses	30
Adaptation	-
Origination	-

List of Experiments/Activities with CO Mapping

Exp No.	List of Experiments	No. of Hours	Course Outcome
1	Simple Programs	4	CO1, CO4, CO5
2	Branching Programs	2	
3	Looping Programs	2	
4	String Programs	2	
5	Functions, scoping and Abstraction Programs	2	
6	Structured types and Mutability Programs	2	CO2, CO4, CO5
7	Higher Order Functions	2	
8	File handling with exceptions	2	
9	Programs by applying Problem solving techniques	2	CO3, CO4, CO5
10	Mini-Project	4	
Total Hours		**24**	

Sample Programs (not limited to)

1. Simple Programs
    a. Print the Python version using.
    b. Accepts the radius of a circle from the user and compute the area.
    c. Accepts the user's first and last name and print them in reverse order with a space between them.
    d. Display the first and last colors from the following list. color_list = ["Red","Green","White" ,"Black"]
    e. Accepts an integer (n) and computes the value of n+nn+nnn.
    f. Print the documents (syntax, description etc.) of Python built-in function(s).

2. Branching Programs

a. Find those numbers which are divisible by 7 and multiple of 5, between 1500 and 2700
b. Convert temperatures to and from celsius, fahrenheit.
c. Takes two digits m (row) and n (column) as input and generates a two-dimensional array. The element value in the i-th row and j-th column of the array should be i*j.
d. Find numbers between 100 and 400 (both included) where each digit of a number is an even number. The numbers obtained should be printed in a comma-separated sequence.

3. Looping Programs
   a. Construct the following pattern, using a nested for loop.

```
*
*                       *
*           *           *
*       *       *       *
*     *     *     *     *
*       *       *       *
*           *           *
*                       *
*
```

   b. Prints each item and its corresponding type from the following list.
   Sample List : datalist = [1452, 11.23, 1+2j, True, 'w3resource', (0, -1), [5, 12], {"class":'V', "section":'A'}]
   c. Iterate the integers from 1 to 50. For multiples of three print "Fizz" instead of the number and for the multiples of five print "Buzz". For numbers which are multiples of both three and five print "FizzBuzz".
   d. Accept a sequence of comma separated 4 digit binary numbers as its input and print the numbers that are divisible by 5 in a comma separated sequence.

4. String Programs
   a. Create all possible strings by using 'a', 'e', 'i', 'o', 'u'. Use the characters exactly once.
   b. Get a string made of the first 2 and the last 2 chars from a given a string. If the string length is less than 2, return instead of the empty string.
   c. Get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.
   d. Add 'ing' at the end of a given string (length should be at least 3). If the given string already ends with 'ing' then add 'ly' instead. If the string length of the given string is less than 3, leave it unchanged.
   e. Find the first appearance of the substring 'not' and 'poor' from a given string, if 'bad' follows the 'poor', replace the whole 'not'...'poor' substring with 'good'. Return the resulting string.
   f. Accepts a comma separated sequence of words as input and prints the unique words in sorted form (alphanumerically).

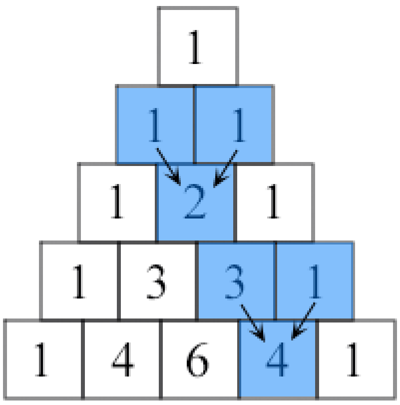
5. Functions, scoping and Abstraction Programs
    a. Multiply all the numbers in a list.
    b. Calculate the factorial of a number (a non-negative integer). The function accepts the number as an argument.
    c. Accepts a string and calculate the number of upper case letters and lower case letters.
    d. Check whether a number is perfect or not.
    e. Accepts a hyphen-separated sequence of words as input and prints the words in a hyphen-separated sequence after sorting them alphabetically.

6. Structured types and Mutability Programs
    a. Count the most common words in a dictionary.
    b. Create an instance of an OrderedDict using a given dictionary. Sort the dictionary during the creation and print the members of the dictionary in reverse order.
    c. Get the array size of types unsigned integer and float.

7. Higher Order Functions
    a. Create a set.
    b. Remove an item from a set if it is present in the set.
    c. Add a key to a dictionary.
    d. Check if a given key already exists in a dictionary.

8. File handling with exceptions
    a. Read a file line by line and store it into a list.
    b. Read a file line by line store it into a variable.
    c. Find the longest words.
    d. Write a list to a file.
    e. Read an entire text file.

9. Programs by applying Problem solving techniques
    a. Calculate the sum of the positive integers of n+(n-2)+(n-4)... (until n-x =< 0).
    b. Prints the first n rows of Pascal's triangle. Note : Pascal's triangle is an arithmetic and geometric figure first imagined by Blaise Pascal.
    Sample Pascal's triangle:



Each number is the two numbers above it added together

c. Find validity of a string of parentheses, '(', ')', '{', '}', '[' and ']. These brackets must be close in the correct order, for example "()" and "()[]{}" are valid but "[)", "({[)]" and "{{{" are invalid.
d. Construct a radius and two methods which will compute the area and the perimeter of a circle.

10. Mini-Project

Design and Development of applications like

a. Encryptor/ Decryptor
b. Physics problem solver
c. Sudoku solver
d. Hospital management system
e. Random number generator
f. Electric circuit solver etc.
g. Scientific Calculator

Mini Project Details: (Team size: 3)

- Problem identification.
- Problem Analysis and Modular design.
- Develop algorithm/pseudo code and draw the flowchart – module wise individually.
- Develop programs module level, test and debug individually.
- Integrate the modular programs and present the results in a team.
- Document the above process as a report.

Learning Resources

1. John V.Guttag, " Introduction to Computation and Programming Using Python : With Application to Understanding Data", Prentice-Hall International publishers, Second Edition, 2017.
2. R.G.Dromey, "How to solve it by Computers", Pearson Education India , First Edition, 2008
3. NPTEL Online Course on "Joy of Computing using Python" - https://nptel.ac.in/courses/106106182/

Course Designers

1.	A. Sheik Abdullah	asait@tce.edu
2.	M. Thangavel	mtit@tce.edu

18IT280	WORKSHOP

Category	L	T	P	Credit
ES	0	0	2	1

Preamble

This is the foundation practical course and aim of this course is to train the students in the basic of operating system and understand the working principles of digital logic gates and IOT devices.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weight age*** in %
CO1	Utilize the instructions to assemble/setup and upgrade Personal Computer Systems and Network Device Management.	8
CO2	Examine the given problem to implement CPU scheduling algorithms in a programming environment.	34
CO3	Apply the contiguous memory allocation techniques in a suitable simulation environment	8
CO4	Apply digital circuit design for a given scenario using logic gates.	8
CO5	Construct combinational and sequential circuits using flip flops and counters	25
CO6	Apply simple IOT application by using Arduino board.	17

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Guided Response	1.2,2.3.1,2.3.2,2.3.3,2.3.4
CO2	TPS3	Apply	Value	Guided Response	1.2,2.3.1,2.3.2,2.3.3,2.3.4,3.2.4
CO3	TPS3	Apply	Value	Guided Response	1.2,2.3.1,2.3.2,2.3.3,2.3.4,3.2.4
CO4	TPS3	Apply	Value	Guided Response	1.2,2.3.1,3.1.1,3.2.4
CO5	TPS3	Apply	Value	Guided Response	1.2,2.3.1,3.1.1,3.2.4
CO6	TPS3	Apply	Value	Guided Response	1.2,2.3.1,3.1.1,3.2.4

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L						M				M		L
CO2	S	M	L		S	M			S			M	M	S	L
CO3	S	M	L		S				S			M	M	M	L
CO4	S	M	L		M				M			M	M	L	L
CO5	S	M	L		M				M			M	M	L	L
CO6	S	M	L		M				M			M	M	L	L

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	-	-
Understand	-	-
Apply	100	-
Analyse	0	0
Evaluate	0	0
Create	0	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Practical Component/Observation
Perception	-
Set	20
Guided Response	30
Mechanism	50
Complex Overt Responses	-
Adaptation	-
Origination	-

List of Experiments/Activities with CO Mapping

Exp No.	List of Experiments	No. of Hours	Course Outcome
1	Operating System Installation and Configuration of a System and Network Device Management	2	CO1
2	Program to implement process and thread management.	2	CO2
3	Program to simulate the following pre-emptive and non pre-emptive CPU scheduling algorithms.	2	
4	Program to simulate the concept of classical synchronization problems.	2	
5	Program to simulate the contiguous memory allocation techniques.	2	
6	Program to simulate disk scheduling algorithms.	2	CO3
7	Implementation of Logic gates: Inverter, AND, OR, NAND, NOR, Exclusive-OR and Exclusive-NOR.	2	CO4
8	Implementation/Simulation of 8 to 1 multiplexer circuit	2	CO5
9	Simulation of a encoder and de-multiplexer using HDL and VHDL.	2	
10	Implementation of SR, D, T, and JK flip flops and basic counters.	2	
11	Basic operation of arduino board for any IOT application	2	CO6
12	Execute a simple C program in 8051 target board.	2	
	Total Hours	**24**	

Learning Resources

1. Silberschatz, Greg Gagne, Peter B. Galvin, “Operating System Concepts”, Wiley, 2014.
2. Garry Nutt, Nabenduchaki, SarmistaNeogy, “Operating Systems”, Third Edition, Pearson Education, 2009.
3. Morris Mano M. “Digital Design: With an Introduction to Verilog HDL :”, Pearson Education, Fifth Edition,2013

Course Designers

1.	K.Indira	kiit@tce.edu
2.	R.Parkavi	rpit@tce.edu

18ES290	LATERAL THINKING

Category	L	T	P	Credit
ES	0	0	2	1

Preamble

The purpose of thinking is to collect information and to make the best possible use of it. Vertical thinking is concerned with proving or developing concept patterns. Lateral thinking is concerned with restructuring such patterns (insight) and provoking new ones (creativity). Lateral and vertical thinking are complementary. Skill in both is necessary. Although the emphasis in education has always been exclusively on vertical thinking, the need for lateral thinking arises from the limitations of the behaviour of mind as a self-maximizing memory system. Lateral thinking can be learned, practised and used. It is possible to acquire skill in it just as it is possible to acquire skill in mathematics. The course provides formal opportunities to practise lateral thinking and also an explanation of the processes involved.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO #	Course Outcome Statement	Weightage in %
CO1	Explain the concept of lateral thinking, distinguish it from vertical thinking.	10
CO2	Use lateral thinking for problem solving	10
CO3	Generate Alternatives, challenge assumptions and suspend judgment and Practice lateral thinking in design process	20
CO4	Apply the concept of factorization and reversal method for restructuring	20
CO5	Organize brainstorming sessions	10
CO6	Use PO for innovation	10
CO7	Aware of limitation of established patterns and practice lateral thinking in small projects	20

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	-	2.3.1, 3.2.6
CO2	TPS3	Apply	Value	-	2.4.1, 2.4.2, 2.4.3
CO3	TPS3	Apply	Value	-	2.4.1, 2.4.2, 2.4.3, 2.4.5, 2.4.6
CO4	TPS3	Apply	Value	-	2.3.1, 2.4.2, 2.4.3
CO5	TPS4	Analyse	Organize	-	3.1.1, 3.1.2, 3.2.1, 3.2.2
CO6	TPS3	Apply	Value	-	2.1.4, 2.3.1, 2.4.1, 2.4.2, 2.4.3, 2.4.6
CO7	TPS5	Evaluate	Characterize	-	2.3.4, 4.5.1, 4.6.1

Mapping with Programme Outcomes and Programme Specific Outcomes

CO #	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	-	-	-	-	-	-	-	-	-	L
CO2	S	M	L	-	-	-	-	-	-	-	-	L
CO3	S	M	L	-	-	-	-	S	L	L	-	L
CO4	S	M	L	-	-	-	-	S	L	L	-	L
CO5	S	S	M	L	-	-	-	S	S	S	-	L
CO6	S	M	L	-	-	-	-					L
CO7	S	S	S	M	-	S	-	-	S	S	-	S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Continuous Assessment

Worksheets (5)	:	20 Marks
Case Studies (3)	:	30 Marks

Terminal Examination

Ability Test	:	50 Marks
Case Study (Best) Presentation and Viva Voce	:	50 Marks

Syllabus

The way the mind works, Difference between lateral and vertical thinking, Attitudes towards lateral thinking, Basic nature of lateral thinking, The use of lateral thinking Techniques, The generation of alternatives, Challenging assumptions, Innovation, Suspended judgment, Design, Dominant ideas and crucial factors, Fractionation, The reversal method, Brainstorming, Analogies, Choice of entry point and attention area, Random stimulation, Concepts/divisions/polarization, The new word PO, Blocked by openness, Description/problem solving/design

Learning Resources

1. Edward de Bono, “Lateral Thinking: Creativity Step by Step”, Happer Collins Publisher, 1990.
2. Edward de Bono, “Six Thinking Hats”, Little Brown and Company Publisher, 1985.
3. Edward de Bono’s Thinking Course, Video Lecture, Weblink: https://www.yputube.com/watch?v=AUq_AL2LNEw

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	The way the mind works	1	CO1
1.1	Difference between lateral and vertical thinking	1	CO1
1.2	Attitudes towards lateral thinking	1	CO2
2.	Basic nature of lateral thinking	1	CO2
2.1	The use of lateral thinking techniques	1	CO2
2.2	The generation of alternatives	1	CO3
2.3	Challenging assumptions	1	CO3
2.4	Innovation	1	CO3
2.5	Suspended judgment	1	CO3
3.	Design	1	CO3
3.1	Dominant ideas and crucial factors	1	CO3
3.2	Fractionation	1	CO4
4.	The reversal method	1	CO4
4.1	Brainstorming	1	CO5
4.2	Analogies	1	CO5
4.3	Choice of entry point and attention area	1	CO5
4.4	Random stimulation	1	CO5
4.5	Concepts/divisions/polarization	1	CO5
4.6	The new word PO	2	CO6
5.	Blocked by openness	2	CO7
5.1	Description/problem solving/design	2	CO7

Course Designers:

S J. Thiruvengadam sjtece@tce.edu

18CHAA0	ENVIRONMENTAL SCIENCE

Category	L	T	P	Credit
ES	1	0	1	-

Preamble

The objective of this course is intended to make the students to understand the basic concepts of environment, ecology and pollution of the current environmental issues and to participate in various activities on conserving and protecting the environment.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome	Weightage*** in %
CO1	Describe the importance and progression of ecological system	15%
CO2	Explain the significance of natural resources	10%
CO3	Demonstrate the effects of pollution on environment and human beings	15%
CO4	Practice the suitable management method during disaster episode	10%
CO5	Explain the ethics and values related to Environment	15%
CO6	Describe the Traditional values and Impact of modernization on Environment	10%
CO7	Carry out group activities	25%

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.1,2.3.1,2.3.2,2.3.4
CO2	TPS2	Understand	Respond	Guided Response	1.1,2.3.1,2.3.2,2.3.4
CO3	TPS3	Apply	Value	Mechanism	1.1,2.1.1,2.1.5,2.4.1,4.1.2
CO4	TPS3	Apply	Value	Mechanism	1.1,2.4.1,2.4.7,4.1.1,4.1.2
CO5	TPS2	Understand	Respond	Guided Response	1.1,2.5.1,2.5.2,
CO6	TPS2	Understand	Respond	Guided Response	1.1,2.4.7,2.5.4,
CO7	TPS4	Analyse	Organise	Complex Overt Responses	3.1.1,3.1.2,3.1.3,3.1.4,4.1.1,4.1.2

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	-	-	-	-	L	S	-	-	-	-	-
CO2	M	-	-	-	-	L	-	L	-	-	-	-
CO3	M	M	-	-	L	M	S	-	-	-	-	-
CO4	M	-	L	L	L	M	M	-	-	-	-	-
CO5	L	-	-	-	-	-	-	M	-	-	-	-
CO6	L	L	-	-	-	-	M	-	-	-	-	-
CO7	S	M	M	M	M	M	-	-	S	M	M	-

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment#			Terminal Examination***
	1	2	3	1	2	3	
Remember	0	20	0	NA	NA	NA	Presentation on Case study report
Understand	0	40	0				
Apply	0	40	0				
Analyse	0	0	0				
Evaluate	0	0	0				
Create	0	0	0				

Assignment: Marks will be given for the review I, II & III of case study presentation.

*** Case study presentation and evaluation

- ❖ Each group comprise of maximum three students
- ❖ Students will submit the case study report similar to final year project report
- ❖ Evaluation of case study presentation is based on the approved rubrics

Method of Evaluation

a)Internal assessment

S.No	Description	Max.marks	Final conversion
1	CAT -II	50	40
2	Assignment marks (from Review I,II & III)	3 X 10 =30	10
		Total	50

b) End semester examination – Case study presentation

Performance Index	Marks per Individual
Originality of the work	20
Data collected	20
Suggestion to overcome for the identified issues	20
Final Presentation	40
Total	100

Model Titles for Case Study:

1. Environmental impacts of quarry industries in Melur Taluk.
2. A study on impacts of tanneries on ground water and soil quality in Dindigul district.
3. Effect of pharmaceutical industry on groundwater quality in poikaraipatty village, Alagar Kovil.
4. Solid waste and waste water management in TCE hostel.
5. Environmental effect of Kudankulam atomic power plant.
6. Case study on effect of Sterlite industry.
7. Effect on ground water and soil quality by dyeing industries in Tiruppur.
8. Effect of textile wastes in Karur District.
9. Segregation of waste and its recycling by Madurai Municipality at Vellakkal
10. Effect of fire work waste on atmosphere in Sivakasi region

Sample Questions for Course Outcome Assessment**

Course Outcome 1(CO1):

1. Describe the Universal Energy flow model in an Ecosystem.
2. Discuss the conversion of one ecosystem into another ecosystem with example.
3. Explain the multidisciplinary nature of the environment.

Course Outcome 2 (CO2):

1. Summarize the importance of Natural resources to animals and human beings.
2. Describe the role of an individual in the conservation of Natural resources.

Course Outcome 3(CO3):

1. Demonstrate the effects and control measures of air pollution
2. Investigate the sources and management methods of e-waste.

Course Outcome 4(CO4):

1. Dramatize the mitigation methods adopted in severe cyclone affected areas.
2. Suggest the precautionary steps to prevent life from flood.

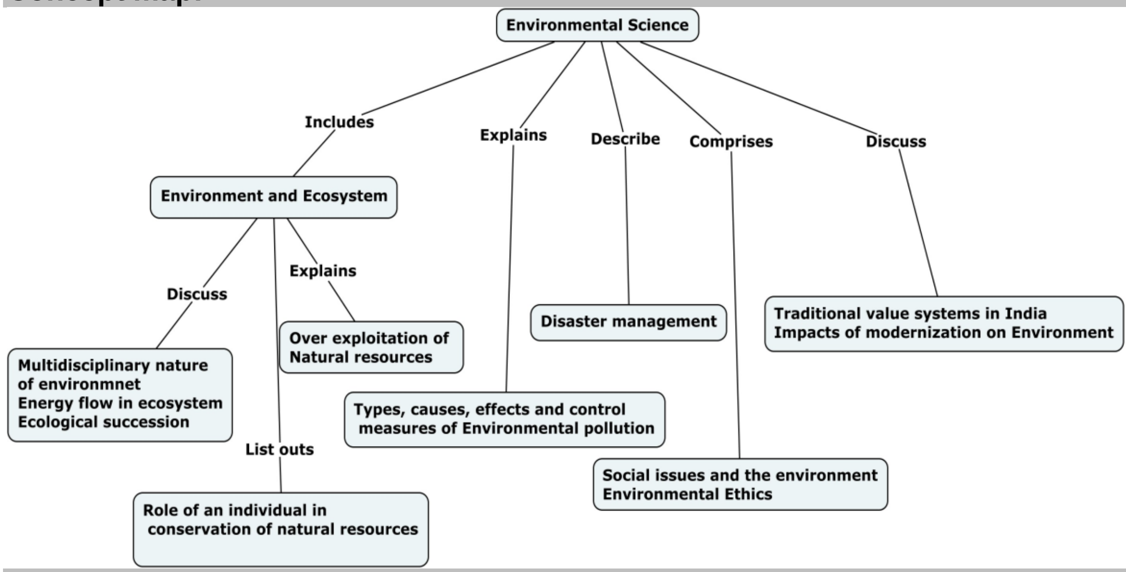
Course Outcome 5 (CO5):

1. Discuss the need for public awareness on environmental protection.
2. Identify the requirement for the equitable utilization of natural resources.

Course Outcome 6(CO6):

1. Describe the traditional value systems of India.
2. Recall the environmental related points discussed in our Indian Vedas.
3. List out the impacts of modernization on environment

Concept map:



Syllabus

Environment and Ecosystem - Multidisciplinary nature of environment- Ecosystem- Energy flow in ecosystem-Ecological succession-Over exploitation of Natural resources-Role of an individual in conservation of natural resources. **Environmental pollution and control -** Environmental pollution – types, causes, effects and control measures - Disaster management strategies. **Environmental Ethics and Values -** Social issues and the environment -need for public awareness, Environmental Ethics- need for equitable utilization of natural resources- Traditional value systems in India, Impacts of modernization on Environment

Awareness and actual activities:

- ✓ Group meeting on water management, promotion of recycle use, reduction of waste,
- ✓ Plantation
- ✓ Cleanliness drive
- ✓ Drive on segregation of waste
- ✓ Energy saving
- ✓ Lectures by Environmentalist
- ✓ Slogan and poster making event

Learning Resources

1. Kaushik,A & Kaushik.C.P, Environmental Science and Engineering, 6th Edition, New Age International, 2018.
2. Erach Bharucha, Text book of Environmental studies for Undergraduate courses, 2nd Edtion, UGC, 2013.

3. Gilbert M.Masters, Introduction to Environmental Engineering and Sciences, 2nd Edition, Pearson , 2004.
4. Garg S.K & Garg, Ecological and Environmental studies, Khanna Publishrers, 2006.
5. Wright &Nebel, Environmental science towards a sustainable future, 8th Editon,Prentice Hall of Indial Ltd, 2002.
6. Documentary titled “HOME” by Yves Bertrand, Video Link: https://www.youtube.com/watch?v=jqxENMKaeCU

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.0	**Environment and Ecosystem**		
1.1	Multidisciplinary nature of environment-Ecosystem	1	CO1
1.2	Energy flow in ecosystem – Universal energy flow model	1	CO1
1.3	Ecological succession	1	CO1
1.4	Over exploitation of Natural resources	1	CO2
1.5	Role of individual in conservation of natural resources	1	CO2
2.0	**Environmental pollution and control**		
2.1	Environmental pollution – types(Air, Water,soil,Marine),	2	CO3
2.2	causes (gaseous, liquid, solid, plastic, e-waste, biomedical waste and radiations),	2	CO3
2.3	**E**ffects and control measures of Pollution	2	CO3
2.4	Disaster managements during cyclone, Tsunami, flood, draught and earthquake	2	CO4
3.0	**Environmental Ethics and Values**		
3.1	Social issues and the environment -need for public awareness	1	CO5
3.2	Environmental Ethics- need for equitable utilization of natural resources	1	CO5
3.3	Traditional value systems in India,	1	CO6
3.4	Impacts of modernization on Environment	2	CO6
4.0	**Awareness and actual activities**		
4.1	Group meeting on water management, promotion of recycle use, reduction of waste	2	CO7
4.2	Plantation	1	CO7
4.3	Cleanliness drive	1	CO7
4.4	Drive on segregation of waste	1	CO7
4.5	Energy saving	1	CO7
4.6	Lectures by Environmentalist	1	CO7
4.7	Slogan and poster making event	Through online	CO7

Course Designers:

1. Dr.M.Kottaisamy hodchem@tce.edu
2. Dr.S.Rajkumar rajkumarsubramanium@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH. INFORMATION TECHNOLOGY DEGREE PROGRAMME

THIRD SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A GOVERNMENT AIDED ISO 9001:2008 CERTIFIED
AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY)
MADURAI – 625 015, TAMILNADU

PHONE: 0452 – 2482240, 41
FAX: 0452 2483427
WEB: WWW.TCE.EDU

Passed in Board of Studies Meeting on 11.05.2019 Approved in 58th Academic Council Meeting on 15.06.2019

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2018-19 onwards)

THIRD SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
18IT310	Discrete Mathematics	BS	3	-	-	3
18IT320	Object Oriented Programming	PC	3	-	-	3
18IT330	Software Engineering	PC	3	-	-	3
18IT340	Data Structures	PC	3	-	-	3
THEORY CUM PRACTICAL						
18IT360	IT operations and Management	ES	2	-	2	3
18ES390	Design Thinking	ES	1	-	2	2
PRACTICAL						
18IT370	Object Oriented Programming Lab	PC	-	-	2	1
18IT380	Data Structures Lab	PC	-	-	2	1
Total			**15**	**-**	**9**	**19**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective
AC :Audit Course

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
1 Hour Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

Scheme of Examinations
(For the candidates admitted from 2018-19 onwards)

THIRD SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	18IT310	Discrete Mathematics	3	50	50	100	25	50
2	18IT320	Object Oriented Programming	3	50	50	100	25	50
3	18IT330	Software Engineering	3	50	50	100	25	50
4	18IT340	Data Structures	3	50	50	100	25	50
THEORY CUM PRACTICAL								
5	18IT360	IT operations and Management	3	50	50	100	25	50
6	18ES390	Design Thinking	-	50	50	100	25	50
PRACTICAL								
7	18IT370	Object Oriented Programming Lab	3	50	50	100	25	50
8	18IT380	Data Structures Lab	3	50	50	100	25	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** Terminal Examination will be conducted for maximum marks of 100 and subsequently be reduced to 50 marks for the award of terminal examination marks

			Category	L	T	P	Credit
18IT310	**Discrete Mathematics**		BS	3	0	0	3

Preamble

Discrete mathematics is the branch of mathematics devoted to the study of discrete objects. Logic is called as the Calculus of Computer Science and it provides rules to determine whether a particular reasoning argument is valid. Propositions are declarative sentences with values true or false and are concerned with the analysis of propositions.Predicate calculus is the generalization of propositional calculus. **Set** is a collection of definite and distinguishable objects selected by means of some rules or description. Relation in mathematics describes connection between different elements of the same set, whereas function describes connections between two different sets. **Function is** a special class of relations. General recursive function coincides with the function defined by a Turing machine. A **lattice** is an abstract structure studied in the mathematical sub disciplines of order theory and abstract algebra.**These topics have wide range of applications** in computer architecture, artificial intelligence, software engineering, expert systems, complexities, digital principles, DBMS, designing concepts, storage methods, managing databases, knowledge representation, distributed computing etc.

Prerequisite

Higher Secondary Level– Set Theory, Logic Theory

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	**Verify** equivalence for the given binary relation and bijection for the given function.	20%
CO2	**Compute** generating function and recursive function.	5%
CO3	**Understand** and **interpret** the given graph for connectivity, matching and coloring	10%
CO4	**Construct** Hasse diagram for the given POSET and also verify the constructed Hasse diagram for modular, distributive, bounded and complemented lattice.	20%
CO5	**Prove** or **disprove** the implication & equivalence problems using truth table method, replacement process, analyzation method, truth table technique, rules of inference.	20%
CO6	**Obtain** PCNF and PDNF of given logical expression.	15%
CO7	**Symbolize** the given predicate statement using quantifiers with the given UOD.	5%
C08	**Pick** out free and bound variables, free and bound occurrence, and scope of the quantifiers from the given predicate statement.	5%

CO Mapping with CDIO Curriculum Framework

CO	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	-	1.1.1, 2.1.1, 2.3.1, 2.4.4
CO2	TPS3	Apply	Value	-	1.1.1, 2.1.1, 2.1.3, 2.4.4
CO3	TPS3	Apply	Value	-	1.1.1, 2.1.1, 2.1.2, 2.2.1, 2.4.4
CO4	TPS2	Understand	Respond	-	1.1.1, 2.1.1, 2.4.3, 2.4.4
CO5	TPS3	Apply	Value	-	1.1.1, 2.2.3, 2.4.3, 2.4.4
CO6	TPS3	Apply	Value	-	1.1.1, 2.2.3, 2.4.3, 2.4.4
CO7	TPS1	Remember	Receive	-	1.1.1, 2.1.4, 2.2.1, 2.4.4
CO8	TPS1	Remember	Receive	-	1.1.1, 2.1.4, 2.2.1, 2.4.4

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	S	-	-	-	-	-	-	M	-	M	M		L
CO2	S	S	S	-	-	-	-	-	-	M	-	M	M		L
CO3	S	S	S	-	-	-	-	-	-	M	-	M	M		L
CO4	S	S	S	-	-	-	-	-	-	M	-	M	M		L
CO5	S	S	S	-	-	-	-	-	-	M	-	M	M		L
CO6	S	S	S	-	-	-	-	-	-	M	-	M	M		L
CO7	S	S	S	-	-	-	-	-	-	M	-	M	M		L
CO8	S	S	S	-	-	-	-	-	-	M	-	M	M		L

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	10	10	10	-	-	-	----
Understand	30	30	30	50	50	50	30
Apply	60	60	60	50	50	50	70
Analyse	00	00	00	-	-	-	00
Evaluate	00	00	00	-	-	-	00
Create	00	00	00	-	-	-	00

Course Level Assessment Questions

Course Outcome (CO1)

1. Let R denote a relation on the set of ordered pairs of integers such that $<x,y>R<u,v>$ iff xv=yu. Show that R is an equivalence relation.
2. Given A = {1,2,3,4} and R ={(1,2),(1,1),(1,3),(2,4)}, S={(1,4),(1,3),(2,3), (3, 1),(4,1)} are relations on A. Find $S \circ R, R \circ S, M_R, M_S, M_{(R \circ S)^{-1}}$ and graph of R,S.
3. Let f: R $\rightarrow$ R and g: R $\rightarrow$ R where R is the set of all real numbers where f(x) = $x^2 - 1$ and g(x) = x+2 .
   (i) Verify ‘ f ’ , ‘g’,for bijection.
   (ii) Find fog and gof,gog, g^4, f^2
   (iii) Verify commutative law to the function f, g with respect to the operation ‘o’.
   (iv) Does f^{-1}, g^{-1} exists? Justify your answer.

Course Outcome (CO2)

1. Write the generating function for the sequence 1, a, a^2, a^3, ...
2. Explain exponential generating function with an example.
3. What is meant by a recursive function? Write one application of each first order and second order linear homogeneous recursive function with examples.

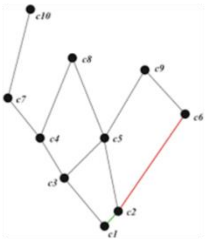
Course Outcome (CO3)

1. Identify the matching number, vertex connectivity, edge connectivity and chromatic number of Peterson graph and the complete bipartite graph $K_{3,4}$.
2. What is the relation between vertex connectivity and edge connectivity?

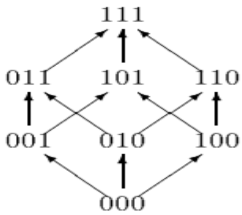
Course Outcome (CO4):

1. Which of the following Hasse diagram represents lattice? Justify your answer.

(i)



(ii)



2. Let L= { 1,2,3,11,66} be a poset under the relation divides.
Draw the Hasse diagram for L.
Check whether 'L' is a
(i)Distributive lattice.(ii) Modular (iii)Bounded (iv)Complemented
(v) Is the complement unique if it exists? Justify your answer

Course Outcome (CO5):

1. Prove the following implication by analyzation method.
$(PVQ) \wedge (P \rightarrow R) \wedge (Q \rightarrow S) \Rightarrow S \vee R$
2. Show that $(QV(P \wedge 7q) \vee (7P \wedge 7Q)$ is a tautology using replacement process.
3. Verify the following implication by truth table.
$(P \rightarrow (Q \rightarrow R)) \Rightarrow ((P \rightarrow Q) \rightarrow (P \rightarrow R))$
4. Show the implication using CP rule if necessary. $7PVQ, 7QVR, R \rightarrow S \Rightarrow P \rightarrow S$.

Course Outcome (CO6):

1. Obtain CNF and DNF of $7(PVQ) \leftrightarrow (P \wedge Q)$
2. Obtain PCNF and PDNF of $(7P \rightarrow R) \wedge (Q \leftrightarrow P)$
3. Obtain principal disjunctive normal form of $P \rightarrow ((P \rightarrow Q) \wedge 7(7Q \vee 7P))$ and hence obtain principal conjunctive normal form.

Course Outcome (CO7):

1. Let C(x) : x is a cat. A(x) : x is an animal . B(x) : x is black. Write the following in words;
$(i)\ \ (\forall x)(C(x) \rightarrow A(x))$ $(ii)\ \ (\exists x)(C(x) \wedge B(x))$

2. Symbolize the following arguments:
All integers are rational numbers. Some integers are power of 5.Therefore some rational numbers are powers of 5.

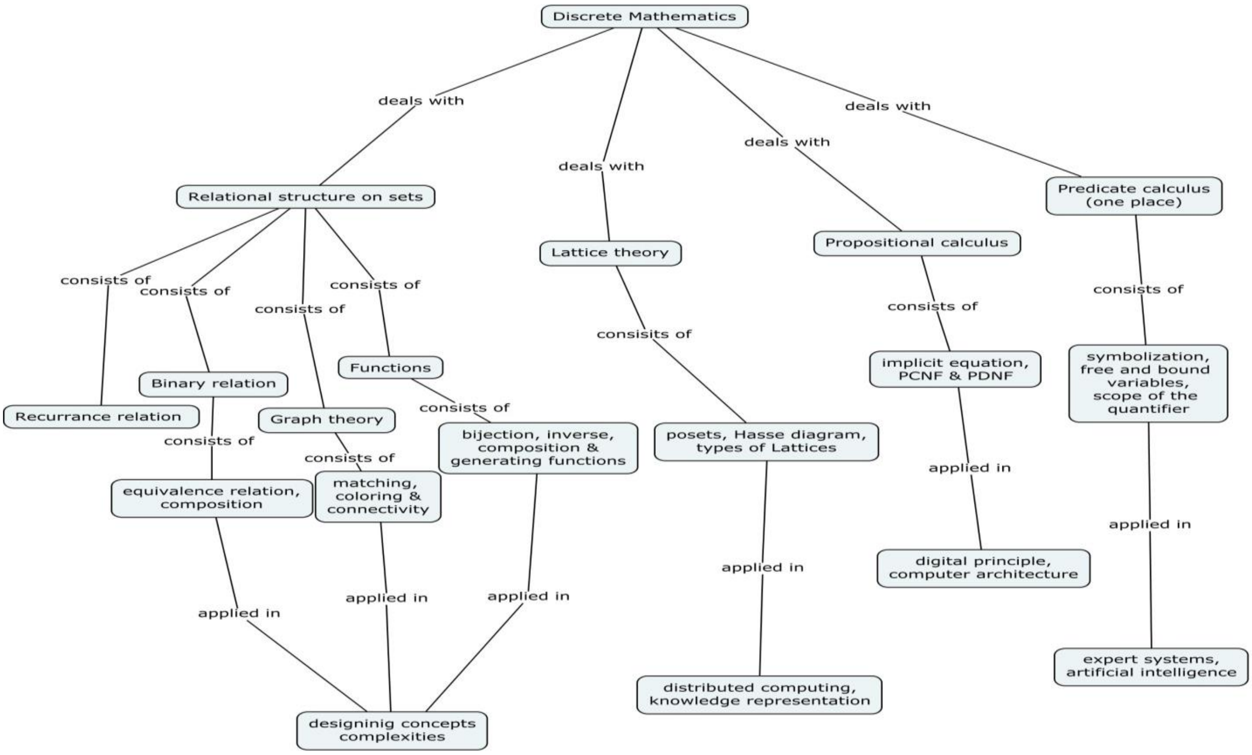
3. Symbolize the following predicate statements using quantifiers where UOD contains everything and hence negate the symbolic form.
(i) Some men are clever (ii) All birds can fly.

Course Outcome (CO8):

1. Pick out free ,bound variable and scope of the quantifier from the following expressions: $(\forall x)(P(x,y) \rightarrow Q(y))$

2. Symbolize the predicate statements and also pick out free and bound variable, scope of the quantifier, free and bound occurrence from the symbolic form:
(UOD contains everything).
All rock music is loud music. Some rock music exists. Therefore, some loud music exists.

Concept Map



Syllabus

Relational Structures on Sets

Relations, Binary Relations, Equivalence Relations, Composition of relations, recurrence relations, Functions, Bijections, composition of functions, generating functions, Graphs, Connectivity, Matching , coloring.

Lattice Theory: Poset, Poset as Lattice, Properties of Lattice, Sublattice, Special Lattices: Modular, Distributive, Complemented, Bounded.

Propositional Calculus: Introduction – Statements and Notations, Basic & Higher Connectives**:**–Truth Tables using connectives – Tautological Implications & Equivalence of Formulas,– Functionally Complete set of connectives **Normal Forms:** Disjunctive-Conjunctive-Principal Disjunctive-Principal Conjunctive. **Validation:** Checking the validity using the truth table, Rules of Inference: P,T,CP,AP rules –Consistency of premises.

Predicate Calculus: Predicates-Function, Variables and Quantifiers, Predicate formulas –Free and Bound Variables (One Place Predicate).

Learning Resources

1. J. P. Tremblay and R. Manohar, " Discrete Mathematical Structures with Applications to Computer Science", McGrawHill Education, 2017.
2. Kenneth H. Rosen, "Discrete Mathematics and its applications", McGrawHill Education, Seventh Edition, 2017.
3. Dr.M.K.Venkataraman., Dr.N.Sridharan and N.Chandrasekaran, "Discrete Mathematics", National Publishing Company, Chennai.of India, 2004.
4. EitanFarchi, Ben-Chaim, "Mathematical Logic and its Application to Computer Science - Lecture Notes" , March 3, 2010.
5. http://www.research.ibm.com/haifa/dept/svt/papers/Mathematical_Logic.pdf

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**Relational Structures on Sets**		
1.1	Definition of Relation – Matrix & Graph representation of a relation - Binary Relation – Properties of Binary Relation.	2	CO1
1.2	Tutorial – I	1	
1.3	Equivalence relation - Composition of Relation - Recurrence relation	2	CO1
1.4	Functions –Bijection Function-Inverse	2	CO2
1.5	Generating Function	1	CO2
1.6	Gaphs, Connectivity	2	CO3
1.7	Matching , Coloring	2	CO3
2	**Lattice Theory**		
2.1	Poset, Hasse Diagram, Lattices	2	CO4
2.2	Properties of Lattices, Sublattice	1	
2.3	Sublattice, Modular Lattice	2	
2.4	Distributive lattice, Complemented and Bounded Lattice	2	
2.5	De'Morgan's Law	1	
3.	**Propositional Calculus**		
3.1	Introduction – Statements and Notations	1	CO5
3.2	Negation – Conjunction – Disjunction – Truth table	2	
3.3	Conditional – Biconditional – Tautological Statements – Equivalence of Formulas	2	
3.4	Tutorial – I	1	
3.5	Duality Law – Tautological Implications-Functionally Complete set of Connectives –Other Connectives-Nand , Nor	1	
3.6	Disjunctive – Conjunctive – Principle Disjunctive – Principle Conjunctive	1	CO6
3.7	Tutorial – II	1	
3.8	Checking the validity using the truth table, Rules of Inference – Consistency of premises and Indirect Method	1	
4.	**Predicate Calculus**		
4.1	Predicates-Function, Variables and Quantifiers	3	CO7
4.2	Predicate formulas – Free and Bound Variables	3	CO8
	Total Lectures	**36**	

Course Designers:

1. M. Kameswari mkmat@tce.edu
2. T.Lakshmi tlaksshmimdu@tce.edu
3. AR. Murugan armmat@tce.edu

18IT320	Object Oriented Programming

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

This course is intended for enabling students to learn Object Oriented Programming concepts and develop solutions for the real world problem. The syllabus emphasizes on OOP concepts, package, interfaces, exception handling, threads, collection, events and swing.

Prerequisite

- None

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Make use of programming concepts like Control structures, looping statements, type casting and I/O file operations etc.	16
CO2	Construct object-oriented programs for the given scenario using object oriented concepts like abstraction, encapsulation, polymorphism and inheritance.	17
CO3	Apply package, interface and exception handling mechanism for the given problem.	17
CO4	Implement multithread concepts for the real world scenario.	16
CO5	Make use of Collections and Logging to solve the given problem.	17
CO6	Develop object-oriented applications for the given scenario that uses events through swing.	17

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5
CO6	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		L			L				M	M	L	L
CO2	S	M	L		L			L				M	M	L	L
CO3	S	M	L		L			L				M	M	L	L
CO4	S	M	L		M			L				M	M	M	L
CO5	S	M	L		M			L				S	M	M	L
CO6	S	M	L		M			L				S	M	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	20	-	-	-	20
Understand	30	30	20	20	20	20	20
Apply	50	50	60	80	80	80	60
Analyze	0	0	0	-	-	-	-
Evaluate	0	0	0	-	-	-	-
Create	0	0	0	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Assignment/Practical Component
Perception	
Set	
Guided Response	20
Mechanism	80
Complex Overt Responses	
Adaptation	
Origination	

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1):

1. Explain about the benefits of Object oriented Programming.
2. Write a Java program to create 2 two-dimensional arrays which hold numbers. Write a method which takes the arrays as arguments to perform matrix multiplication.
3. Write a Java Program to Copy the file contents from one to another.
4. Write a Java Program to generate the Armstrong no within the predefined range.

Course Outcome 2 (CO2):

1. Write a java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.

2. Write a Java Program to implement multilevel inheritance for the following classes: Project, Task and Module. Assume the data members and methods used.
3. Illustrate compile time and runtime polymorphism for employee management system using a java program.
4. Produce a Java program for finding volume of different geometric shapes - cylinder, Rectangle and cube. Apply 'encapsulation' to get and set the values of the attributes and apply compile time polymorphism to findthe volume of shapes. (Hint: Volume of cylinder: $3.14*r^2*h$, rectangle = l*b*h, Cube = a^3)

Course Outcome 3 (CO3):

1. Illustrate the following exceptions with a sample program and handle it using try with multiple catch.
   - Number Format Exception
   - Array Index Out of Bounds Exception
   - Arithmetic Exception
2. Discuss the ways of implementing interface with example program.
3. Differentiate checked exception from unchecked exception.
4. Write a Java program to create a package which has classes and methods to read Student Admission details.

Course Outcome 4 (CO4):

1. Write a Java Program to print the numbers 1 to 50 alternatively by Threads (Use Multithreading).
2. Write a java program to illustrate synchronization concept in threading.
3. Demonstrate inter-thread communication between ticket booking and cancellation in "Bus Reservation System". Assume appropriate members and member functions
4. Apply multi thread programming concept to demonstrate how threads are running with different priority value. Take any real time application to illustrate the above.

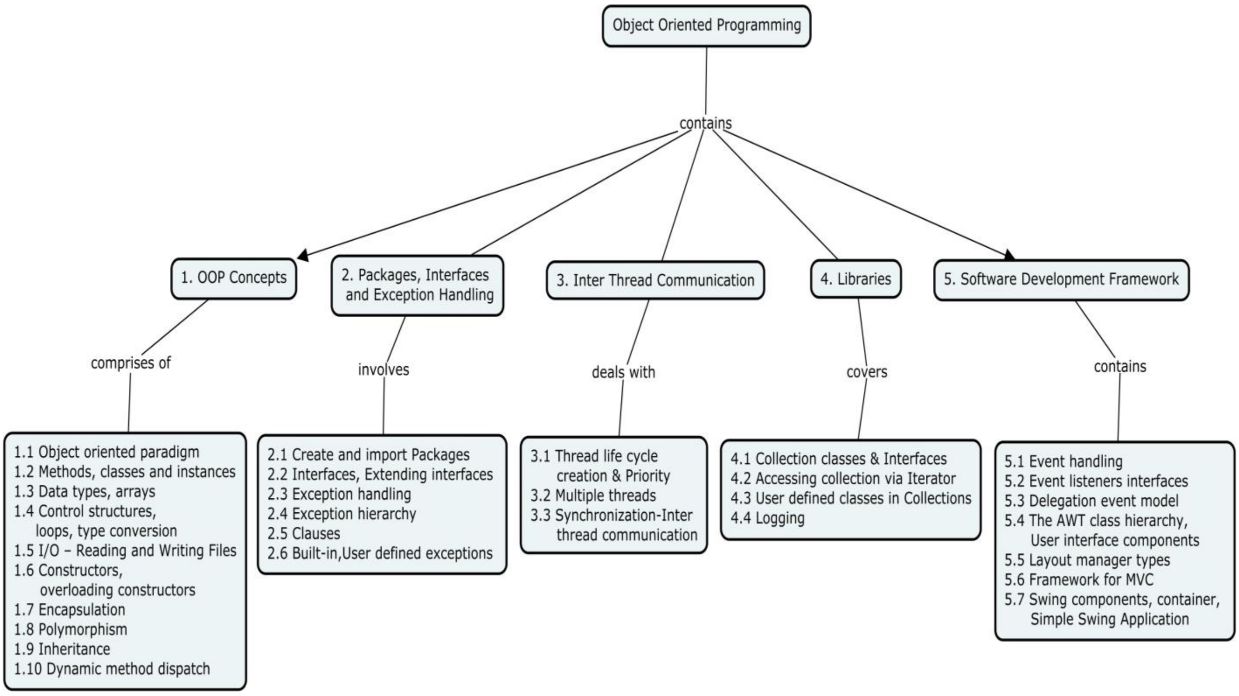
Course Outcome 5 (CO5):

1. Identify the suitable collection for storing the student name (inclusive of duplicates) in the random order. Perform the following operations.
   a. Display the student name without duplicate
   b. Arrange the name in ascending order
   c. Count the number of students with duplicate
   d. Remove the student whose index is at '5'
2. Identify any three levels of logs for electrical billing application. Write a program to generate it and store it in a file.
3. List out any four built-in classes in "collections framework".
4. List any four "handlers" that uses to handle log information.
5. Create any 3 collections for different types of books. Find the name of the book based on the given id. Generate the bill for the purchased books.

Course Outcome 6 (CO6):

1. Design and develop an application for bill calculation of a book shop using swing with events.
2. Write an applet to perform the 4 basic arithmetic operations as buttons in a form accepting two integers in text boxes and display their result.
3. List out any four Listener Interfaces in Event Handling.
4. Recall the syntax of different layouts in swing handling.
5. Write a java program that simulates a traffic signal. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.

Concept Map



Syllabus

Object Oriented Programming Concepts: object-oriented paradigm, methods, classes and instances, data types, arrays, control structures, looping statements, type conversion and casting, I/O – Reading and Writing Files, Constructors, overloading constructors, encapsulation, polymorphism, inheritance, Dynamic Method Dispatch

Packages, Interfaces and Exception Handling: Create and import packages - Interfaces, extending interfaces - Exception handling, exception hierarchy, Clauses, built in exceptions and user defined exceptions

Inter Thread Communication: Thread life cycle, creation & priority - Multiple threads, Synchronization - Inter thread communication

Libraries: Collection classes & Interfaces - Accessing collection via an Iterator - User defined classes in Collections –Logging

Software Development Framework: Event Handling: Events, Event sources, Event classes, Event Listeners Interfaces (Action Listener, Adjustment Listener Focus Listener, Item Listener, Key Listener, Mouse Listener, Text Listener), Delegation event model: handling mouse and keyboard events. The AWT class hierarchy, user interface components - Labels, button, scrollbars, text components, check box, check box groups, choices, lists, layout manager types – boarder, grid, flow and card.

Swing: Framework forMVC, components, containers and Simple Swing Application.

Learning Resources

- Herbert Schildt, “Java: The Complete Reference”, McGraw-Hill. Ninth Edition, 2014.

- Paul Deitel and Harvey Deitel, “Java How to Program (Early Objects)”, Pearson, Eleventh Edition, 2017.
- E.Balagurusamy, “Programming with Java” , McGraw-Hill, Fifth Edition, 2014.
- Kathy Sierra, “Head First Java”, Shroff publications, Second edition, 2005.
- Cay S. Horstmann and Gary Cornell, “Core Java, Volume I - Fundamentals”, Prentice Hall, Ninth Edition, 2013.
- Cay S. Horstmann and Gary Cornell, “Core Java, Volume II – Advanced Features : 2”, Prentice Hall, Eleventh Edition, 2018.

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcome
1	**Object Oriented Programming Concepts**		
1.1	Object oriented paradigm - Introduction	2	CO1
1.2	Methods, classes and instances		
1.3	Data types, arrays	1	
1.4	Control structures, looping statements, type conversion	2	
1.5	I/O – Reading and Writing Files	1	
1.6	Constructors, overloading constructors	1	CO2
1.7	Encapsulation	1	
1.8	Polymorphism	1	
1.9	Inheritance	2	
1.10	Dynamic Method Dispatch	1	
2	**Packages, Interfaces and Exception Handling**		
2.1	Create and Import packages	1	CO3
2.2	Interfaces, Extending interfaces	2	
2.3	Exception handling	1	
2.4	Exception hierarchy		
2.5	Clauses	1	
2.6	Built-in and User defined exceptions	1	
3	**Inter Thread Communication**		
3.1	Thread life cycle, creation & priority	2	CO4
3.2	Multiple threads	2	
3.3	Synchronization - Inter thread communication	2	
4	**Libraries**		
4.1	Collection classes & interfaces	2	CO5
4.2	Accessing collection via an Iterator	1	
4.3	User defined classes in Collections	1	
4.4	Logging	2	
5	**Software Development Framework**		
5.1	Event handling: Events, Event sources, Event classes	1	CO6
5.2	Event listeners interfaces (action listener, adjustment listener focus listener, item listener, key listener, mouse listener, text listener)		
5.3	Delegation event model: handling mouse and keyboard events	1	
5.4	The AWT class hierarchy, user interface components-labels, button, scrollbars, text components, check box, check box groups, choices, lists	1	
5.6	Layout manager types – boarder, grid, flow and card.	1	

	Framework for MVC	1	
5.7	Swing components, container, Simple Swing Application	1	
	Total Lectures	**36**	

Course Designers:

1. Dr.S.Sridevi sridevi@tce.edu
2. Mr.M.Manikandakumar mmrit@tce.edu

18IT330	SOFTWARE ENGINEERING

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

This course presents methods, tools and procedures that enable to control the process of software development and provide the student with a foundation for building quality software in a productive manner. The course highlights the application of systematic, disciplined, quantifiable approach to the development, operation and maintenance of software. The course also enables the students to acquire analytical, critical, technical writing, team building and managerial skills through team project activities by using agile practices

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Compare traditional and agile software process models	17
CO2	Identify user stories, Story map, functional and non-functional requirements for any given problem	16
CO3	Prepare design documents with standards for the given requirements	23
CO4	Develop test cases using appropriate testing techniques for an application	30
CO5	Illustrate the use of version controlling and tracking mechanisms	6
CO6	Demonstrate DEVOPS life cycle processes	8

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2,2.3.1,2.3.2
CO2	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,3.1.4, 3.1.5
CO3	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,3.2.3, 4.4.1, 4.4.2
CO4	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,4.4.1, 4.4.2 4.5.5
CO5	TPS2	Understand	Respond	Guided Response	1.2,4.3.4
CO6	TPS2	Understand	Respond	Guided Response	1.2,4.3.4, 4.5.3, 4.5.6

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L						M				S	L		L
CO2	S	M	L		M	M			S	S		S	M	M	M
CO3	S	M	L		M	M			S	S		S	M	L	M
CO4	S	M	L		M				S	S		S	M	L	M
CO5	M	L							S	S		S	L		M
CO6	M	L			L				S	S		S	L		M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	30	20	20	-	-	-	20
Understand	40	40	40	-	-	-	30
Apply	30	40	40	100	100	100	50
Analyse	0	0	0	-	-	-	0
Evaluate	0	0	0	-	-	-	0
Create	0	0	0	-	-	-	0

AssessmentPattern: Psychomotor

Psychomotor Skill	**Miniproject/Assignment/Practical Component**
Perception	-
Set	-
Guided Response	50
Mechanism	50
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1):

1. Identify the needs for software engineering.
2. Differentiate the various processing models highlighting their advantages and disadvantages.
3. As a Project Manager, you have been contracted to build the software for weather monitoring system. Choose a process model that best fits your project and justify your answer comparing with other process models. Explain your choice of process model in detail.
4. Using the example of safe home security function, justify how does Agile process model can be implemented in this project. Write advantages and disadvantages
5. Explain the roles and responsibilities of software project manager.

Course Outcome 2 (CO2):

1. Identify user stories and draw story map for Railway reservation system.
2. Explain the requirements analysis process.
3. Differentiate the requirements analysis process between various process models
4. Signing off contract is a major task in requirements analysis. Justify your answer for this for agile process model.
5. Identify functional requirements for Online shopping software
6. Identify functional and non-functional requirements for the given case study.

Course Outcome 3 (CO3):

1. Draw DFD for the given case study (online shopping software)
2. Select use case diagram for the given case study (online shopping software)
3. Draw class and sequential diagram for the given case study (online shopping software)
4. Construct activity diagram for the given case study (Library Management System)
5. Draw use case diagram for Hospital management.

Course Outcome 4 (CO4):

1. Explain different testing techniques
2. Explain cause-effect testing technique with suitable example
3. Design the black-box test suite for software that computes the square root of an input integer which can assume values in the range of 0 to 5000.
4. Identify test cases for Prime Number generation program using the cyclomatic complexity
5. Draw program dependence graph and write test cases for the given problem.

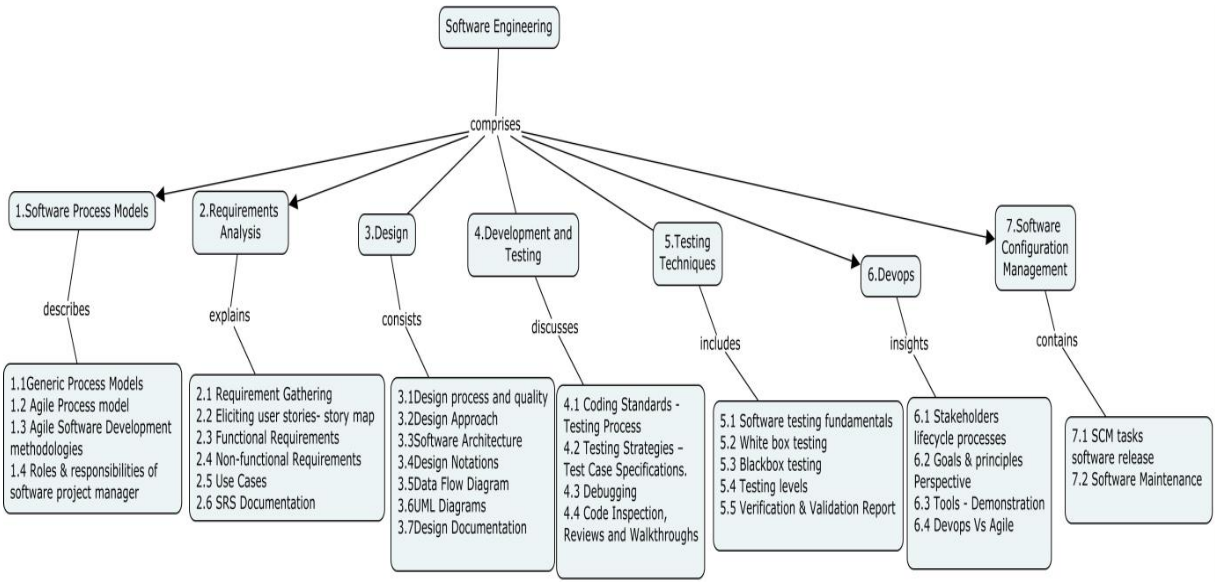
Course Outcome 5 (CO5):

1. List SCM tasks.
2. Explain version controlling and tracking
3. Identify the characteristics of software maintenance.
4. Define software release plan.
5. Discuss about software reviews

Course Outcome 6 (CO6):

1. List Devops stakeholders.
2. Identify Devops goals and principles.
3. Explain Devops life cycle processes
4. Compare Devops and Agile process models
5. Describe the advantages of using Devops

Concept Map



Syllabus

Software Process Models: Generic Process Models Vs Agile Process model. Agile Software Development methodologies -Extreme Programming (XP), Adaptive Software Development (ASD) - Dynamic Systems Development Method (DSDM) – Scrum – Crystal – Feature Driven Development (FDD) - Roles and responsibilities of software project manager

Requirements Analysis: Requirement Gathering – Eliciting user stories- story map - Functional Requirements - Non-functional Requirements. Use Cases – SRS Documentation

Design: Design process and quality - Design concepts – design guidelines – Design Approach - Structured approach – Object-oriented approach. Software Architecture- Data design – Architectural styles and patterns - User Interface Design. Design Notations – Data Flow Diagram – Context Diagram - UML Diagrams – Class Diagram - Sequential Diagram – User Interface Design - Design Documentation. Exploration of Design tools

Development and Testing: – Coding Standards –Testing Process – Testing Strategies – Test Case Specifications. Debugging - Code Inspection, Reviews and Walkthroughs

Testing techniques: – Software testing fundamentals – Black box and white box testing - White box testing - Basis path testing- Control structure testing – Program Dependence Graph. Black box testing –Equivalence Partitioning – Boundary Value Analysis – Cause effect graph Testing levels – Unit testing – Integration testing - System testing -Modular testing – Regression testing –User acceptance testing – Verification & Validation Report. Testing tools.

Devops: Stakeholders – Lifecycle processes – Goals & principles –Perspective –Tools - Demonstration of Devops. DevopsVs Agile.

Software Configuration Management: SCM tasks- version control- tracking- software release. Software Maintenance – characteristics, controlling factors, maintenance tasks

Learning Resources

1. Orit Hazzan, Yael Dubinsky, “Agile software engineering Ⅱ”, Springer,2014
2. Roger S.Pressman, “Software Engineering A Practitioner’s Approach”, McGraw Hill, 8th edition, 2014.
3. Rajib Mall, “Fundamentals of Software Engineering”, PHI, 4th edition, 2014.
4. Michael Duffy, “DevOps Automation Cookbook”, Kindle editions, 2015
5. Adithya P. Mathur, “Foundations of Software Testing”, Pearson Education, 2008..
6. https://cloudacademy.com/blog/introduction-to-devops/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Software Process Models**		
1.1	Generic Process Models	1	CO1
1.2	Agile Process model	1	
1.3	Agile Software Development methodologies		
1.3.1	Extreme Programming (XP)	1	
1.3.2	Adaptive Software Development (ASD)		
1.3.3	Dynamic Systems Development Method (DSDM)	1	
1.3.4	Scrum	1	
1.3.5	Crystal		
1.3.6	Feature Driven Development (FDD)		
1.4	Roles and responsibilities of software project manager	1	
2	**Requirements Analysis**		
2.1	Requirement Gathering	1	CO2
2.2	Eliciting user stories- story map	1	
2.3	Functional Requirements	1	
2.4	Non-functional Requirements	1	
2.5	Use Cases	1	
2.6	SRS Documentation	1	
3	**Design**		CO3
3.1	Design process and quality - Design concepts – Design guidelines	1	
3.2	Design Approach - Structured approach – Object-oriented approach.	1	
3.3	Software Architecture - Data design –Architectural styles and patterns	1	
3.4	Design Notations	2	
3.5	Data Flow Diagram – Context Diagram		
3.6	UML Diagrams – Class Diagram - Sequential Diagram – User Interface Design	2	
3.7	Design Documentation	1	
4	**Development and Testing**		CO4
4.1	Coding Standards –Testing Process -	1	
4.2	Testing Strategies – Test Case Specifications.		
4.3	Debugging	1	
4.4	Code Inspection, Reviews and Walkthroughs	1	
5	**Testing techniques**		
5.1	Software testing fundamentals	1	
5.2	White box testing	2	

5.2.1	Basis path testing		CO4
5.2.2	Control structure testing		
5.2.3	Program Dependence Graph		
5.3	Black box testing	2	
5.3.1	Equivalence Partitioning		
5.3.2	Boundary Value Analysis		
5.3.3	Cause effect graph		
5.4	Testing levels – Unit testing – Integration testing - System testing -Modular testing – Regression testing –User acceptance testing	1	
5.5	Verification & Validation Report	1	
5.6	Testing tools	1	
6	**Devops**		CO6
6.1	Stakeholders – lifecycle processes	1	
6.2	Goals & principles – Perspective		
6.3	Tools - Demonstration	1	
6.4	DevopsVs Agile	1	
7	**Software Configuration Management**		CO5
7.1	SCM tasks- version control- tracking- software release.	1	
7.2	Software Maintenance – characteristics, controlling factors, maintenance tasks	1	
	Total Hours	36	

Course Designers:

1. R.Suganya rsuganya@tce.edu
2. S.Pudu Malar spmit@tce.edu

18IT340	DATA STRUCTURES

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

The course introduces the fundamental data structures and their operations. The course discusses the use of linear and non-linear data structures with real time applications. It strives to strengthen the programming ability of students to solve problems and write efficient algorithms using suitable data structures.

Prerequisite

Basic Programming Skills

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Use suitable linear ADT data structures and their operations for solving a given problem	25%
CO2	Use suitable non-linear ADT data structures and their operations for solving a given problem	30%
CO3	Illustrate hash table and sets data structure and their operations for simple applications	15%
CO4	Compute space and time complexity of a given problem	10%
CO5	Interpret computational efficiency of searching and sorting algorithms	10%
CO6	Formulate solutions by using suitable ADTs and write efficient procedures for implementing problems	10%

CO Mapping with CDIO Curriculum Framework

CO#	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.4.5, 2.4.6
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.4.5, 2.4.6
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.4.5, 2.4.6
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.4.5, 2.4.6
CO6	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.1.2, 3.2.3, 3.2.4, 4.1.1, 4.1.2, 4.5.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		S			M				S	M	M	L
CO2	S	M	L		S			M				S	M	M	L
CO3	S	M	L		S			M				S	M	M	L
CO4	S	M	L		S			M				S	M	M	L
CO5	S	M	L		S			L				S	M	M	L
CO6	S	M	L		S	S	L	S	S	S	M	S	M	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	30	20	20	-	-	-	20
Understand	30	40	40	-	-	-	40
Apply	40	40	40	10	10	10	40
Analyze	0	0	0	-	-	-	0
Evaluate	0	0	0	-	-	-	0
Create	0	0	0	-	-	-	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini-project / Assignment / Practical Component
Perception	-
Set	10
Guided Response	30
Mechanism	60
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):

1. Insert the elements into the Singly Linked list so that the list is sorted
2. Use Stack to check whether the given string is palindrome or not
3. Select the appropriate data structure to check the palindrome so as to minimize the traversal

Course Outcome 2 (CO2):

1. AVL tree is better than Binary Search Tree. Give reason.
2. Identify the suitable data structure so as to delete the minimum element from the list.
3. Insert the A to J into the suitable data structure, so that search always yields O(log n) time.

Course Outcome3 (CO3):

1. Demonstrate the operations of Set ADT with suitable examples.
2. Suggest the suitable collision resolution strategies when the given keys are hashed into the hash table
3. List different collision resolving strategies in Hashing technique

Course Outcome 4 (CO4):

1. List few $O(n^2)$ and $O(n \log n)$ sorting algorithms
2. Describe the potential advantages of notations Ω, θ, O
3. Find the space complexity and time complexity of matrix multiplication

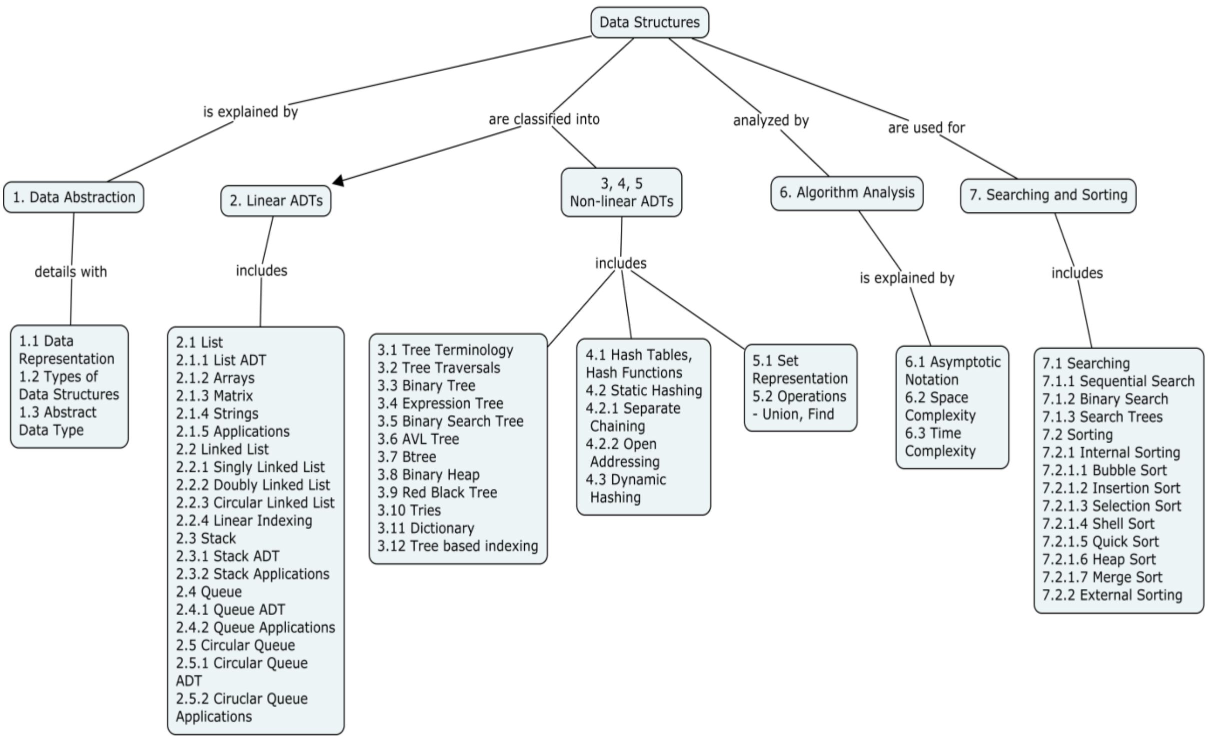
Course Outcome 5 (CO5):

1. Compare linear and binary search techniques
2. Write procedure and sort the elements using insertion sort
3. Demonstrate Merge sort for the set of numbers

Course Outcome 6 (CO6):

1. Convert infix expression to postfix using stack ADT
2. Solve polynomial equation using singly linked list ADT
3. Mini-project implementation

Concept Map



Syllabus

Data Abstraction: Data Representation - Types of Data Structures - Abstract Data Type (ADT)

Linear ADTs: List - Arrays - Matrix - String - Applications - Stack - Queue - Circular Queue - Linked List - Singly Linked List, Doubly Linked List, Circular Linked List, Applications -

Expression evaluation, Recursion, FCFS Algorithm, Round Robin Scheduling Algorithm, Linear Indexing

Non-linear ADTs: Tree Terminology - Tree traversals - Binary tree - Expression Tree - Binary Search Tree - AVL Tree - B-tree - Binary Heap (Priority Queue) - Red Black Tree, Tries, Applications - Dictionary - Tree-based indexing

Tables: Hash Tables - Hash Functions - Static Hashing - Separate Chaining, Open Addressing - Dynamic Hashing

Sets: Representation - Operations - Union, Find

Algorithm Analysis: Asymptotic Measures - Space Complexity - Time Complexity

Searching and Sorting: Sequential Search - Binary Search - Search trees - Internal Sorting - Bubble Sort, Insertion Sort, Selection Sort, Shell Sort, Quick Sort, Merge Sort - External Sorting

Learning Resources

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 2012.
2. Richard Gilberg, Behrouz A. Forouzan, “Data Structures: A Pseudo code Approach with C”, Second edition, India Edition 2007.
3. S Sridhar, “Design and Analysis of Algorithms”, 1st edition, Oxford University Press, 2014.
4. BasantAgarwal, BejaminBaka, “Hands-On Data Structures and Algorithms with Python: Write complex and powerful code using the latest features of Python 3.7, 2nd Edition, 2018
5. Aho, J.E. Hopcroft and J.D. Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
6. Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, “Fundamentals of Computer Algorithms”, Galgotia Publications, 2010.
7. NPTEL’s Course for Data Structures - http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/data_str_algo/frameset.htm
8. Web Reference for Data Structures - https://www.geeksforgeeks.org/data-structures
9. Web Reference for Data Structures -https://www.hackerrank.com/domains/data-structures
10. Web Reference for Data Structures - www.leetcode.com/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Data Abstraction**		CO1
1.1	Data Representation	1	
1.2	Types of Data Structures		
1.3	Abstract Data Type (ADT)		
2	**Linear ADTs**		
2.1	List		CO1, CO6
2.1.1	List ADT	1	
2.1.2	Arrays		
2.1.3	Matrix	1	
2.1.4	Strings	1	

2.1.5	Applications		
2.2	Linked List		
2.2.1	Singly Linked List ADT	2	
2.2.2	Doubly Linked List ADT	2	
2.2.3	Circular Linked List ADT		
2.2.4	Applications - Linear Indexing		
2.3	Stack		
2.3.1	Stack ADT	1	
2.3.2	Applications - Expression Evaluation	1	
2.3.3	Applications - Recursion	1	
2.4	Queue		
2.4.1	Queue ADT	1	
2.4.2	Applications - FCFS Algorithm		
2.5	Circular Queue		
2.5.1	Circular Queue ADT	1	
2.5.2	Applications - Round Robin Algorithm	1	
3	**Non-linear ADTs**		
3.1	Tree Terminology	1	CO2, CO6
3.2	Tree Traversals		
3.3	Binary Tree	1	
3.4	Expression Tree	1	
3.5	Binary Search Tree	1	
3.6	AVL Tree	1	
3.7	B-tree	1	
3.8	Binary Heap (Priority Queue)	1	
3.9	Red Black Tree	1	
3.10	Tries		
3.11	Applications - Dictionary	1	
3.12	Applications - Tree-based indexing		
4	**Tables**		
4.1	Hash Tables, Hash Functions	1	CO3, CO6
4.2	Static Hashing	1	
4.2.1	Separate Chaining		
4.2.2	Open Addressing		
4.3	Dynamic Hashing	1	
5	**Sets**		
5.1	Representation	1	
5.2	Operations: Union and Find	1	
6	**Algorithm Analysis**		
6.1	Aysmptotic Measures	2	CO4, CO6
6.2	Space Complexity		
6.3	Time Complexity		
7	**Searching and Sorting**		
7.1	Searching Techniques	1	CO5,

7.1.1	Sequential Search		CO6
7.1.2	Binary Search		
7.1.3	Search Trees		
7.2	Sorting Techniques		
7.2.1	Internal Sorting		
7.2.1.1	Bubble Sort	1	
7.2.1.2	Insertion Sort		
7.2.1.3	Selection Sort		
7.2.1.4	Shell Sort		
7.2.1.5	Quick Sort	1	
7.2.1.6	Heap Sort	1	
7.2.1.7	Merge Sort	1	
7.2.2	External Sorting	1	
	Total Lecture Hours	36	

Course Designers:

1. A.M. Abirami abiramiam.@tce.edu
2. E. Ramanujam erit@tce.edu

18IT380	DATA STRUCTURES LAB

Category	L	T	P	Credit
PC	0	0	2	1

Preamble

The course is designed to develop programming skills for writing applications using linear and non-linear data structures. It strengthens the logical reasoning skills of students to solve problems and write efficient algorithms using suitable data structures.

Prerequisite

Basic Programming Skills

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Use suitable array-based linear data structures for a given problem	35%
CO2	Use suitable linked list data structures for a given problem	30%
CO3	Use suitable tree data structures for a given problem	15%
CO4	Use suitable hashing techniques and sets for a given problem	7%
CO5	Experiment with different searching and sorting algorithms using time complexity measures	7%
CO6	Develop solutions for real time applications using suitable linear or non-linear data structures and communication skills by involving in project teams	6%

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5
CO6	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.5.1, 3.1.1, 3.2.3, 3.2.4, 4.1.1, 4.5.1,

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	S	M	L		S			S				S	M	M	L
CO2	S	M	L		S			S				S	M	M	L
CO3	S	M	L		S			S				S	M	M	L
CO4	S	M	L		S			S				S	M	M	L
CO5	S	M	L		S			S				S	M	M	L
CO6	S	M	L		S	S	L	S	S	S	M	S	M	S	S

S- Strong; M-Medium; L-Low

Passed in Board of Studies Meeting on 11.05.2019   Approved in58th Academic Council Meeting on 15.06.2019

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	-	-
Understand	10	-
Apply	90	100
Analyze	-	-
Evaluate	-	-
Create	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject/Practical Component/Observation
Perception	-
Set	10
Guided Response	40
Mechanism	50
Complex Overt Responses	-
Adaptation	-
Origination	-

List of Experiments/Activities with CO Mapping

S. No	Topic	No. of Sessions	COs Mapping
1	Implementation of List ADT using array and structures for simple applications	1	CO1
2	Implementation of Matrix ADT using array and pointers for simple applications	1	
3	Implementation of String Algorithms (eg. string matching) for simple applications	1	
4	Implementation of List ADT using Linked List and its applications	1	CO2
5	Implementation of Stack ADT for simple applications i. Two way stack ii. Stack Applications	1	CO1
6	Implementation of Queue ADT, Queue Applications	1	
7	Implementation of Circular Queue ADT, Circular Queue Applications		
8	Implementation of List ADT using Doubly Linked List, Applications	1	CO2
9	Implementation of List ADT using Circular linked list, Applications	1	
10	Implementation of Binary Search Tree ADT	1	CO3
11	Implementation of Binary Heap ADT	1	
12	Implementation of Hashing techniques	1	CO4
13	Performance analysis of searching and sorting algorithms	1	CO5
14	Mini-project Implementation and review		CO6
	Total Sessions	**12**	

Learning Resources

1. GeeksforGeeks - www.geeksforgeeks.org
2. HackerRank - www.hackerrank.com

Course Designers:

1. A.M. Abirami abiramiam.@tce.edu
2. E. Ramanujam erit@tce.edu

18IT360	IT OPERATIONS AND MANAGEMENT	Category	L	T	P	Credit
		ES	2	0	2	3

Preamble

This course intends to provide basic knowledge on system administration to administer Linux/Windows machines and further explores IT operations concepts such as server Management, Storage, Back-up and Business Continuity Planning

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Identify the commands to manage user and group administrative structure, File system, devices and kernels in a standalone or network system	30
CO2	Apply the essential Windows administration concepts for given scenario	30
CO3	Describe the functionalities, Configuration, monitoring and Power budget for different types of servers	5
CO4	Summarize various storage networking and virtualization technologies	20
CO5	Review backup and restore strategy used in a system or enterprise	10
CO6	Outline a suitable disaster recovery plan for a small enterprise	5

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.1.1,2.1.5,3.1, 4.6.2
CO2	TPS3	Apply	Value	Mechanism	1.2,2.1.1,2.1.5,3.1, 4.6.2
CO3	TPS2	Understand	Respond	Guided Response	1.2,2.3.3
CO4	TPS2	Understand	Respond	Guided Response	1.2,2.2.2,2.3.2,
CO5	TPS2	Understand	Respond	Guided Response	1.2, 2.1.1,2.1.5,2,2.2.2,3.1
CO6	TPS2	Understand	Respond	Guided Response	1.2,2.1.5,2.2.2

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		S			M		M		M	M	L	M
CO2	S	M	L		S			M		M		M	M	L	M
CO3	M	L					M						L		L
CO4	M	L											L		
CO5	M	L											L		
CO6	M	L					M	M					L		L

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	ContinuousAssessment Tests			Model Exam	Practical Component/ Observation	Terminal Exam
	1	2	3			
Remember	20	40	30	0	0	30
Understand	30	60	40	30	20	40
Apply	50	0	30	70	80	30
Analyse	0	0	0	0	0	0
Evaluate	0	0	0	0	0	0
Create	0	0	0	0	0	0

CO1, CO2 and CO5will be evaluated using practical exercises/assignments/mini-project/standard Linux Certifications.

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	0
Set	0
Guided Response	70
Mechanism	30
Complex Overt Responses	0
Adaptation	0
Origination	0

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1):

1. Enlist the LVM commands used for the creation of logical volumes according to the given description in linux environment
2. Choose the commands to manage user and group administrative structure in linux environment.
3. Organize the steps to configure network file system
4. Illustrate the linux firewall features in details and write appropriate commands for firewall setup in your college network
5. Experiment what are all events are happen when the command ping www.annauniv.edu is executed.
6. Identify the command to search files in /etc directory

Course Outcome 2 (CO2):

1. Identify the steps to manage file services in windows server 2012
2. Illustrate the steps to configure name resolution in windows server 2012
3. Sequence the steps to administer active directory by managing and maintaining domain controller in windows server 2012
4. Explain the procedure for setting system password and accound lockout policies in windows machine.

Course Outcome 3 (CO3):

1. Explain the schemes of Power budgeting
2. Illustrate the architecture of Application Server
3. List the steps of configuring a Mail Server

Course Outcome 4 (CO4):

1. How can a block-level virtualization implementation be used as a data migration tool? Compare this method to traditional migration methods
2. A company is considering implementing storage. They do not have a current storage infrastructure to use, but they have a network that gives them good performance. Discuss whether native or bridged iSCSI should be used and explain your recommendation.
3. The IT Department of a departmental store uses tape to archive data. The data once created may be accessed within 30 days and when it crosses that period, the frequency of access is less than 1%. Suggest a CAS solution

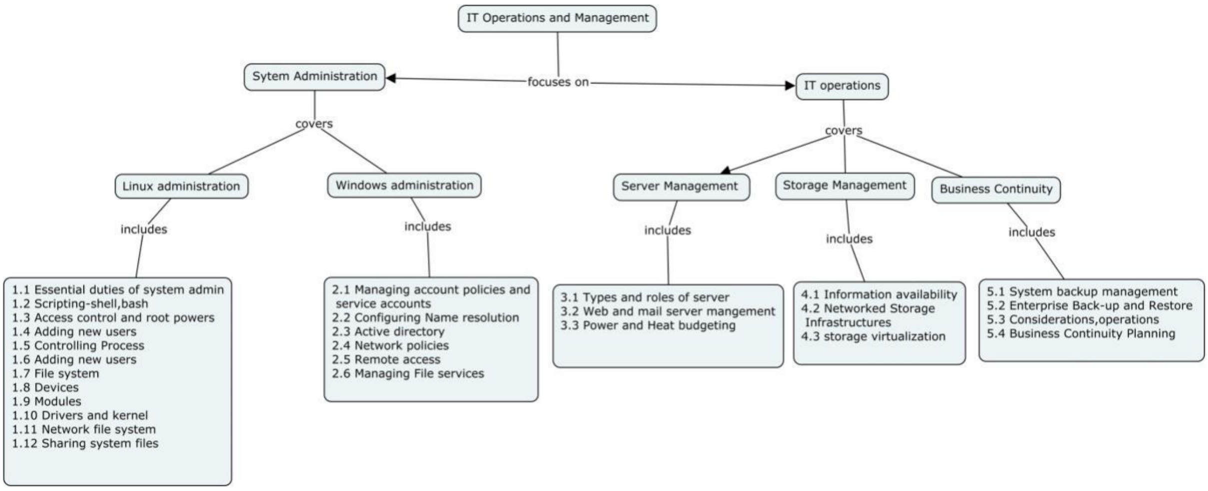
Course Outcome 5 (CO5):

1. What are the various business/technical considerations for implementing a backup
2. solution and how do these considerations impact the backup solution implementation?
3. Explain how remote replication technology is helpful in disaster recovery.
4. Illustrate the components of bacula and sequence the steps to perform backup and restore of your system's root directory

Course Outcome 6 (CO6):

1. Describe the Business continuity plan guidelines for a financial organization
2. Explain the steps involved in BCP
3. What is the purpose of performing operation backup, disaster recovery and archiving?

Concept Map



Syllabus

Linux Administration- Essential duties of system admin-Scripting – Shell - Shell Configuration - Access control and Root powers- Adding new users- Controlling Process- File system- Devices- Modules- Drivers and kernel - Network file system - sharing system files

Windows Administration - Managing account policies and service accounts- Configuring Name resolution- Active directory- Network policies- Remote access- Managing File services

Server Management - Types of servers - Roles of Server - Web Server Management – Mail server Management - Setup - Monitoring - Optimization - Power and Heat budgeting

Storage Management- Information availability - Networked Storage Infrastructures (NAS, SAN) - RAID - Storage Virtualization

Business Continuity - System Backup management- Enterprise Back-up and Recovery: Considerations , Operations - Backup Granularity, Methods, Technologies - Replication - Business Continuity Planning

Learning Resources

- Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, “UNIX and Linux System Administration Handbook”, 5th edition, Pearson education,2017.
- Orin Thomas, “Administering Windows Server 2012 – Training guide”, O’Reilly Media, 2014
- EMC Education Services,” Information Storage and Management”, Wiley, 2nd edition, 2012
- Gilbert Held, "Server Management (Best Practices Book 9)", Auerbach Publications, 1st edition.2000
- Nicholas Wells, “Guide to Linux Installation and Administration”, Course Technology Inc; 2nd Revised edition, 2003
- Matthias KalleDalheimer, Matt Welsh, ”Running Linux”, Om books, Fifth Edition, 2006.
- Robert Spalding, “Storage Networks :The Complete Reference”, Tata McGraw Hill,Osborne,2017
- Backup management-https://www.baculasystems.com/training
- System administration and engineering training - https://www.cbtnuggets.com/it-training/systems-administration-engineering
- System administration certification - https://www.koenig-solutions.com/specialization/system-administration-training-courses.aspx

Course Contents and Lecture Schedule

Module No	Topic	No. of Hours	Course Outcome
1	**Basic Linux Administration**		CO1
1.1	Essential duties of system admin	3	
1.2	Shell scripting - Configuration		
1.3	Access control and Root powers	1	
1.3	Controlling Process	1	
1.4	Adding new users	1	
1.5	File system		
1.6	Devices	1	
1.7	Modules		
1.8	Drivers and kernel	1	
1.9	Network file system	1	
1.10	Sharing system files	1	
2	**Windows Administration**		CO2
2.1	Managing account policies and service accounts	1	
2.2	Configuring Name resolution	1	
2.3	Active directory	1	
2.4	Network policies	1	
2.5	Remote access	1	
2.6	Managing File services		
3	**Server Management**		CO3
3.1	Types of servers - Roles of Server	1	
3.2	Web Server Management - Setup - Monitoring - Optimization	1	
3.3	Mailserver Management - Setup - Monitoring - Optimization	1	
3.4	Power and Heat budgeting	1	
4	**Storage Management**		CO4
4.1	Information availability	1	
4.2	Networked Storage Infrastructures	1	
4.3	RAID	1	
4.4	Storage Virtualization		
5	**Business Continuity**		CO5
5.1	System Backup - Replication	1	
5.2	Enterprise Back-up and Restore	1	
5.3	Business Continuity Planning	1	CO6
	Total No. of Lecture Hours	24	

List of Experiments

S. No	Description	No. of Hours	Course Outcome
	Linux Administration		
1	Shell scripting and Configuration	2	CO1
2	Access management	2	
3	User management	2	
4	File System Management	2	
5	Web server management	2	
6	Mail server management	2	
7	Backup	2	CO5

8	Network file system	1	CO1
9	Sharing system files	1	
	Windows Administration		
10	Managing account policies and service accounts	2	CO2
11	Configuring Name resolution	1	
12	Active directory	2	
13	Remote access	1	
14	Managing File services	2	
	Total Lectures	24	

Course Designers

1. J John Shiny shinyit@tce.edu
2. S.ThiruchadaiPandeeswari eshwarimsp@tce.edu

18IT370	OBJECT ORIENTED PROGRAMMING LAB

Category	L	T	P	Credit
PC	0	0	2	1

Preamble

This course provides knowledge and skills on object oriented concepts such as inheritance, polymorphism and also the concepts such as threading, packages, exceptions and collections. It also provides knowledge at analyze level on selecting java libraries to implement logging and swing for an application.

Prerequisite

Nil

Course Outcomes

On successful completion of the course, students will be able to

Course Outcomes		Weightage in %
CO1	Apply Basic Programming concepts like type casting, control structures, looping statements, I/O Operations etc.	16
CO2	Apply object oriented concepts like abstraction, encapsulation, polymorphism and inheritance to solve the given problem.	25
CO3	Develop applications that use packages, interfaces, exceptions, and threads for the given requirements.	25
CO4	Implement Collections and logging to solve the given problem.	17
CO5	Examine suitable Application Programming Interfaces (APIs) to incorporate swing concepts in the given application.	9
CO6	Develop applications for the given real time problems based on core and advanced OOP concepts.	8

CO Mapping with CDIO Curriculum Framework

CO	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 3.1.1, 3.2.1 3.2.6, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 3.1.1, 3.2.1 3.2.6, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 3.1.1, 3.2.1 3.2.6, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 3.1.1, 3.2.1 3.2.6, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 3.1.1, 3.2.1 3.2.6, 4.1.1, 4.3.1, 4.4.3, 4.5.3

CO6	TPS4	Analyze	Organize	Complex Overt Responses	1.2, 2.1.1, 2.1.5, 2.4.3, 2.4.6, 2.4.7, 2.5.1, 3.1.1, 3.2.1 - 3.2.6, 4.1.1, 4.3.1, 4.4.3, 4.5.3, 4.5.5

Mapping with Programme Outcomes / Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		L			L	M	M		M	M	L	M
CO2	S	M	L		L			L	M	M		M	M	L	M
CO3	S	M	L		M			M	S	S		S	M	M	M
CO4	S	M	L		M			M	S	S		S	M	M	M
CO5	S	M	L		M			M	S	S		S	M	M	M
CO6	S	S	M	L	M			M	S	S		S	S	M	M

S - Strong, M – Medium, L – Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	-	-
Understand	20	20
Apply	60	60
Analyse	20	20
Evaluate	0	0
Create	0	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Practical Component/Observation
Perception	-
Set	-
Guided Response	20
Mechanism	80
Complex Overt Responses	-
Adaptation	-
Origination	-

List of Experiments/Activities with CO Mapping

Exp No.	List of Experiments	No. of Hours	Course Outcome
1.	Use of data types, operators, scope and life time of variables, Type casting	2	CO1
2.	Practice Java I/O	2	
3.	Demonstrate Encapsulation	2	CO2
4.	Practice Inheritance	2	
5.	Practice Polymorphism	2	
6.	Practice Packages & Interfaces	2	CO3
7.	Demonstrate built-in Exceptions and User defined Exceptions	2	
8.	Practice Threading	2	
9.	Practice Collections with string methods	2	CO4
10.	Practice Logging with JAR	2	

11.	Practice Event Handling with Swing	2	CO5
12.	Case study on J2EE Concepts like Servlet/Spring frameworks/Struts	2	CO6
	Total Hours	24	

Course Designers

1. Dr.S.Sridevi sridevi@tce.edu
2. M. Manikandakumar mmkit@tce.edu

18IT380	DATA STRUCTURES LAB

Category	L	T	P	Credit
PC	0	0	2	1

Preamble

The course is designed to develop programming skills for writing applications using linear and non-linear data structures. It strengthens the logical reasoning skills of students to solve problems and write efficient algorithms using suitable data structures.

Prerequisite

Basic Programming Skills

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Use suitable array-based linear data structures for a given problem	35%
CO2	Use suitable linked list data structures for a given problem	30%
CO3	Use suitable tree data structures for a given problem	15%
CO4	Use suitable hashing techniques and sets for a given problem	7%
CO5	Experiment with different searching and sorting algorithms using time complexity measures	7%
CO6	Develop solutions for real time applications using suitable linear or non-linear data structures and communication skills by involving in project teams	6%

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5
CO6	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.5, 2.5.1, 3.1.1, 3.2.3, 3.2.4, 4.1.1, 4.5.1,

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	S	M	L		S			S				S	M	M	L
CO2	S	M	L		S			S				S	M	M	L
CO3	S	M	L		S			S				S	M	M	L
CO4	S	M	L		S			S				S	M	M	L
CO5	S	M	L		S			S				S	M	M	L
CO6	S	M	L		S	S	L	S	S	S	M	S	M	S	S

S- Strong; M-Medium; L-Low

Passed in Board of Studies Meeting on 11.05.2019 Approved in58th Academic Council Meeting on 15.06.2019

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	-	-
Understand	10	-
Apply	90	100
Analyze	-	-
Evaluate	-	-
Create	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject/Practical Component/Observation
Perception	-
Set	10
Guided Response	40
Mechanism	50
Complex Overt Responses	-
Adaptation	-
Origination	-

List of Experiments/Activities with CO Mapping

S. No	Topic	No. of Sessions	COs Mapping
1	Implementation of List ADT using array and structures for simple applications	1	CO1
2	Implementation of Matrix ADT using array and pointers for simple applications	1	
3	Implementation of String Algorithms (eg. string matching) for simple applications	1	
4	Implementation of List ADT using Linked List and its applications	1	CO2
5	Implementation of Stack ADT for simple applications i. Two way stack ii. Stack Applications	1	CO1
6	Implementation of Queue ADT, Queue Applications	1	
7	Implementation of Circular Queue ADT, Circular Queue Applications		
8	Implementation of List ADT using Doubly Linked List, Applications	1	CO2
9	Implementation of List ADT using Circular linked list, Applications	1	
10	Implementation of Binary Search Tree ADT	1	CO3
11	Implementation of Binary Heap ADT	1	
12	Implementation of Hashing techniques	1	CO4
13	Performance analysis of searching and sorting algorithms	1	CO5
14	Mini-project Implementation and review		CO6
	Total Sessions	**12**	

Learning Resources

1. GeeksforGeeks - www.geeksforgeeks.org
2. HackerRank - www.hackerrank.com

Course Designers:

1. A.M. Abirami abiramiam.@tce.edu
2. E. Ramanujam erit@tce.edu

18ES390	DESIGN THINKING

Category	L	T	P	Credit
ES	1	-	2	2

Preamble

Design has been defined as a "systematic, intelligent process in which designers generate, evaluate, and specify concepts for devices, systems, or processes whose form and function achieve clients' objectives or users' needs while satisfying a specified set of constraints". Human-centered design is defined as a process and a set of techniques used to create new solutions for the world. Solutions include products, services, environments, organizations, and modes of interaction. The reason this process is called "human-centered" is because it starts with the people we are designing for. This course facilitates the development of students' professional skills through their team engagement in developing conceptual design for a local community problem.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Identify a specific social need to be addressed	20
CO2	Identify stakeholder's requirements for the societal project	20
CO3	Develop measurable criteria in which design concepts can be evaluated	10
CO4	Develop prototypes of multiple concepts using user's feedback	30
CO5	Select the best design solution among the potential solutions with its functional decomposition	20

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1.1, 3.1.2, 3.2.3, 3.2.6, 4.1.2
CO2	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1.2, 2.5.1, 2.5.2, 3.1.2, 3.2.3, 3.2.6, 4.1.2
CO3	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1.3, 3.1.2, 3.2.3, 3.2.6, 4.1.2, 4.3.1
CO4	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1.4, 3.1.2, 3.2.3, 3.2.6, 4.1.2, 4.4.1
CO5	TPS5	Evaluate	Organise	Adaptation	1.1, 1.2, 2.1.5, 3.1.2, 3.2.3, 3.2.6, 4.1.2, 4.4.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	-	-	M	M	M	L	M	M	S
CO2	S	M	L	-	-	M	M	M	L	M	M	S
CO3	S	M	L	-	-	M	M	M	L	M	M	S
CO4	S	M	L	-	M	M	M	M	L	M	M	S
CO5	S	S	M	L	M	M	M	M	L	M	M	S

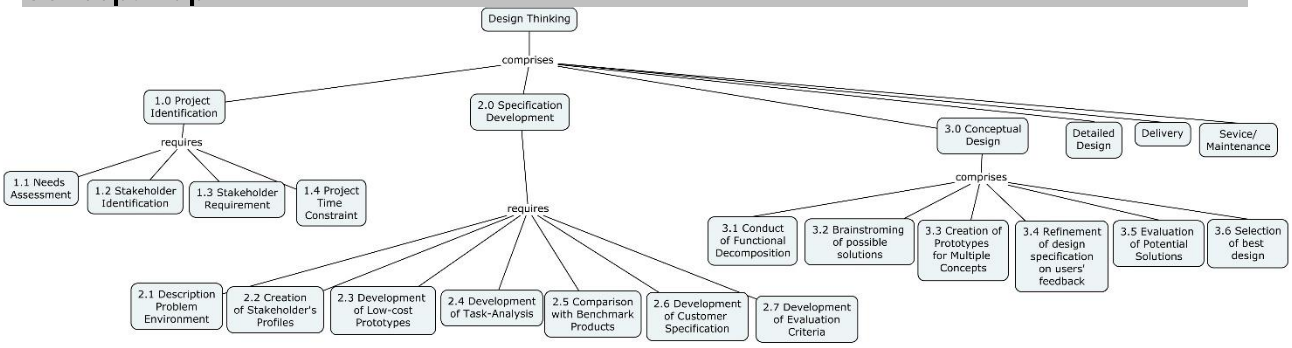
S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Phases	Deliverables	Marks	Course Outcomes
Continuous Assessment			
Review 1 – Problem Identification	Technical Report	10	CO1 and CO2
Review 2 – Specification Development	Technical Report	20	CO3
Review 3 -Conceptual Design	Technical Report	20	CO4 and CO5
End-Semester Examination			
Demonstration	Prototype	60	CO1, CO2, CO3, CO4 and CO5
Poster Presentation	Poster	40	

- Reports are to be submitted at each review. The report and presentation will be evaluated based on Rubrics
- Demonstration and Poster presentation will be evaluated by two faculty members nominated by their respective Head of the Department.

Concept Map



Syllabus

1.0 Project Identification: Needs Assessment, Stakeholder Identification, Stakeholder Requirement Project Time Constraint.

2.0 Specification Development: Description Problem Environment, Creation of Stakeholder's Profiles Development of Low-cost Prototypes, Development of Task-Analysis, Comparison with Benchmark Products, Development of Customer Specification, Development of Evaluation Criteria,

3.0 Conceptual Design: Conduct of Functional Decomposition, Brainstroming of possible solutions, Creation of Prototypes for Multiple Concepts, Refinement of Design Specification on users' feedback, Evaluation of Potential Solutions, Selection of best design

Learning Resources

1. Learning Material prepared by TCE faculty members
2. https://www.ideo.com/
3. https://engineering.purdue.edu/EPICS

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours		Course Outcome
		In-Class	Hands-on	
1.	**Project Identification**: Introduction to Human-Centered Design	1	-	CO1
1.1	Needs Assessment	1	2	CO1
1.2	Identification of Stakeholders	1	2	CO2
1.3	Identification of Stakeholder Requirements		2	CO2
1.4	Project Time Constraint	1	2	CO2
2.	**Specification Development**			
2.1	Description Problem Environment	1	2	CO3
2.2	Creation of Stakeholder's Profiles		2	CO3
2.3	Development of Low-cost Prototypes	1	2	CO3
2.4	Development of Task-Analysis	1	2	CO3
2.5	Comparison with Benchmark Products	1	2	CO3
2.6	Development of Customer Specification		2	CO3
2.7	Development of Evaluation Criteria	1	2	CO3
3.	**Conceptual Design**			
3.1	Conduct of Functional Decomposition	1	2	CO4
3.2	Brainstroming of possible solutions	1	2	CO5
3.3	Creation of Prototypes for Multiple Concepts	1	2	CO5
3.4	Refinement of design Specification on users' feedback		2	CO6
3.5	Evaluation of Potential Solutions	1	2	CO6
3.6	Selection of best design		2	CO6
	Total	12	34	

Course Designers:

1. Dr.S.J.Thiruvengadam sjtece@tce.edu
2. Dr.S.Saravana Perumaal sspmech@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH. INFORMATION TECHNOLOGY DEGREE PROGRAMME

FOURTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A GOVERNMENT AIDED ISO 9001:2008 CERTIFIED
AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY)
MADURAI – 625 015, TAMILNADU

PHONE: 0452 – 2482240, 41
FAX: 0452 2483427
WEB: WWW.TCE.EDU

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2018-19 onwards)

FOURTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
18IT410	Probability and Statistics	BS	3	-	-	3
18IT420	Algorithm Design Principles	PC	3	-	-	3
18IT430	Computer Networks	PC	3	-	-	3
18IT440	Database Management Systems	PC	3	-	-	3
18IT490	Project Management	HSS	3	-	-	3
18YYFX0	Foundation Elective I	FE	3	-	-	3
THEORY CUM PRACTICAL						
18EG460	Professional Communication	HSS	-	1	2	2
PRACTICAL						
18IT470	Computer Networks Lab.	PC	-	-	2	1
18IT480	Database Management Systems Lab	PC	-	-	2	1
AUDIT COURSE						
18CHAB0	Constitution of India	AC	1	-	-	-
Total			**19**	**1**	**6**	**22**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
1 Hour Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

Scheme of Examinations
(For the candidates admitted from 2018-19 onwards)

FOURTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	18IT410	Probability and Statistics	3	50	50	100	25	50
2	18IT420	Algorithm Design Principles	3	50	50	100	25	50
3	18IT430	Computer Networks	3	50	50	100	25	50
4	18IT440	Database Management Systems	3	50	50	100	25	50
5	18IT490	Project Management	3	50	50	100	25	50
6	18YYFX0	Foundation Elective I	3	50	50	100	25	50
THEORY CUM PRACTICAL								
7	18EG460	Professional Communication	3	50	50	100	25	50
PRACTICAL								
8	18IT470	Computer Networks Lab.	3	50	50	100	25	50
9	18IT480	Database Management	3	50	50	100	25	50
AUDIT COURSES								

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** Terminal Examination will be conducted for maximum marks of 100 and subsequently be reduced to 50 marks for the award of terminal examination marks

18IT410	PROBABILITY AND STATISTICS

Category	L	T	P	Credit
BS	3	0	0	3

Preamble

The main objective of this course is to provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modelling, climate prediction and computer networks etc.
Statistical methods are important tools which provide the engineers with both descriptive and analytical methods for dealing with the variability in observed data. It introduces students to cognitive learning in statistics and develops skills on analyzing the data by using different tests and designing the experiments with several factors.

Prerequisite

Higher secondary level -probability theory.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	**Understand** and interpret mathematical expectation, conditional probability and probability mass/density functions.	10
CO2	**Apply** the basic rules and theorems of probability theory to determine probabilities that help to solve engineering problems.	20
CO3	**Compute** and interpret the correlation and regression coefficients that arise in engineering problems	20
CO4	**Identify** the scopes of sampling theory in engineering problems	10
CO5	**Apply** the concepts of large/small sample tests into real life problems.	20
CO6	**Identify** the appropriate non parametric hypothesis testing procedure based on type of outcome variable and number of samples	20

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	-	1.1.1, 2.1.1
CO2	TPS3	Apply	Value	-	1.1.1, 2.1.1, 2.1.5
CO3	TPS3	Apply	Value	-	1.1.1, 1.2, 2.1.1, 2.1.5
CO4	TPS2	Understand	Respond	-	1.1.1, 2.1.1
CO5	TPS3	Apply	Value	-	1.1.1, 1.2, 2.1.1, 2.1.5
CO6	TPS3	Apply	Value	-	1.1.1, 1.2, 2.1.1, 2.1.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	M	M	-	-	-	-	M	-	-	M			S
CO2	S	S	S	S	-	-	-	-	M	-	-	M			S
CO3	S	S	S	S	-	-	-	-	-	-	-	M			S
CO4	S	S	S	S	-	-	-	-	-	-	-	M			S
CO5	S	S	S	S	-	-	-	-	-	-	-	M			S
CO6	S	S	S	S	-	-	-	-	-	-	-	M			S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	10	10	10	-	-	-	10
Understand	30	30	30	50	50	50	20
Apply	60	60	60	50	50	50	70
Analyse							
Evaluate							
Create							

Sample Questions for Course Outcome Assessment**

Course Outcome 1(CO1):

1. An individual has 3 different email accounts. Most of her messages, in fact 70%, come nto account #1, whereas 20% come into account #2 and the remaining 10% into account #3. Of the messages into account #1, only 1% are spam, whereas the corresponding percentages for accounts #2 and #3 are 2% and 5%, respectively. What is the probability that a randomly selected message is spam?

2. A store carries flash drives with either 1 GB, 2 GB, 4 GB, 8 GB, or 16 GB of memory. The accompanying table gives the distribution of *Y* = the amount of memory in a purchased drive:

y	1	2	4	8	16
$p(y)$	.05	.10	.35	.40	.10

Determine the Cumulative Distribution function F (y).

Course Outcome 2(CO2):

1. A particular telephone number is used to receive both voice calls and fax messages. Suppose that 25% of the incoming calls involve fax messages, and consider a sample of 25 incoming calls. What is the probability that
a. At most 6 of the calls involve a fax message?
b. Exactly 6 of the calls involve a fax message?
c. At least 6 of the calls involve a fax message?
d. More than 6 of the calls involve a fax message?

2. A soft-drink machine is regulated so that it discharges an average of 200 milliliters per cup. If the amount of drink is normally distributed with a standard deviation equal to 15 milliliters,
(a) what fraction of the cups will contain more than 224 milliliters?
(b) what is the probability that a cup contains between 191 and 209 milliliters?
(c) how many cups will probably overflow if 230-milliliter cups are used for the next 1000 drinks?
(d) below what value do we get the smallest 25% of the drinks?

Course Outcome 3(CO3):

1. Suppose we have a linear equation through the origin. Estimate the regression line passing through the origin for the following data.

x	0.5	1.5	3.2	4.2	5.1	6.5
y	1.3	3.4	6.7	8.0	10.0	13.2

Suppose it is not known whether the true regression should pass through the origin. Estimate the regression line.

2. A study was done on a diesel-powered light-duty pickup truck to see if humidity, air temperature, and barometric pressure influence emission of nitrous oxide (in ppm). Emission measurements were taken at different times, with varying experimental conditions. The data are given in Table 12.2. The model is *yi* = *β*0 + *β*1*x*1*i* + *β*2*x*2*i* + *β*3*x*3*i* + *_i, i*= 1*,* 2*, . . . ,* 20*.* Fit this multiple linear regression model to the given data and then estimate the amount of nitrous oxide emitted for the conditions where humidity is 50%, temperature is 76◦F, and barometric pressure is 29.30.

Nitrous Oxide, y	Humidity, x_1	Temp., x_2	Pressure, x_3	Nitrous Oxide, y	Humidity, x_1	Temp., x_2	Pressure, x_3
0.90	72.4	76.3	29.18	1.07	23.2	76.8	29.38
0.91	41.6	70.3	29.35	0.94	47.4	86.6	29.35
0.96	34.3	77.1	29.24	1.10	31.5	76.9	29.63
0.89	35.1	68.0	29.27	1.10	10.6	86.3	29.56
1.00	10.7	79.0	29.78	1.10	11.2	86.0	29.48
1.10	12.9	67.4	29.39	0.91	73.3	76.3	29.40
1.15	8.3	66.8	29.69	0.87	75.4	77.9	29.28
1.03	20.1	76.9	29.48	0.78	96.6	78.7	29.29
0.77	72.2	77.7	29.09	0.82	107.4	86.8	29.03
1.07	24.0	67.7	29.60	0.95	54.9	70.9	29.37

Course Outcome 4 (CO4):

1. Many older homes have electrical systems that use fuses rather than circuit breakers. A manufacturer of 40-amp fuses wants to make sure that the mean amperage at which its fuses burn out is in fact 40. If the mean amperage is lower than 40, customers will complain because the fuses require replacement too often. If the mean amperage is higher than 40, the manufacturer might be liable for damage to an electrical system due to fuse malfunction. To verify the amperage of the fuses, a sample of fuses is to be selected and inspected. If a hypothesis test were to be performed on the resulting data, what null and alternative hypotheses would be of interest to the manufacturer? Describe type I and type II errors in the context of this problem situation.

2. Water samples are taken from water used for cooling as it is being discharged from a power plant into a river. It has been determined that as long as the mean temperature of the discharged water is at most 150°F, there will be no negative effects on the river's cosystem. To investigate whether the plant is in compliance with regulations that prohibit a mean discharge water temperature above 150°, 50 water samples will be taken at randomly selected times and the temperature of each sample recorded. The resulting data will be used to test the hypotheses that mean temperature is 150^0 versus mean temperature exceeds 150^0. . In the context of this situation, describe type I and type II errors. Which type of error would you consider more serious? Explain.

Course Outcome 5 (CO5):

1. Lightbulbs of a certain type are advertised as having an average lifetime of 750 hours. The price of these bulbs is very favorable, so a potential customer has decided to go ahead with a purchase arrangement unless it can be conclusively demonstrated that the true average lifetime is smaller than what is advertised. A random sample of 50 bulbs was selected, the lifetime of each bulb determined, and the appropriate hypotheses were tested using Minitab, resulting in the accompanying output.

Variable	N	Mean	StDev	SEMean	Z	P-Value
lifetime	50	738.44	38.20	5.40	−2.14	0.016

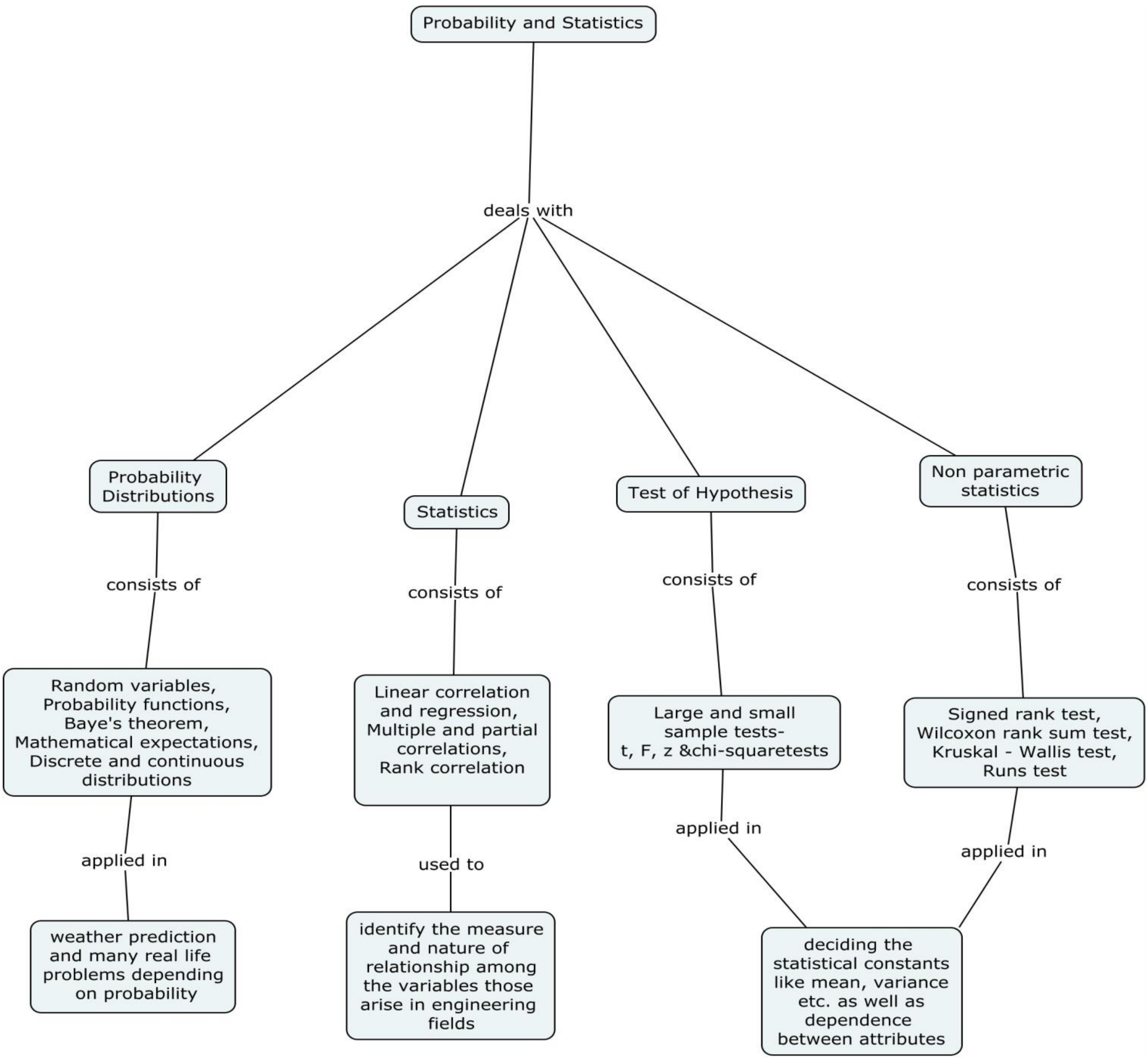
What conclusion would be appropriate for a significance level of .05? A significance level of .01? What significance level and conclusion would you recommend?

2. A random sample of 150 recent donations at a certain blood bank reveals that 82 were type A blood. Does this suggest that the actual percentage of type A donations differs from 40%, the percentage of the population having type A blood? Carry out a test of the appropriate hypotheses using a significance level of .01. Would your conclusion have been different if a significance level of .05 had been used?

Course Outcome 6(CO6):

1. A cigarette manufacturer claims that the tar content of brand B cigarettes is lower than that of brand A cigarettes. To test this claim, the following determinations of tar content, in milligrams, were recorded: Brand A 1 12 9 13 11 14 Brand B 8 10 7 Use the rank-sum test with $\alpha = 0.05$ to test whether the claim is valid.
2. A machine dispenses acrylic paint thinner into containers. Would you say that the amount of paint thinner being dispensed by this machine varies randomly if the contents of the next 15 containers are measured and found to be 3.6, 3.9, 4.1, 3.6, 3.8, 3.7, 3.4, 4.0, 3.8, 4.1, 3.9, 4.0, 3.8, 4.2, and 4.1 liters? Use a 0.1 level of significance.

Concept Map



Syllabus

PROBABILITY DISTRIBUTIONS Conditional probability -Bayes' theorem- Random variables - discrete and continuous random variables - mathematical expectation - Probability mass and density functions - discrete distributions: Binomial, Poisson -continuous distributions: uniform, exponential, Weibull and normal
STATISTICS Linear correlation and regression-Rank correlation-Multiple and partial correlations-
TEST OF HYPOTHESIS Large and small sample tests, Test for (i)Proportion (ii) Mean (iii) Variance and (iv) Difference between two proportions, Means and variances in large and small samples, Tests of normality, Applications of chi-square, 't', 'F' distributions for test of hypothesis
NON PARAMETRIC STATISTICS Introduction- Signed rank test - Wilcoxon rank sum test - Kruskal Wallis test - Runs test

Learning Resources

1. Jay L. Devore, "Probability and Statistics for Engineering and the Sciences", 8th Edition, Cengage Learning India Pvt Ltd, New Delhi, 2012.
2. Ronald E. Walpole, Sharon L. Myers, Keying Ye, "Probability & Statistics for Engineers and Scientists", 9th Edition, Pearson Education, New Delhi, 2012.
3. Mendenhall William, "Introduction to Probability and Statistics", 14th Edition, Duxbury Press, New Delhi, 2012.
4. John A. Gubner, "Probability and Random Processes for Electrical and Computer Engineers, 1st edition, Cambridge University Press, UK, (1 June 2006)
5. Richard A. Johnson, Irwin Miller, John Freund, "Miller & Freund's Probability and Statistics for Engineers", 8th Edition, Pearson, 2015

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**PROBABILITY DISTRIBUTIONS**		
1.1	Conditional probability -Bayes' theorem	1	CO1
1.2	Random variables - discrete and continuous random variables	1	CO1
1.3.	mathematical expectation - Probability mass and density functions	2	CO1
1.4	discrete distributions: Binomial, Poisson	2	CO2
1.5	continuous distributions: uniform, exponential,	2	CO2
1.6	Weibull and normal distributions	2	CO2
2.	**STATISTICS**		
2.1	Linear correlation and regression	2	CO3
2.2	Rank correlation	2	CO3
2.3	Multiple correlation	2	CO3
2.4	Partial correlation	2	CO3
3.	**TEST OF HYPOTHESIS**		
3.1	Introduction to sampling theory	1	CO4
3.2	Large sample tests, Test for (i)Proportion (ii) Mean and (iii) Difference between two proportions and means	3	CO5
3.3	Small sample tests for mean, variance and Difference between means	3	CO5
3.4	Chi-square tests and applications of it	3	CO5
4.	**NON - PARAMETRIC STATISTICS**		
4.1	Introduction	1	CO6
4.2	Signed rank test	2	CO6
4.3	Wilcoxon rank sum test	2	CO6
4.4	Kruskal - Wallis test	2	CO6
4.5	Runs test	1	CO6
	Total Lecture Hours	36	

Course Designers:

1. Dr.M. Kameswari mkmat@tce.edu
2. Dr.T. Lakshmi tlakshmimdu@tce.edu
3. Mr.AR. Murugan armmat@tce.edu

			Category	L	T	P	Credit
18IT420	**Algorithm Design Principles**		PC	3	-	-	3

Preamble

This course aims at explaining how to identify, formulate and solve real world engineering problems that require usage of algorithms with emphasis on design and analysis based on asymptotic notations. Upon completion of this course, they will be able to constructing efficient algorithms for solving engineering problems by using various algorithm design paradigms and data structures.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Analyze the best case, worst case and average case running time of algorithms using Asymptotic notation.	11
CO2	Identify the appropriateness of brute force approach for the problems like sorting, searchingetc.	11
CO3	Develop algorithms to solve computational problems using design paradigms like divide and conquer, greedy and dynamic programming.	42
CO4	Construct algorithms using design paradigms like Backtracking and branch and bound for a given problem.	17
CO5	Make use ofthe complexity classes like NP-Complete, NP-hard and develop polynomial reductions for the real world problems	11
CO6	Examine the appropriate design scenario and algorithmic design paradigms based on the application requirements.	8

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS4	Analyse	Organise	Complex Overt Responses	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.4.1, 4.5.1, 4.5.3, 4.5.5
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.3.1, 2.3.2
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO5	TPS4	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO6	TPS3	Analyse	Organise	Complex Overt Responses	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.4.1, 4.5.1, 4.5.3, 4.5.5

Mapping with Programme Outcomesand Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PSO 3
CO1	S	S	M	L								L	S		L
CO2	S	M	L									L	M		L
CO3	S	M	L									L	M		L
CO4	S	M	L					L	L	L	L	L	M		L
CO5	S	M	L					L	L	L	L	L	M		L
CO6	S	S	M	L	L			M	M	M	L	L	S	L	M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	**10**	**-**	**10**	-	-	-	**10**
Understand	**20**	**20**	**20**	-	-	-	**20**
Apply	**40**	**60**	**50**	50	50	50	**50**
Analyse	**30**	**20**	**20**	50	50	50	**20**
Evaluate							
Create							

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	
Guided Response	10
Mechanism	60
Complex Overt Responses	30
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

** (2 to 3 at the cognitive level of course outcome)

Course Outcome1(CO1):

1. Illustrate the fundamental steps for analyzing the given problem in detail.
2. Evaluate 1+2+3+...n. Find out the basic operation and it's efficiency.
3. Analyze the Selection sort in best, worst and average cases.
4. Apply the step-counting to compute the time-complexity of the given code snippet:

```
   For ( j=2; j<n-1; j++)
  {
      If mod(n,j)==0;
      Then output n is a prime;
}
 Else
```

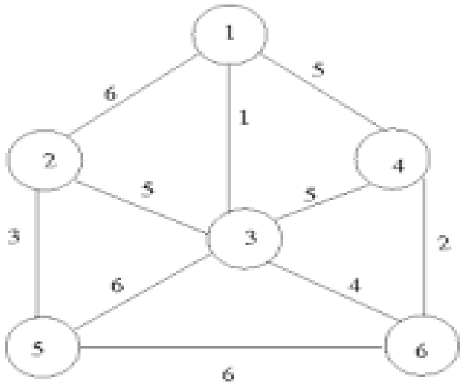
Output n is not a prime;
}

Course Outcome2(CO2):

1. Illustrate the fundamental steps for analyzing the given problem in detail.
2. Discuss in detail the empirical framework of analysis.
3. Analyze the Brute force approach for selection sort, Bubble sort and String Matching algorithms.

Course Outcome3(CO3):

1. Explain in detail the prim's algorithm for a given example



2. Build the Huffman tree construction for the given scenario. Consider the five-character alphabet {A,B,C,D,_} with the following occurrence probabilities

Character	A	B	C	D	_
Probability	0.35	0.1	0.2	0.2	0.15

3. Apply the working principle of Kruskal's algorithm for constructing a minimum spanning tree for the above example and compute its complexity

Course Outcome 4 (CO4):

1. Solve the following instance of the knapsack problem by the branch-and-bound algorithm (Capacity of knapsack = 16)

Item	Weight	Value
1	10	$100
2	7	$63
3	8	$56
4	4	$12

2. Solve n-queens problem using appropriate algorithm design paradigms.
3. Find the solution for assignment problem using branch and bound technique

Course Outcome 5 (CO5):

1. Interpret the m-coloring graph from 3-SAT using NP-hard analysis.
2. Let X be an NPComplete problem. Consider a decision problem Z Є NP such that X Z. Then defend that Z is also NPComplete
3. Let HAMD denote the problem of deciding whether a graph G<N, A> is Hamiltonian and let TSPD denote the problem of deciding whether or not there is a tour in the graph G

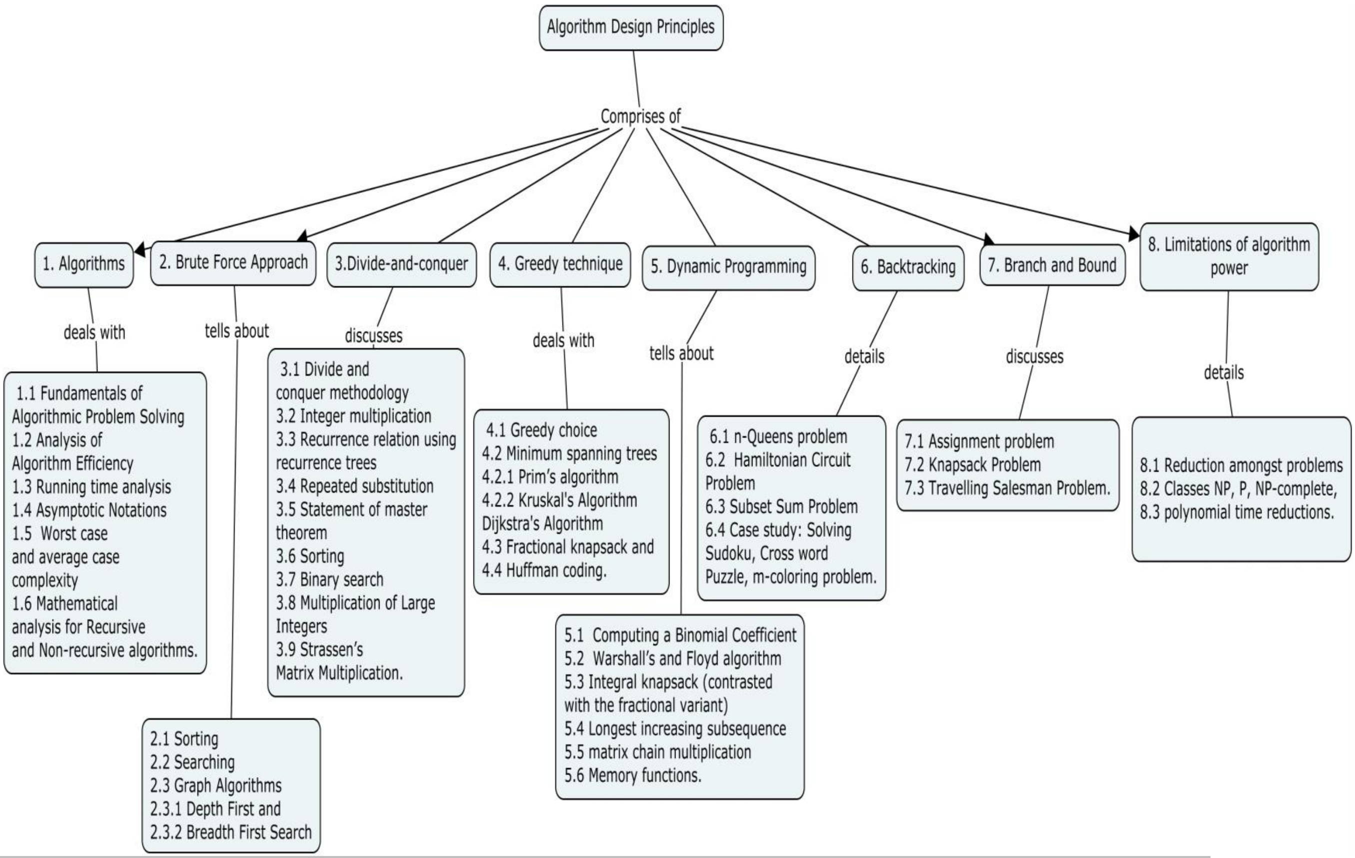
thatbegins and ends at the same node; after having visited each of the other nodes exactly once and whose total cost does not exceed a givenbound L. Translate a HAMD problem instance into a TSPD problem instance.

Course Outcome6(CO6):

Extensive analysis on algorithms is done through assignments/Mini Project is a principal activity of this course. It is assessed using standard rubrics. These assignments will focus on developing skills that are immediately transferrable to building real-world systems. Some of the mini project problems are listed below [but not limited to]:

1. Banks often record transactions on an account in order of the times of the transactions, but many people like to receive their bank statements with checks listed in order by check number. People usually write checks in order by check number, and merchants usually cash them with reasonable dispatch. The problem of converting time-of-transaction ordering to check -number ordering is therefore the problem of sorting almost -sorted input. Analyze whether the procedure Insertion- sort would tend to beat the procedure Quick – sort on this problem.
2. We have a set of n jobs to execute, each of which takes unit time. At any time T = 1,2,... we can execute exactly one job. Job i earns us a profit gi> 0 if and only if it is executed no later than time di. Solve this schedulingproblem and by identifying appropriate design paradigms.
3. A Jeroo starts at (0, 0) facing East with no flowers in its pouch. There is a flower at location (3, 0). Write a program that directs the Jeroo to pick the flower and plant it at location (3, 2). After planting the flower, the Jeroo should hop one space East and stop. There are no other nets, flowers, or Jeroos on the island.

Concept Map



Syllabus

Algorithms: Fundamentals of Algorithmic Problem Solving – Analysis of Algorithm Efficiency – Running time analysis - Asymptotic Notations - Worst case and average case complexity - Mathematical analysis for Recursive and Non-recursive algorithms.

Bruteforce Approach: Sorting – Searching - Graph Algorithms: Depth First and Breadth First Search

Divide-and-conquer: Divide and conquer methodology - Integer multiplication - Recurrence relation using recurrence trees - repeated substitution - statement of master theorem – Sorting– Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication.

Greedy technique: Greedy choice - minimum spanning trees - Prim's algorithm- Kruskal's Algorithm-Dijkstra's Algorithm- fractional knapsack and Huffman coding.

Dynamic programming: Computing a Binomial Coefficient – Warshall's and Floyd algorithm – Integral knapsack (contrasted with the fractional variant) - longest increasing subsequence - matrix chain multiplication- Memory functions.

Backtracking: n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem - Case study: Solving Sudoku, Cross word Puzzle, m-coloring problem.

Branch and bound: Assignment problem – Knapsack Problem – Travelling Salesman Problem.

Limitations of algorithm power:NP-completeness: reduction amongst problems, classes NP, P, NP-complete, and polynomial time reductions.

Learning Resources

1. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI Learning Private Limited, Third Edition, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
4. Design And Analysis of Algorithms -http://nptel.ac.in/courses/106101060/
5. Design And Analysis of Algorithms -https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Algorithms (5)**		
1.1	Fundamentals of Algorithmic Problem Solving	1	CO1
1.2	Analysis of Algorithm Efficiency – Running time analysis	2	CO1,CO6
1.3	Asymptotic Notations - Worst case and average case complexity	1	CO1
1.4	Mathematical analysis for Recursive and Non-recursive algorithms	1	CO1
2	**Brute Force Approach(4)**		
2.1	Sorting	2	CO2
2.2	Searching		
2.3	Breadth First Search	1	
2.4	Depth First Search	1	
3	**Divide-and-conquer (6)**		
3.1	Recurrence relation using recurrence trees - repeated substitution	1	CO3
3.2	Master theorem	1	
3.3	Merge sort - Quick sort	1	
3.4	Binary search	1	
3.5	Multiplication of Large Integers	2	
3.6	Strassen's Matrix Multiplication.		
4	**Greedy technique(4)**		
4.1	Greedy choice	2	
4.2	Minimum spanning trees - Prim's algorithm, Kruskal's Algorithm		
4.3	Dijkstra's Algorithm	1	
4.4	Fractional knapsack and Huffman coding	1	
5	**Dynamic programming(6)**		
5.1	Computing a Binomial Coefficient	1	
5.2	Warshall's and Floyd algorithm	1	
5.3	Integral knapsack (contrasted with the fractional variant)	1	
5.4	Longest increasing subsequence	1	
5.5	Matrix chain multiplication, Memory functions	1	
	Case study on Greedy and Dynamic programming techniques	1	CO6
6	**Backtracking (4)**		
6.1	n-Queens problem	1	CO4
6.2	Hamiltonian Circuit Problem	1	
6.3	Subset Sum Problem	1	
6.4	Case study: Solving Sudoku, Cross word Puzzle, m-colouring problem	1	CO6

7	**Branch and bound (3)**		
7.1	Assignment problem	1	
7.2	Knapsack Problem	1	
7.3	Travelling Salesman Problem	1	
8	**Limitations of algorithm power (4)**		
8.1	NP-completeness: reduction amongst problems	1	CO5
8.2	Classes NP, P, NP-complete	2	
8.3	Polynomial time reductions	1	
	Total Lecture hours	36	

Course Designers:

1. Dr.S.Padmavathi spmcse@tce.edu
2. Mrs.T.Manju tmanju@tce.edu

18IT430	COMPUTER NETWORKS

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

This course will help the students to gain knowledge in Networking concepts, Models, technologies and protocols. This course further provides introduction to Socket Programming, Network Simulation and packet analysis.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Describe various Network components, topologies, reference models and technologies	20
CO2	Experiment Flow control, Error control and Access control techniques at layer 2	30
CO3	Apply Subnetting and routing mechanisms for a given network	30
CO4	Explain the working principle of End-to-End and application layer protocols	10
CO5	Compare the needs and implementation architectures of peer to peer, Client server and Cloud Networks	5
CO6	Examine the Performance metrics of a specific Network traffic using tools such as Wireshark	5

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2, 2.3.1
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.5, 2.2.2, 2.3.1, 2.3.4
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.1.5, 2.3.1
CO4	TPS2	Understand	Respond	Guided Response	1.2, 2.1.5, 2.3.1
CO5	TPS2	Understand	Respond	Guided Response	1.2, 2.2.2, 2.3.1
CO6	TPS3	Apply	Value	Mechanism	1.2, 2.1.5, 2.2.3, 2.3.4, 3.1.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L								L			L		
CO2	S	M	L							L			M		
CO3	S	M	L							L			M		
CO4	M	L								L			L		
CO5	M	L								L			L		
CO6	S	M	L	L	S			L	L	L		L	S	M	L

S- Strong; M-Medium; L-Low

Passed in Board of Studies Meeting on 11.05.2019 Approved in 58th Academic Council Meeting on 15.06.2019

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	20	30	20	0	20
Understand	20	30	20	50	40	20	20
Apply	60	50	60	20	40	80	60
Analyse	0	0	0	0	0	0	0
Evaluate	0	0	0	0	0	0	0
Create	0	0	0	0	0	0	0

CO6 may also be evaluated using practical exercises/assignments/mini-project.
Assignments may include exercises such as

- capturing network traffic using Wireshark
- inspecting the packet capture details
- Filtering packets using precise filter such as hostnames and protocols
- Capturing and inspecting streams
- Sniffing passwords

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Assignment/Practical Component
Perception	0
Set	20
Guided Response	60
Mechanism	20
Complex Overt Responses	0
Adaptation	0
Origination	0

Sample Questions for Course Outcome Assessment**

Course Outcome 1(CO1):

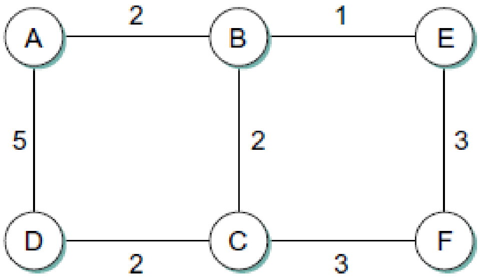
1. Mention the physical devices operating at various layers of TCP/IP protocol Suite.
2. Distinguish between LAN and WAN.
3. Recall the functionalities of all layers in OSI architecture

Course Outcome 2(CO2):

1. Explain the scheme prescribed in Ethernet for collision Detection
2. Suppose we want to transmit the message 11001001 and protect it from errors using the CRC polynomial x^3+1. Use polynomial long division to determine the message that should be transmitted
3. Draw a timeline diagram for the sliding window algorithm with SWS = RWS = 3 frames, for the following two situations. Use a timeout interval of about 2×RTT.
   (i) Frame 4 is lost. (ii) Frames 4 to 6 are lost

Course Outcome 3(CO3):

1. For the network given in below demonstrate how the link-state algorithm builds routing table for node D.



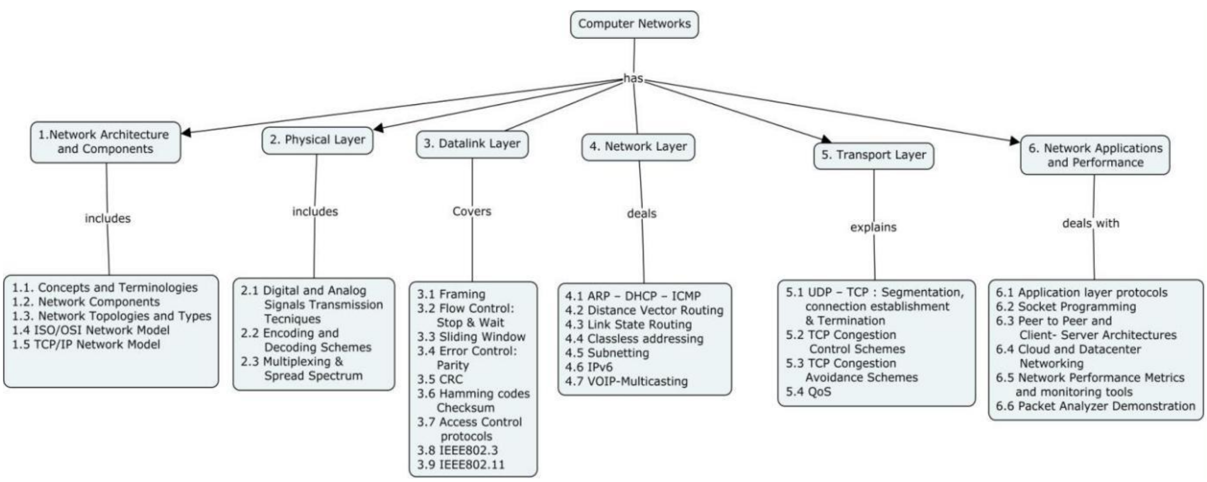
2. An ISP is granted a block of addresses starting with 120.60.4.0/22. The ISP wants to distribute these blocks to 100 organizations with each organization receiving just eight addresses. Design the subblocks and give the slash notation for each subblock. Find out how many addresses are still available after these allocations.
3. Distinguish Classful Addressing and Classless Addressing

Course Outcome 4 (CO4):
1. Explain how the Network layer and Transport layer complements each other's functionalities. And bring out the dependencies between the two
2. Demonstrate a congestion avoidance technique based on queue length monitoring
3. Compare various email protocols like SMTP, IMAP and POP and Outline When it is appropriate each

Course Outcome 5 (CO5):
1. Distinguish between Peer-to-peer and Client-Server application architectures
2. Illustrate the Network architecture for cloud
3. Describe Network virtualization

Course Outcome 6(CO6):
1. Write the procedure to perform password sniffing using Wireshark.
2. Enlist any four tools used for Network monitoring and network management.
3. Demonstrate the necessary steps to capture traffic directed to a specific host using wireshark

Concept Map



Syllabus

Network Architecture and Components – Terminologies-components: NIC, Switches, Routers, Bridges, Hub -Topologies-ISO/OSI Architecture – Internet Architecture

Physical Layer – Digital and Analog Signals, Encoding and Decoding, Analog and Digital data Transmission techniques , Multiplexing, Spread spectrum

Datalink Layer – Framing- Flow Control : Stop and Wait, Sliding Window – Error Control : Parity, Hamming codes, CRC, Access Control : ALOHA, CSMA, CSMA-CD, CSMA-CA, Reservation, Polling – IEEE 802.3 – IEEE 802.11

Internetworking – IPv4 – Global Addresses – ARP – DHCP – ICMP – Routing – Intra domain Routing algorithms (RIP, OSPF) – Subnetting – Classless Addressing – Interdomain routing – Ipv6 – Multicasting – VoIP

Transport Layer – UDP – TCP : Segmentation, connection establishment & Termination, Congestion control – Congestion Avoidance - QoS

Network Performance and Applications – HTTP,WWW, SMTP, IMAP,POP,DNS, FTP – Sockets – Peer to Peer and Client- Server Architectures - Cloud and Datacenter Networking –Network Performance Metrics and Analysis

Learning Resources

1. Larry L.Peterson and Bruce S. Davie, “Computer Networks – A systems Approach” Fifth Edition, Elsevier, 2011
2. BehrouzA.Foruzan, “Data Communication and Networking”, McGraw Hill Education, Fifth Edition, 2017
3. NPTEL Course on Computer Networks by IIT-Kharagpur - http://nptel.ac.in/video.php?subjectId=106105081
4. Cisco network fundamentals - http://ptgmedia.pearsoncmg.com/images/9781587132087/samplepages/1587132087.pdf

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	COs
1	**Network Architecture and Components**		
1.1	Network concepts and Terminologies	1	CO1
1.2	Components of Computer Networks	1	CO1
1.3	Network Types and Topologies	1	CO1
1.4	ISO/OSI Reference Model	1	CO1
1.5	TCP/IP Network Model	1	CO1
2	**Physical Layer**		
2.1	Digital and Analog signals, Transmission Techniques	1	CO1
2.2	Encoding and Decoding Schemes	1	CO1
2.3	Multiplexing and Spread spectrum	1	CO1
3	**Datalink Layer**		
3.1	Framing	1	CO2
3.2	Flow Control : Stop and Wait	1	CO2
3.3	Sliding Window technique	1	CO2
3.4	Error Control : Parity	1	CO2
3.5	Cyclic Redundancy Check	1	CO2

3.6	Hamming Codes, Checksum	1	CO2
3.7	Access Control Protocols	1	CO2
3.8	IEEE 802.3	1	CO2
3.9	IEEE 802.11	1	CO2
4	**Network Layer**		
4.1	ARP – DHCP – ICMP	1	CO3
4.2	Distance Vector Routing	1	CO3
4.3	Link State Routing	1	CO3
4.4	Classless addressing	1	CO3
4.5	Subnetting	1	CO3
4.6	IPv6	1	CO3
4.7	VOIP-Multicasting	1	CO3
5	**Transport Layer**		
5.1	UDP – TCP : Segmentation, connection establishment & Termination	1	CO4
5.2	TCP Congestion Control Schemes	1	CO4
5.3	TCP Congestion avoidance Schemes	1	CO4
5.4	QoS	1	CO4
6	**Network Performance and Applications**		
6.1	Application layer protocols	2	CO4
6.2	Socket Programming	1	CO5
6.3	Peer to Peer and Client- Server Architectures	1	CO5
6.4	Cloud and Datacenter Networking	2	CO5
6.5	Network Performance Metrics and monitoring tools	1	CO6
6.6	Packet Analyzer Demonstration	1	CO6
	Total Hours	**36**	

Course Designers:

1. S.Muthuramalingam smrit@tce.edu
2. S.Thiruchadaipandeeswari eshwarimsp@tce.edu

18IT440	DATABASE MANAGEMENT SYSTEMS

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

This course facilitates the student to understand the various functionalities of DBMS and perform many operations related to creating, using and maintaining databases for real world applications and emerging technologies in Databases. It emphasizes the need for design of database systems and provides an in depth coverage of various principles of database systems.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain database architecture and its environment.	14
CO2	Use SQL and PL/SQL to perform various Query operations for a given database designed using different data models.	31
CO3	Design database with appropriate use of normalization techniques	14
CO4	Build database using NoSQL model.	14
CO5	Apply concurrency control and transaction processing techniques for the given scenario.	22
CO6	Explain Temporal and Spatial database.	5

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2,2.3.2,2.3.3
CO2	TPS3	Apply	Value	Mechanism	1.2,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO3	TPS3	Apply	Value	Mechanism	1.2,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO4	TPS3	Apply	Value	Mechanism	1.2,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO5	TPS3	Apply	Value	Mechanism	1.2,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO6	TPS2	Understand	Respond	Guided Response	1.2,2.4.6

Mapping with Programme Outcomesand Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		S			M	M	M		L	M	S	M
CO3	S	M	L										M		
CO4	S	M	L		S			M	M	M		L	M	S	M
CO5	S	M	L									L	M		L
CO6	M	L											L		

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	ContinuousAssessmentTests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	20	20	20	-	-	-	10
Understand	30	30	40	-	-	-	40
Apply	50	50	40	100	100	100	50
Analyse	0	0	0	-	-	-	0
Evaluate	0	0	0	-	-	-	0
Create	0	0	0	-	-	-	0

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	20
Guided Response	40
Mechanism	40
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome1(CO1):

1. Describe database management systems.
2. State the need of a schema.
3. Recall the structure of a DBMS
4. Define a database model? Give any two types of data models with an example for each.
5. Describe the different components of a database systems environment

Course Outcome2(CO2):

1. Write the following queries on the database schema using the relational operators in Relational Algebra. Also show the result of each query as it would apply to the database of relational operations.
   a. Retrieve the names of all employees in department 5 who work more than 10 hours per week on the ProductXproject.
   b. List the names of all employees who have a dependent with the same first name as themselves.

c. Find the names of all employees who are directly supervised by ‗Franklin Wong'.

d. For each project, list the project name and the total hours per week (by all employees) spent on that project.

2. Consider the following relations:Employee (empID , FirstName, LastName, address, DOB,sex,position,deptNo),Department(dtptNo,deptName,mgr,empID),Project(projNo,projName,deptNo), Work on (empID, projNo, hours worked).
3. Writethe SQL statements for the following:

a. List the name and addresses of all employees who work for the IT department.

b. List the total hours worked by each employee, arranged in order of department number and within department, alphabetically by employee surname.

c. List the total number of employees in each department for those departments with more than 10 employees.

d. List the project number, project name and the number of employees who work on that project.

4. A table Employee with the following fields: EmpNo, Name, Designation, salary are maintained in a computer. Write SQL queries for the following.

a. Display the details for all employees.

b. Find average salary paid to employees.

c. Display the details of all employees whose salary fall in the range of Rs.10,000 and Rs.50,000.

5. Identify some of the character, number and date functions available in SQL. List the two functions that allow the user to transform column values regardless of the data type.
6. Illustrate the creation of constraints and their enforcement on views.

Course Outcome3(CO3):

1. Suppose that we have the following requirements for a university database that is used to keep track of students' transcripts:
    a. The university keeps track of each student's name (SNAME); student number (SNUM); social security number (SSN); current address (SCADDR) and phone (SCPHONE); permanent address (SPADDR) and phone (SPPHONE); birth date (BDATE); sex (SEX); class (CLASS) (freshman, sophomore, ..., graduate); major department (MAJORCODE); minor department (MINORCODE) (if any); and degree program (PROG) (B.A., B.S., ..., PH.D.). Both SSSN and student number have unique values for each student.
    b. Each department is described by a name (DNAME), department code (DCODE), office number (DOFFICE), office phone (DPHONE), and college (DCOLLEGE). Both name and code have unique values for each department.
    c. Each course has a course name (CNAME), description (CDESC), course number (CNUM), number of semester hours (CREDIT), level (LEVEL), and offering department (CDEPT). The course number is unique for each course.
    d. Each section has an instructor (INAME), semester (SEMESTER), year (YEAR), course (SECCOURSE), and section number (SECNUM). The section number distinguishes different sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, .up to the total number of sections taught during each semester.

e. A grade record refers to a student (SSN), a particular section, and a grade (GRADE).

2. Prepare a relational database schema for this database application.
3. Then. Specify the key attributes of each relation. Note any unspecified requirements, and make appropriate assumptions to render the specification complete.
4. For the above schema show all the functional dependencies that should hold among the attributes
5. Design relation schemas for the above mentioned database that are each in 3NF or BCNF.

Course Outcome 4(CO4):
1. Explain CAP theorem.
2. Use Cypher query language operation MATCH and RETURN clause to retrieve the locations for department number 5 in Employee database.
3. Apply MongoDB CRUD operations for the Student database.

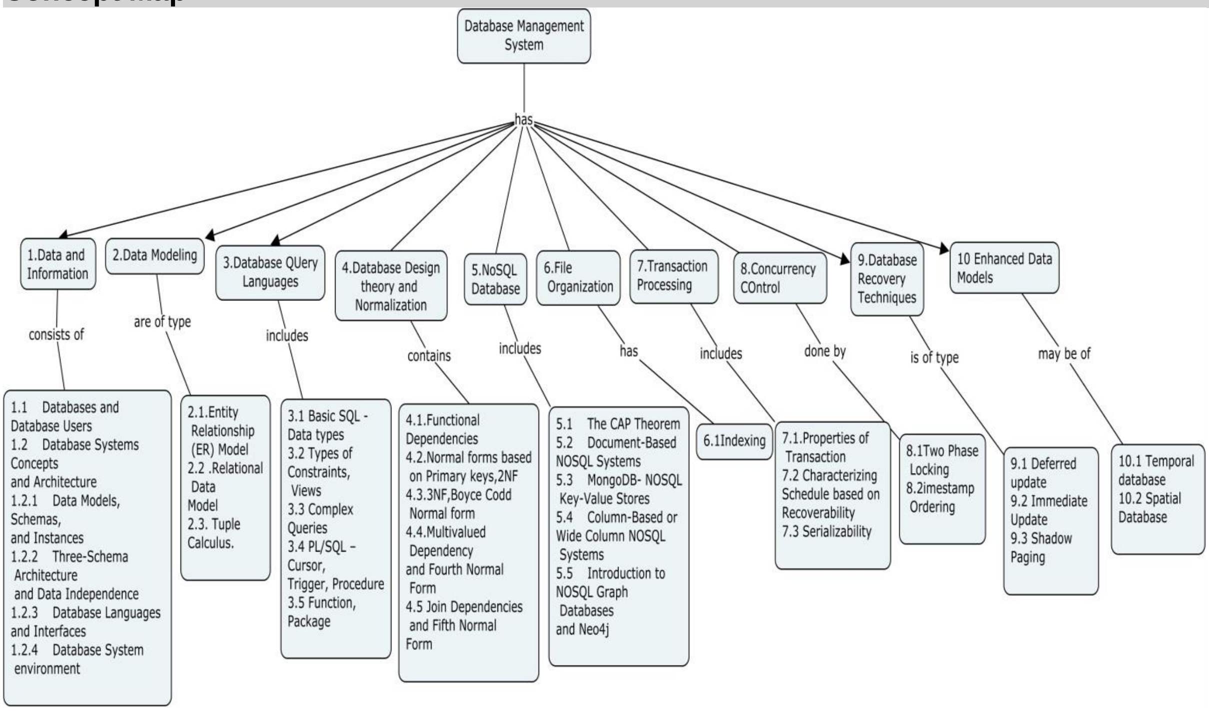
Course Outcome5(CO5):

1. Explain Lost update problem with an example.
2. List the different types of Transaction failures.
3. Describe ACID properties.
4. Expalin Serial, Non-serial, and Conflict-Serializable Schedules.

Course Outcome6(CO6):

1. Explain Spatial Database.
2. List the different data types in Spatial database.
3.Explain Temporal Database with an example.

Concept Map



Syllabus

Data and Information: Databases and Database Users. **Database Systems Concepts and Architecture**-Data models, Schemas and Instances, -Three Schema Architecture and Data Independence-Database Languages and Interfaces-Database System environment

Data Modeling: Entity Relationship (ER) Model, Relational Data Model -The Relational Algebra and Relational Calculus. Tuple Calculus. **Database query language:** Basic SQL-Data types –Types of Constraints,Views Complex Queries. PL/SQL –Cursor, Trigger, Procedure ,Function, Package

Database Design Theory and Normalization: Functional Dependencies-Normal forms based on Primary keys-2NF-3NF-Boyce Codd Normal form-Multivalued dependence and Fourth Normal form-Join dependencies and Fifth Normal Form
NOSQL Database: The CAP Theorem - Document-Based NOSQL Systems and MongoDB - NOSQL Key-Value Stores- Column-Based or Wide Column NOSQL Systems. Introduction to NOSQL Graph Databases and Neo4j.
File Organization: Indexing - B+tree
Transaction Processing-Properties of Transaction, Characterizing Schedule based on Recoverability, Serializability. **Concurrency Control** –Two Phase Locking, Timestamp Ordering. **Database Recovery Techniques**-Deferred update, Immediate Update, Shadow Paging.
Enhanced Data Models - Introduction to Temporal, Spatial Databases

Learning Resources

1. RamezElmasri, Shamkant B. Navathe,"Fundamentals of Database Systems", Pearson, Seventh Edition, 2016
2. C.J Date, A.Kannan, S.Swamynathan , "An Introduction to database systems",Pearson Education, Eighth Edition, 2006.
3. Abraham Silberschatz, Henry F.Korth and Sudarshan, "Database System Concepts", Tata Mcgraw-Hill, Sixth edition, 2010
4. Raghu Ramakrishnan, Johannes Gehrke, —Database Management Systemsǁ, McGraw Hill ,Fourth Edition, 2010
5. Pramod J. Sadalage,Martin Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence,Pearson,2013.
6. Web Reference : http://nptel.ac.in/courses/106106093/ Course Name:Database Design

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcomes
1	**Data and Information**		CO1
1.1	Databases and Database Users	1	
1.2	Database Systems Concepts and Architecture		
1.2.1	Data Models, Schemas, and Instances	1	
1.2.2	Three-Schema Architecture and Data Independence	1	
1.2.3	Database Languages and Interfaces	1	
1.2.4	Database System environment	1	

2	**Data Modeling**		CO2
2.1	Entity Relationship (ER) Model	1	
2.2	Relational Data Model		
2.2.1	The Relational Algebra and Relational Calculus	2	
2.3.	Tuple Calculus.	1	
3	**Database query languages**		
3.1	Basic SQL - Data types	1	
3.2	Types of Constraints, Views	1	
3.3	Complex Queries	2	
3.4	PL/SQL –Cursor, Trigger, Procedure	1	
3.5	Function, Package	2	
4	**Database Design Theory and Normalization**		CO3
4.1	Functional Dependencies	2	
4.2	Normal forms based on Primary keys,2NF		
4.3	3NF,Boyce Codd Normal form	1	
4.4	Multivalued Dependency and Fourth Normal Form	1	
4.5	Join Dependencies and Fifth Normal Form	1	
5	**NOSQL database**		CO4
5.1	The CAP Theorem	1	
5.2	Document-Based NOSQL Systems	1	
5.3	MongoDB- NOSQL Key-Value Stores	1	
5.4	Column-Based or Wide Column NOSQL Systems	1	
5.5	Introduction to NOSQL Graph Databases and Neo4j	1	
6	**File Organization**		CO5
6.1	Indexing - B+tree	1	
7	**Transaction Processing**		
7.1	Properties of Transaction	1	
7.2	Characterizing Schedule based on Recoverability	1	
7.3	Serializability	1	
8	**Concurrency Control**		
8.1	Two Phase Locking	1	
8.2	Timestamp Ordering		
9	**Database Recovery Techniques**		
9.1	Deferred update	1	
9.2	Immediate Update	1	
9.3	Shadow Paging	1	
10	**Enhanced Data Models**		CO6
10.1	Temporal database	1	
10.2	Spatial Database	1	
	Total Hours	**36**	

Course Designers:

1. C.Deisy cdcse@tce.edu
2. K.V.Uma kvuit@tce.edu

18EG460	PROFESSIONAL COMMUNICATION

Category	L	T	P	Credit
HSS	0	1	2	2

Preamble

This course helps the students to achieve effective language proficiency for their professional, social and interpersonal communication skills, hence increasing their employability and career skills.

Prerequisite

Basic English Knowledge

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Listen, watch, understand and respond to talks, conversations, etc by native and neutral speakers on science, general context, and from ETS test samples with confidence.	22%
CO2	Present ideas, express opinions/comments, practice presentation, and converse in discussions on a variety of technical and non-technical domains without fear	39%
CO3	Read and comprehend passages/texts from various topics – general and reasoning, to respond precisely through reading techniques, besides getting awareness on competitive exam lexicon/verbal exercises for career prospects	17%
CO4	Write journal abstracts/projects and business correspondences with clarity, accuracy, intelligibility, and precision.	22%

*** Weightage depends on Bloom's Level, number of contact hours

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	2.4.2, 2.4.6, 3.2.1, 3.2.2,
CO2	TPS3	Apply	Value	Mechanism	3.1.3, 3.1.2, 3.2.4, 3.2.5,3.2.6
CO3	TPS2	Understand	Respond	Guided Response	2.4.6, 2.4.5, 3.2.1,
CO4	TPS3	Apply	Value	Mechanism	2.4.3, 3.2.1, 3.2.3, 3.2.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									L	S		M			
CO2									S	S		M			
CO3									M	S		M			
CO4									M	S		M			

S- Strong; M-Medium; L-Low

Assessment Pattern:

Internal: No Continuous Assessment Test(CAT) will be conducted. Students' performance will be continuously assessed in various classroom activities in Listening, Speaking, Reading and Writing for 50 marks as detailed below:

Listening Test - 10
Speaking Test (Group Discussion and Technical Presentation) - 20
Written Test(Objective/Descriptive to be tested for 40 marks and converted to 20 marks) - 20

External (Practical):

Group Discussion	- 20
Personal Interview / Situational Conversation (BEC speaking based)	- 20
Listening Test	- 20
Reading / Writing – Computerised or Paper-based Test / General Aptitude Test – Objective type	- 40

List of Experiments/Activities with CO Mapping

S.No	Activities	Hours		CO Mapping			
		T	P				
1	Listening, Reading and Writing based on Extensive Reading	2		CO1		**CO3**	CO4
2	Listening exercises at lab - online resources		2	**CO1**			
3	Developing Listening skills (BEC / IELTS / TOEIC / TOEFL)		2	**CO1**			
4	GD/Mock interview/Presentation Intro at lab through online		2	**CO1**			
5	GD Practice at classroom in groups		4	CO1	**CO2**		
6	Presentation on Technical / general topics – from dailies &	1	4		**CO2**		
7	Mock interview practice at classroom	1	4	CO1	**CO2**		
8	Comprehension Descriptive and Reasoning	2	2			**CO3**	
9	General Aptitude Practice – Vocabulary Development / Sentence completion / Error spotting /Analogy / Reasoning	3	2			CO3	**CO4**
10	Business Correspondence - BEC Writing Task II	2					**CO4**
11	Basics of Technical Writing/ Project Reports		2		**CO2**		
12	Preparation of Resume	1					**CO4**

Learning Resources

Reference Books:

1. Cappel, Annette and Sharp, Wendy, Cambridge English: Objective First, 4th Ed., CUP, New Delhi, 2013.
2. Cusack, Barry. Improve Your IELTS Listening and Speaking Skills (With CD) Paperback, Mcmillan, 2007.
3. Bates, Susan TOEFL iBT Exam Paperback – Oxford, 2012.
4. Hart, Guy Brook. Cambridge English Business Benchmark: 2 Ed., CUP 2014

Websites:

1. https://ielts-up.com (IELTS – LSRW – Practice Tests)
2. www.cambridgeenglish.org (BEC - LSRW)
3. www.etsglobal.org (TOEIC Preparation)
4. www.examenglish.com (Online Exams for international ESL Exams)
5. www.testpreppractice.net (GRE Tests -Vocabulary /Analogy / Sentence Completion / Reading)
6. https://www.freshersworld.com (Placement Papers)

Extensive Reading:

Coelho, Paulo. The Alchemist, Harper Publication, 2018.

Course Designers:

1. Dr.A.Tamilselvi , Convenor
2. Dr S.Rajaram
3. Mr.Vinoth.R
4. Dr.G.Jeya Jeevakani
5. Ms.R.Manibala

18IT470	COMPUTER NETWORKS LAB

Category	L	T	P	Credit
PC	0	0	2	1

Preamble

This laboratory course helps the students to explore Networking concepts by simulating various scenarios using simulation tools and develop simple networking applications using Java based Socket programming. This course also includes hands-on exercises on Packet capture and analysis.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Simulate various Network topologies using Network simulation tools and examine their performance	20
CO2	Implement Routing algorithms for the given piece of network	20
CO3	Demonstrate the working of Layer 2 and Layer 3 protocols	20
CO4	Develop Simple Network applications with socket programming	20
CO5	Analyze the given network traffic using network packet analyzer tools	10
CO6	Demonstrate the configuration of web servers and DNS servers	10

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2,3.1.5,2.3.3,2.3.4,3.2.3,2.2.3
CO2	TPS3	Apply	Value	Mechanism	1.2,3.2.3,2.3.4, 2.2.3
CO3	TPS3	Apply	Value	Mechanism	1.2, 3.2.3, 2.2.3
CO4	TPS3	Apply	Value	Mechanism	1.2, 3.2.3, 2.2.3
CO5	TPS3	Analyze	Organize	Complex overt Response	1..2,3.1.5, 3.2.3, 2.2.3
CO6	TPS3	Apply	Value	Mechanism	1.2, 3.1.5, 3.2.3, 2.2.3

Mapping with Programme Outcomesand Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		S			S	S	S			M	S	S
CO2	S	M	L		L								M	L	
CO3	S	M	L		L								M	L	
CO4	S	M	L		L			M	M	M			M	L	M
CO5	S	M	L		S			S	S	S			M	S	S
CO6	S	M	L		L								M	L	

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	0	0
Understand	20	20
Apply	70	70
Analyse	10	10
Evaluate	0	0
Create	0	0

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Practical Component/Observation
Perception	0
Set	10
Guided Response	20
Mechanism	70
Complex Overt Responses	0
Adaptation	0
Origination	0

Guidelines for carrying out exercises:

- Students may do pair programming for the Socket programming exercises
- Students may form teams of size 3, to complete Simulation and packet analysis exercises

List of Experiments/Activities with CO Mapping

Exp No	List of Experiments	COs	No. of Lab Hours
	Socket Programming and Configuration Exercises		
1	Develop a simple single client-server chatting application using (i) Connection-oriented and (ii) Connectionless sockets (Use Stream Mode Socket API and Datagram Socket API respectively)	CO4	2
2	Develop a concurrent server that spawns several threads, one for each client requesting a specific service	CO4	2
3	Extend the single client – single server chatting application developed using connection-oriented sockets to a multiple client – single server chatting application using threads	CO4	2
4	Develop a multicast chatting tool that will be used to communicate among a multicast group	CO4	1
5	Implement a simple file transfer protocol (FTP) using connection-oriented and connectionless sockets		1
6	Implement sliding window and stop and wait techniques to establish flow control between a sender and receiver	CO3	2
7	Develop a remote service request-response application using RMI	CO4	2
8	Install and configure DNS Server with forward and reverse lookups	CO6	2
9	Develop an simple interactive web-based application using LAMP/WAMP servers	CO6	2
	Simulation Exercises		
10	Simulate a LAN based on Ethernet with a minimum of ten nodes and examine the performance under different load scenarios	CO1	2

11	Simulate switched LAN and compare the performances withdifferent Network topologies	CO1	
12	Simulate Distance vector routing with and without Node failure scenarios	CO2	2
13	Simulate Link State routing with and without Node failure scenarios	CO2	
14	Simulate Address Resolution and reverse address resolution	CO3	
	Packet Analysis Exercises		
15	Install and configure Network Packet Analyzer like Wireshark, to capture and analyze Packet Data Unit for HTTP, TCP and DNS	CO5	2
	Total Hours		24

- Socket Programming exercises may be carried out using networking capabilities of Java platform.
- Simulation Experiments may be carried out using GNS3 or Riverbed Modeler Academic edition
- Packet Analysis experiments may be carried out using Wireshark, Fiddler or Network Miner

Learning Resources

1. Harold, Elliotte Rusty. *Java network programming*. " O'Reilly Media, Inc.", 2004.
2. Kurose, James F. *Computer networking: A top-down approach featuring the internet, 3/E*. Pearson Education India, 2005.
3. Sanders, Chris. *Practical packet analysis: Using Wireshark to solve real-world network problems*. No Starch Press, 2017.

Course Designers:

1 S.Muthuramalingam smrit@tce.edu

2. S.Thiruchadaipandeeswari eshwarimsp@tce.edu

18IT480	DATABASE MANAGEMENT SYSTEMS LAB	Category	L	T	P	Credit
		PC	0	0	2	1

Preamble

This course aims to provide a strong foundation in database design concepts and to give adequate exposure to the SQL and PL/SQL programming with the help of the Oracle RDBMS environment. It also deals with connecting the database to a programming language and thereby creating web application for real world scenarios.

Prerequisite

- None

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Design database with integrity constraints and appropriate normal forms	12
CO2	Implement SQL data model for a given application	25
CO3	Use PL/SQL constructs to add programming extension to SQL	10
CO4	Implement Procedures, Functions, Triggers, Cursors and Packages for the given application.	25
CO5	Implement NoSQL data model for a given application.	20
CO6	Develop projects by incorporating database concepts with PHP connectivity.	8

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2,2.1.1,2.1.2,2.3.1,3.1.1.3.2.6
CO2	TPS3	Apply	Value	Mechanism	1.2,2.1.2,2.2.3
CO3	TPS3	Apply	Value	Mechanism	1.2,4.5.3
CO4	TPS3	Apply	Value	Mechanism	1.2,4.5.3
CO5	TPS3	Apply	Value	Mechanism	1.2,2.1.2,2.2.3
CO6	TPS3	Apply	Value	Mechanism	1.2,2.1.1,2.1.2,2.2.3,2.3.1,3.1.1, 3.2.6

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		S			S	S	S	L		M	S	M
CO2	S	M	L		S			S	S	S	L	L	M	S	M
CO3	S	M	L		S			S	S	S	L		M	S	M
CO4	S	M	L		S			S	S	S	L		M	S	M
CO5	S	M	L		S			S	S	S	L	L	M	S	M
CO6	S	M	L		S			S	S	S	L	L	M	S	M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	-	-
Understand	-	-
Apply	100	100
Analyse	0	0
Evaluate	0	0
Create	0	0

***CO6 will be assessed through Mini Project.**

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Practical Component/Observation
Perception	-
Set	-
Guided Response	30
Mechanism	70
Complex Overt Responses	
Adaptation	-
Origination	-

List of Experiments/Activities with CO Mapping

Exp No.	List of Experiments	No. of Hours	Course Outcome
1	Identification of Mini Project	1	CO1
2	Creation and Modification of relations	2	CO2
3	Integrity constraint enforcement and simple SQL queries	2	CO1
4	Creation and updation of views	2	CO2
5	Complex SQL Queries	2	CO2
6	Query Tuning	2	CO2
7	PL/SQL block creation and usage of various composite data types	2	CO3
8	Cursor management and Creation of Triggers in SQL	2	CO4
9	Procedures, functions and packages in PL/SQL	2	CO4
10	Installation of MongoDb and creation of Collections	1	CO5
11	Simple and Join Queries in MongoDb	2	CO5
12	Perform MongoDb Query and Projection operation	2	CO5
13	Demonstrate Mini-Project as Web application	2	CO6
Total Hours		**24**	

Learning Resources

1. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems,McGraw Hill Publications,3rd Edition,2014
2. NileshShah,”DATABASE SYSTEMS USING ORACLE –, 2nd edition, PHI.
3. NPTEL Online Course on “Database Management System” - https://nptel.ac.in/courses/106105175/2

Course Designers

1. C.Deisy cdcse@tce.edu
2. K.V.Uma kvuit@tce.edu
3. S.Pudumalar spmit@tce.edu

18IT490	PROJECT MANAGEMENT	Category	L	T	P	Credit
		HSS	3	0	0	3

Preamble

This course provides students with a comprehensive overview of the principles, processes, and practices of Software project management. Insights into the techniques for planning, organizing, scheduling, and controlling software projects. The course aims to provide substantial focus on software cost estimation and software risk management. Students will obtain practical project management skills and competencies related to the definition of a software project, establishment of project communications, managing project changes and managing distributed software teams and projects based on the Project Management Body of Knowledge (PMBOK) as a framework.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain the key components of a project plan	11
CO2	Apply appropriate project planning and tracking tools	19
CO3	Show the importance of a cost benefit analysis to the successful implementation of a project plan	11
CO4	Interpret how to identify the lessons learned in a project closeout and review session	11
CO5	Develop a project plan for the applications on Internet of Things, Society and Environment	15
CO6	Apply suitable software project management technique for the given software project scenario	33

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.1, 2.1.1, 2.3.1,2.4.1
CO2	TPS3	Apply	Value	Mechanism	1.1, 2.4.1, 2.4.7
CO3	TPS3	Apply	Value	Mechanism	1.1, 2.1.3
CO4	TPS2	Understand	Respond	Guided Response	1.1, 4.6.4
CO5	TPS3	Apply	Value	Mechanism	1.1, 3.1, 3.2, 4.1
CO6	TPS3	Apply	Value	Mechanism	1.1,2.3.1,2.4.7,

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		M						S		M	M	S
CO2	S	M	L		M						S		M	M	S
CO3	S	M	L		S						S		M	S	S
CO4	M	L									S	L	L		M
CO5	S	M	L		S	M	M	S	S	S	S	L	M	M	S
CO6	S	M	L		M				S	S	S		M	M	S

S- Strong; M-Medium; L-Low

Passed in Board of Studies Meeting on 11.5.2019 Approved in 58th Academic Council Meeting on 15.06.2019

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Mini Project			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	20	-	-	-	20
Understand	60	60	40	-	-	-	40
Apply	20	20	40	100	100	100	40
Analyze	-	-	-				-
Evaluate	-	-	-				-
Create	-	-	-				-

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	-
Guided Response	20
Mechanism	80
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1):

1. Identify the milestones in requirement engineering process
2. Explain the steps involved in project planning process.
3. Describe the concept of work break down structure in project planning.
4. Explain the process of project portfolio and project formulation.
5. List the key roles of a stakeholder and a project charter.

Course Outcome 2 (CO2):

1. Define the term direct cost in projects with examples
2. Differentiate between CPM and PERT
3. Estimate the cost associated with the project using bottom up technique
4. Elaborate the methods of project budgeting
5. What do you mean by budget uncertainty? How risk is managed in projects?

Course Outcome 3 (CO3):

1. List the benefits and limitations of latest tools in project management
2. Identify the reasons to terminate a project
3. A project consists of six activities with the following logical relationships. Draw a network for the project and determine the critical path using traditional method - A and B are initial activities and can be performed concurrently - C follows A but cannot start until B is over - D and E succeed B - C and D precede F - E and F are terminal activities

Activity	A	B	C	D	E	F
Duration (Days)	7	8	3	2	7	4

4. Find the status of the project on the 10th day of its commencement.
5. What are the steps needed in developing the Project Staffing Management Plan
6. Draw a Gantt chart for tracking purpose and explain their use in scheduling

Course Outcome 4 (CO4):

1. Summarize the key tools of project life cycle's closing phase
2. Illustrate the KICK-OFF meeting essentials for any project development.
3. Write the need and meaning of fast tracking and estimation of projects
4. Using any Software Planning and tracking tool, Plan a project systematically.

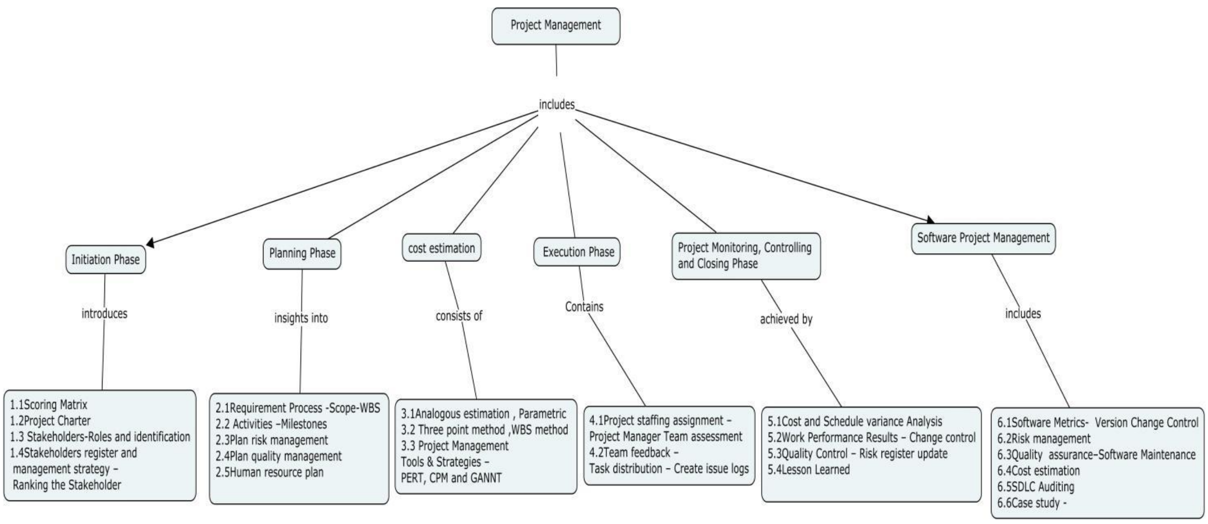
Course Outcome 5 (CO5):

1. Explain why or why not LOC is an appropriate software size metric in your organization
2. List the quality attributes that contribute to a quality software product. Discuss how it influences the software quality.
3. What are baselines? Interpret how it contributes to version control.
4. Illustrate COCOMO Estimation using your own example.
5. Develop a plan for Smart Health Care project using appropriate tools.

Course Outcome 6 (CO6):

1. Development of mini-project by using appropriate Software Engineering practices and Software Project Management techniques

Concept Map



Syllabus

Project Initiation Phase – Scoring Matrix – Project Charter – Role of charter – Creation of charter – Role of stakeholder – Identification of stakeholders– Stakeholders register and management strategy – Ranking the Stakeholder

Project Planning Phase - Requirement Process Collection – Project Scope – Work break down structure– Define activities –Milestones Estimate activity resources – Activity durations

– Plan risk management – Identify and rank risks –Risk response plan – Risk contingency plan – Plan quality management –Quality roles and responsibilities – Define project quality – Measure project quality – Quality control – Quality management plan – Human resource plan – Communication management plan
Project cost estimation - Analogous estimation – Parametric – Three point method – WBS method – Project Management Tools & Strategies – PERT, CPM and GANNT
Project Execution Phase – Project staffing assignment – Project Manager Team assessment – Team feedback – Task distribution – Create issue logs
Project Monitoring, Controlling and Closing Phase – Cost and Schedule variance Analysis –Work Performance Results – Change control – Quality Control – Risk register update – Lesson Learned

Software Project Management – Software Metrics-Metrics Analysis Report-Version Change Control- Risk management - Quality management and assurance–Software Maintenance-Cost estimation –COCOMO model – SDLC Auditing–Case study - Software management tools and techniques

Learning Resources

1. Warburton. R &Kanabar. V, The Art and Science of Project Management, RW Press, RI, Second Edition, 2016.
2. Bob Hughes, Mike Cotterell, Software Project Management, Tata McGraw Hill, Third Edition, 2011.
3. Kanabar. V and Warburton, R, Fundamentals Project Management, Kaplan Press, New York, 2008.
4. Walker Royce, Software Project Management A Unified Framework, Pearson Education, 2004

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcomes
1	**Project Initiation Phase**		
1.1	Scoring Matrix	1	CO1
1.2	Project Charter – Role of charter – Creation of charter	1	
1.3	Role of stakeholder – Identification of stakeholders	1	
1.4	Stakeholders register and management strategy – Ranking the Stakeholder	1	
2	**Project Planning Phase**		
2.1	Requirement Process Collection – Project Scope – Work breakdown structure	1	CO2
2.2	Define activities –Milestones - Estimate activity resources – Activity durations	1	
2.3	Plan risk management – Identify and rank risks – Risk response plan – Risk contingency plan	2	
2.4	Plan quality management –Quality roles and responsibilities – Define project quality – Measure project quality – Quality control – Quality management plan	2	
2.5	Human resource plan – Communication management plan	1	
3	**Project cost estimation**		

3.1	Analogous estimation – Parametric	1	CO3
3.2	Three point method – WBS method	1	
3.3	Project Management Tools & Strategies – PERT, CPM and GANNT	3	
4	**Project Execution Phase**		
4.1	Project staffing assignment – Project Manager Team assessment	1	
4.2	Team feedback – Task distribution – Create issue logs	2	CO4
5	**Project Monitoring, Controlling and Closing Phase**		
5.1	Cost and Schedule variance Analysis	1	CO5
5.2	Work Performance Results – Change control	1	CO5
5.3	Quality Control – Risk register update	1	CO5
5.4	Lesson Learned	1	CO5
6	**Software Project Management**		
6.1	Software Metrics- Metrics Analysis Report - Version Change Control	2	CO6
6.2	Risk management	2	CO6
6.3	Quality management and assurance–Software Maintenance	2	CO6
6.4	Cost estimation – COCOMO model	2	CO6
6.5	SDLC Auditing	2	CO6
6.6	Case study - Software management tools and techniques	2	CO6
	Total	**36**	

Course Designers:

1. P.Karthikeyan karthikit@tce.edu
2. S.Pudu Malar spmit@tce.edu

18CHAB0	CONSTITUTION OF INDIA	Category	L	T	P	Credit
		AC	2	0	0	0

Preamble

On the successful completion of the course, the students will be able to explain the basic features and fundamental principles of Constitution of India. The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own AICTE Model Curriculum for Mandatory Courses & Activities (Non-Credit) for Undergraduate Degree in Engineering & Technology ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”

Course Outcome:

On the successful completion of the course students will be able to

CO1	Explain the meaning of the constitution law and constitutionalism and Historical perspective of the Constitution of India	Understand
CO2	Explain the salient features and characteristics of the Constitution of India, scheme of the fundamental rights and the scheme of the Fundamental Duties and its legal status	Understand
CO3	Explain the Directive Principles of State Policy, Federal structure and distribution of legislative and financial powers between the Union and the States, and Parliamentary Form of Government in India	Understand
CO4	Explain the amendment of the Constitutional Powers and Procedure, the historical perspectives of the constitutional amendments in India, and Emergency Provisions.	Understand
CO5	Explain the Local Self Government – Constitutional Scheme in India, Scheme of the Fundamental Right to Equality,	Understand
CO6	Explain the scheme of the Fundamental Right to certain Freedom under Article 19, and Scope of the Right to Life and Personal Liberty under Article 21	Understand

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	-	-	-	M	-	M	-	L	-	-
CO2	M	L	-	-	-	M	-	M	-	L	-	-
CO3	M	L	-	-	-	M	-	M	-	L	-	-
CO4	M	L	-	-	-	M	-	M	-	L	-	-
CO5	M	L	-	-	-	M	-	M	-	L	-	-
CO6	M	L	-	-	-	M	-	M	-	L	-	-

S- Strong; M-Medium; L-Low

Syllabus

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

Assessment Pattern

Bloom's category	**Continuous Assessment Tests**		**Seminar**
	1	**2**	**-**
Remember	40	40	0
Understand	60	60	100
Apply	0	0	0
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

References

1. Durga Das Basu, 'Introduction to The Constitution of India', LexisNexis Butterworths Wadhwa, 20th Edition, Reprint 2011.
2. Constitution of India, National Portal of India, Web link: https://www.india.gov.in/my-government/constitution-india

Course Designers:

1. Adapted from AICTE Model Curriculum for Undergraduate Degree Courses in Engineering & Technology, Volume-II, January 2018.

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH. INFORMATION TECHNOLOGY DEGREE PROGRAMME

FIFTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A GOVERNMENT AIDED ISO 9001:2008 CERTIFIED
AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY)
MADURAI – 625 015, TAMILNADU

PHONE: 0452 – 2482240, 41
FAX: 0452 2483427
WEB: WWW.TCE.EDU

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2018-19 onwards)

FIFTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
18IT510	Web Technologies	PC	3	-	-	3
18IT520	Information Security	PC	3	-	-	3
18IT530	Data Mining	PC	3	-	-	3
18IT540	Accounting and Finance	HSS	3	-	-	3
18ITPX0	Programme Elective	PE	3	-	-	3
18XXGX0	General Elective	GE	3	-	-	3
THEORY CUM PRACTICAL						
18ES590	Systems Thinking	ES	1	-	1	2
PRACTICAL						
18IT570	Web Technologies Lab	PC	-	-	2	1
18IT580	Information Security Lab	PC	-	-	2	1
AUDIT COURSES						
18CHAC0	Essence of Indian Knowledge	AC	1	-	1	-
Total			**19**	**-**	**11**	**23**

Capstone Design Project
BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective
AC :Audit Course

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
2 Hours Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

Scheme of Examinations
(For the candidates admitted from 2018-19 onwards)

FIFTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	18IT510	Web Technologies	3	50	50	100	25	50
2	18IT520	Information Security	3	50	50	100	25	50
3	18IT530	Data Mining	3	50	50	100	25	50
4	18IT540	Accounting and Finance	3	50	50	100	25	50
5	18ITPX0	Programme Elective	3	50	50	100	25	50
6	18XXGX0	General Elective	3	50	50	100	25	50
THEORY CUM PRACTICAL								
7	18ES590	Systems Thinking	-	100	-	100	-	100
PRACTICAL								
8	18IT570	Web Technologies Lab	3	50	50	100	25	50
9	18IT580	Information Security Lab	3	50	50	100	25	50
AUDIT COURSES								
10	18CHAC0	Essence of Indian Knowledge	-	50	50	100	25	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** Terminal Examination will be conducted for maximum marks of 100 and subsequently be reduced to 50 marks for the award of terminal examination marks

18IT510	WEB TECHNOLOGIES

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

This course covers the design, implementation, and testing of web-based applications including related software, database and interfaces. The students will learn about mark-up languages, scripting languages, interactive graphics and databases. It also covers social, ethical and security issues arising from the web and social software. The concepts will be illustrated with appropriate examples and tools.

Prerequisite

- NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain the basic web components and development environment.	17
CO2	Build applications for distributed environment using XML.	19
CO3	Develop simple server applications in NodeJS with DB – SQL, NoSQL.	22
CO4	Select suitable web framework and presentation technologies for web applications based on the requirements.	11
CO5	Build simple web applications using RESTful service.	17
CO6	Examine the need of security for the developed web applications.	14

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Set	1.2,2.3.1,2.3.2
CO2	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,3.1.4, 3.1.5
CO3	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,3.2.3, 4.4.1, 4.4.2
CO4	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,4.4.1, 4.4.2,4.5.5
CO5	TPS3	Apply	Value	Mechanism	1.2,4.3.4
CO6	TPS3	Analyze	Organize	Complex Overt Response	1.2,4.3.4, 4.5.3, 4.5.6

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		S			S	S	S			M		
CO3	S	M	L		S			S	S	S			M	M	M
CO4	S	M	L		S			S	S	S			M		
CO5	S	M	L		S			S				L	M	M	L
CO6	S	S	M	L									S		

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	30	20	20	-	-	-	20
Understand	30	40	30	20	20	20	30
Apply	40	40	50	80	80	40	50
Analyse	0	0	0	-	-	40	0
Evaluate	0	0	0	-	-	-	0
Create	0	0	0	-	-	-	0

Assignments may be evaluated by miniproject demonstration.

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Assignment/Practical Component
Perception	-
Set	10
Guided Response	40
Mechanism	40
Complex Overt Responses	10
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1(CO1):

1. Explain web browser architecture.
2. List out the types of web pages.
3. Define a CSS Rule to change color of all elements containing attribute class = “green move” to green and shift them down to 25 pixels and right 15 pixels?

Course Outcome 2(CO2):

1. Considering the below information develop an XML Doc and embed it into html file.
   1. Name Job Department Cubicle
   2. Joe Programmer Engineering 5E
   3. Erin Designer Marketing 9M
   4. Melisa Designer Human Resource 8H
   5. Craig Admin Engineering 4E
   6. Eileen Proj Coordinator Marketing 3M
   7. Danielle Programmer Engineering 12E
   8. Frank SalesPerson Marketing 17M
   9. Corinne Programmer TechSupport 19T
2. Design a webpage using PHP for implementing marks sheet based system in which it is generated with 6 theory subjects,2 lab subjects with Grading point system for 10 students and generate report in table format with XML.Check whether the maximum marks exceeds, generate exceptions.
3. Create an XML file which will display the Book Information. .It includes the following:1) Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price

And retrieve the results in table format using DOM.

Course Outcome 3(CO3):

1. Identify the first argument passed to a Node.js callback handler
2. Show the Server enabled form validation from the following using PHP and regular expression.

3. Model the database for Employee Details System and do the following queries using PHP.
    a. Insert a new employee into the database.
    b. Delete the 2nd record for the particular employee.
    c. Make search provision.
    d. Provide view for the whole table.

Course Outcome 4 (CO4):

1. Create dynamic web application for College Management system using Angular js.
    a. Perform the following task by using jQuery UI
    b. Click Toggle colors
    c. Click Add a New Box
    d. Click add a New Box
    e. Click Add a New Box
    f. Click Toggle Colors
    g. Click Add a New Box
    h. Click add a New Box
    i. Click Add a New Box
2. Develop and implement DOM manipulation using Javascript for an application.
3. Illustrate the best technologies for developing responsive web pages.

Course Outcome 5 (CO5):

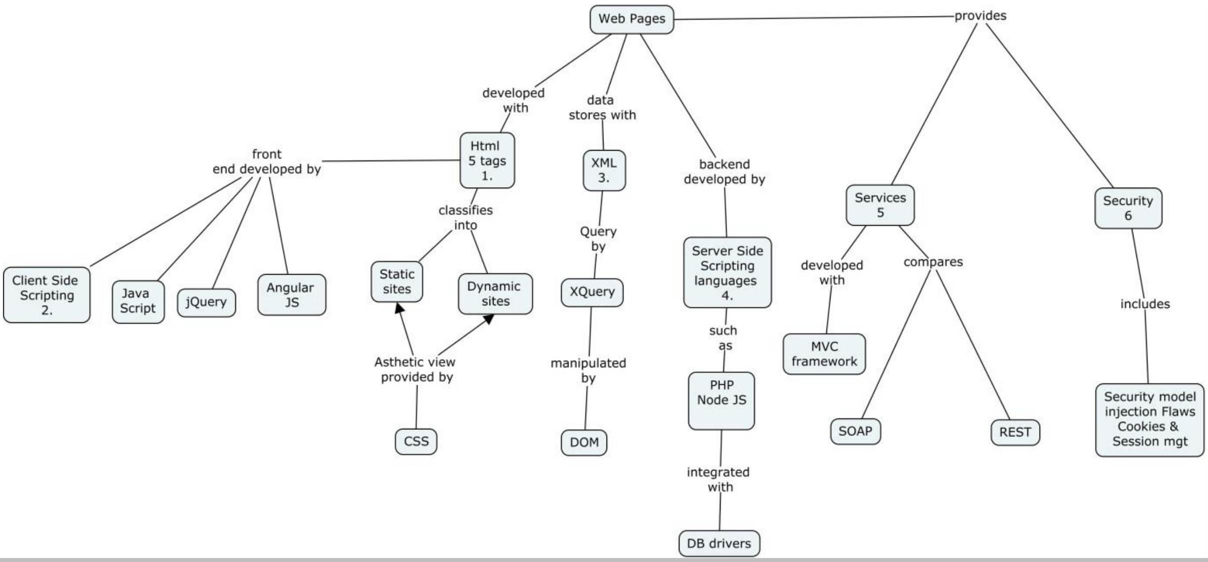
1. Build simple web service for Hotel Management using REST.
2. Convert back-end of any real time application into RESTful service.
3. Compare Thin clients and Thick clients.

Course Outcome 6 (CO6):

1. Create cookie information to identify the visitors for the web pages.

2. Construct 2 user id's and password and write these to cookies. Read the information entered in the Login form and authenticate with the values (user id and passwords) available in the cookies and check the validity of the user.
3. Identify different types of attacks in web security.

Concept Map



Syllabus

Web essentials: Deconstructing the web from URL to website - Different types of web applications, HTML5 – Static vs Dynamic sites, Tags, Basic styling through CSS3 – HTTP – basics, tools to analyze HTTP requests. Developer Tools: Introduction - GIT, IDE/ Editors, Deployment, Console, Framework: Angular JS, Mean Stack.

XML: XML Basics- Structure- Elements and attributes- Namespaces- Working with DTD- Schema- Grouping elements- writing and Parsing XML Document. DOM- XML Formatters- CSS- XSLT- XPATH –XQUERY, Data exchange in Distributed environment.JSON - Introduction.

Back End – Different kinds of servers - web servers – Apache & nginx, File servers – time servers- DB servers. Server-side scripting languages Introduction: PHP basics - PHP server applications (No DB).Introduction to NodeJS – asynchronous nature of nodejs – simple apps Integrating application with DB – DB drivers- Integrate NodeJS with NOSQL, Integrate NodeJS with SQL.

Front end: Client side scripting – Javascript / JQuery, DOM manipulation through XQuery, Responsive Web Design, Front end framework- Angular JS.

Web Architecture & Web services: MVC introduction- Thin clients Vs Thick clients. Web services – Introduction- SOAP, REST – writing a RESTful service (nodejs + expres). SOAP vs REST

Web Security: Web security model - HTTPS: Goals and Pitfalls - Injection flaws: Cross site scripting, SQL Injection, Command Injection, Cross site request forgery and HTTP header injection - Cookie Flaws and Server Misconfiguration - Session management and user authentication.

Learning Resources

1. Mastering HTML, CSS &Javascript Web Publishing by Laura Lernay, Rafe Colburn, Jennifer Kyrnir, BPB Publications, 2016
2. Jeffrey C. Jackson, "Web Technologies – A Computer Science Perspective", Pearson Education, Fourth Edition, 2012.
3. Deitel and Deitel, "Internet and World Wide Web How to Program", Prentice Hall of India, Fourth Edition, 2009.
4. RESTful Web Services by Leonard Richardson & Sam Ruby. O'Reilly, 2007
5. https://angularjs.org/
6. https://www.javatpoint.com/restful-web-services
7. https://www.cs.uct.ac.za/mit_notes/web_programming.html
8. https://crypto.stanford.edu/cs155/syllabus.html
9. http://www.comp.nus.edu.sg/~prateeks/teaching/sp16/cs5331-sp16.html

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcomes COs
1	**Web essentials**		
1.1	Deconstructing the web from URL to website	2	CO1
1.2	Different types of web applications		
1.3	HTML5 – Static vs Dynamic sites		
1.3.1	Basic Tags		
1.4	Basic styling through CSS3	1	
1.5	HTTP – basics, tools to analyze HTTP requests.		
1.6	Developer Tools Introduction -GIT, IDE/ Editors, Deployment, Console Framework: Angular JS, Mean Stack Introduction	3	
2	**XML**		
2.1	XML Basics	1	CO2
2.1.1	Structure		
2.1.2	Elements and attributes		
2.1.3	Namespaces		
2.2	Working with DTD		
2.3	Schema	1	
2.4	Grouping elements		
2.5	Writing and Parsing XML Document		
2.6	DOM	2	
2.7	XML Formatters		
2.8	XSLT		
2.9	XPATH		
2.10	XQUERY		
2.11	Data exchange in Distributed environment	2	
2.12	JSON	1	
3	**Back End**		
3.1	Different kinds of servers	2	CO3
3.1.1	web servers- Apache &nginx		
3.1.2	File servers		
3.1.3	Time servers		
3.1.4	DB servers		
3.2	Server-side scripting languages Introduction	2	
3.3	PHP Basics		
3.3.1	PHP server applications (No DB)		

3.4	Introduction to NodeJS	2	
3.4.1	Asynchronous nature of nodejs		
3.5	Integrating application with DB	2	
3.5.1	DB drivers		
3.5.2	Integrate NodeJS with NOSQL		
3.5.3	Integrate NodeJS with SQL		
4	**Front end**		
4.1	Client Side Scripting	2	CO4
4.1.1	Javascript / JQuery		
4.1.2	DOM manipulation through XQuery		
4.2	Responsive Web Design	2	
4.3	Front-end Framework - Angular JS.		
5	**Web Architecture & Web services**		
5.1	MVC	3	CO5
5.1.1	Introduction- Thin clients Vs Thick clients.		
5.2	Web services	3	
5.2.1	Introduction- SOAP, REST – writing a RESTful service (nodejs + express). SOAP vs REST		
6	**Web security**		
6.1	Web security model – HTTPS	1	CO6
6.2	Injection flaws :Cross site scripting, SQL Injection, Command Injection, Cross site request forgery and HTTP header injection	2	
6.3	Cookie Flaws and Server Misconfiguration		
6.4	Session management and user authentication	2	
	Total Lectures	**36**	

Course Designers:

1. R.Suganya rsuganya@tce.edu
2. C.Santhiya csit@tce.edu

18IT520	INFORMATION SECURITY

Category	L	T	P	C
PC	3	0	0	3

Preamble

The objective of the course on Information Security is to provide exposure on cryptography and secure communication protocols. This course develops a basic understanding of the algorithms used for data protection and few design choices behind these algorithms. The course emphasizes the understanding of previous attacks on the networks with the aim of preventing future attacks.

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Perform Encryption/ Decryption of text using symmetric and asymmetric crypto algorithms to provide confidentiality.	25
CO2	Compute hash and digital signature for the given message to provide integrity and non-repudiation.	11
CO3	Examine the strength of any cryptographic algorithm by crypt analysis.	12
CO4	Explain different types of authentication and key agreement protocols.	19
CO5	Use security protocols such as SSL, IP Sec etc., at different layers of TCP/IP stack to develop security solutions.	11
CO6	Identify security attacks and vulnerabilities in any information system and provide preventive measures and solutions in adherence with security standards.	22

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.1.5, 2.5.1
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.1.5, 2.5.1
CO3	TPS4	Analyze	Organize	Complex Overt Response	1.2, 2.1.1, 2.1.2, 2.1.5, , 2.4.4, 2.5.1
CO4	TPS2	Understand	Respond	Guided Response	1.2
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.1.5, , 2.5.1
CO6	TPS4	Analyze	Organize	Complex Overt Response	1.2, 2.1.1, 2.1.2, 2.1.5, 2.3.1, 2.5.1, 2.4.4, 2.4.6, 3.1.1, 3.2.2, 3.2.3

Mapping with Programme Outcomesand Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	S	M	L										M		
CO2	S	M	L										M		
CO3	S	S	M	L									S		
CO4	M	L											M		
CO5	S	M	L										M		
CO6	S	S	M	L	M			S	M	M		M	S	M	M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	10				10
Understand	20	20	30				20
Apply	40	40	50	7 0	70	50	50
Analyse	20	20	10	30	30	50	20
Evaluate							
Create							

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	
Set	
Guided Response	30
Mechanism	50
Complex Overt Responses	20
Adaptation	
Origination	

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):

1. Alice Wishes to send the message (24, 26) to Bob using Elliptic curve encryption. If the Cryptosystem parameters are E67(2,3), G=(2,22) and the private key of Alice is 4 ,find the public key of Alice and the encrypted message if the random value is r=2. Show the steps by which Bob recovers the plaintext from the cipher text.
2. Encrypt the message “CS” using RSA algorithm with n= 18923 and e=79. Break the code by factorizing n and compute the deciphering key.
3. Consider a Diffie Hellman scheme with a common prime q=19 and a primitive root 13. (i) If User A has a public key 10, what is his private key? (ii) If User B has a private key 6, what is his public key? (iii) What is the shared secret key?

Course Outcome 2 (CO2):

1. Apply SHA-1 message digest to message M=THIAGARAJARCOLLEGE…. for one step. Make assumptions of initial buffer values in big endian form. F(t,b,c,d)=bc+b'd. Draw the flow diagram for the scheme and then compute all other relevant parameters required for the calculation.
2. Generate the digital signature for a message with hash value h(m) =25 using Digital Signature Standard Scheme if p=709,q=59,d=14,r=4,e0=3. Verify the signature at the receiving end.
3. Differentiate strong and weak collision resistance with reference to hash functions.

Course Outcome 3 (CO3):

1. Intercept the message 'FBRTLWUGATEPHBNXSW' which was encoded using a Hill Cipher System with a 3 X 3 key matrix in a 26 letter alphabetic system. The last nine letters are the sender's signature 'JAMESBOND'. Find the enciphering matrix, deciphering matrix and read the message.
2. Can the following matrix be used as key in Hill cipher? Justify your answer.
   {1,2,3; 4,5,6; 7,8,9}
3. John is reading a mystery book involving cryptography. In one part of the book, the author gives a cipher text "CIW" and two paragraphs later the author tells the reader that this is a Caesar cipher and the plain test is "yes", In the next chapter the hero found a tablet in a cave with "XVIEWYWI" engraved on it. John immediately found the actual meaning of the cipher text, what type of attack did John launch here? What is the plain text?

Course Outcome 4 (CO4):

1. Compare and contrast biometric authentication vs. cryptographic authentication.
2. Explore the various ways of distribution of public keys.
3. Enlist the various parameters present in a digital certificate.

Course Outcome 5 (CO5):

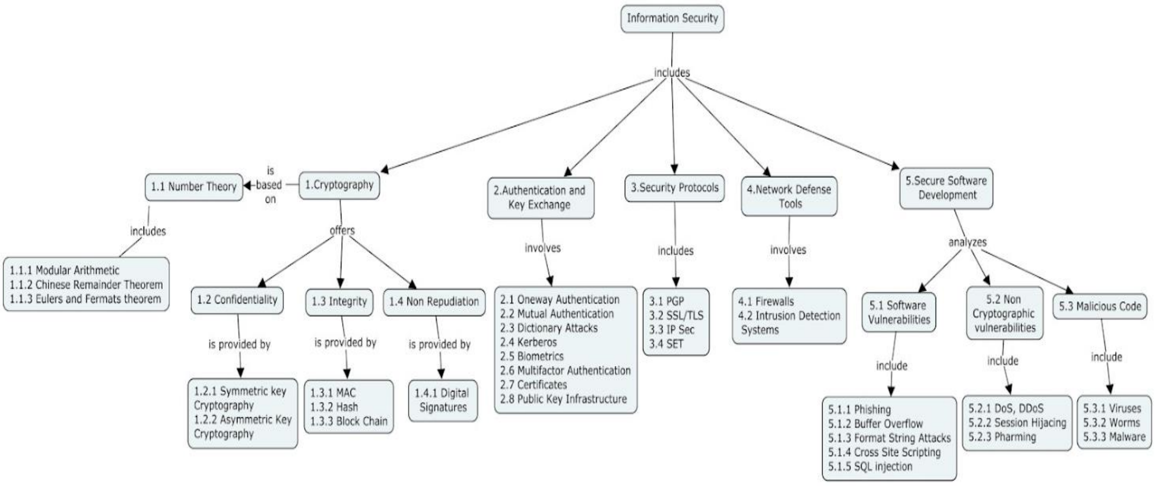
1. An organization allows its employees a remote login facility through an IPsec based VPN. With the help of neat sketches, show different possible placements of VPN terminator with respect to organization firewalls. Discuss the pros and cons of each placement.
2. Compare the packet marking versus packet logging schemes for IP trace back in respect to the probability of success, cost, and ease of deployment and performance overheads.
3. How are the following supported in electronic passport? (i)Detection of fake passports, (ii) Detection of stolen passports, (iii) Prevention of passport skimming attacks, (iv) Prevention of eaves dropping on passport to reader communications.

Course Outcome 6 (CO6):

1. Is it possible to design a protocol that accomplishes both authentication and session key exchange with only two messages and without timestamps? Consider each of the following two cases separately.
   The two parties share a long term secret.
   Both communicating parties have a public key – private key pair. Each party knows other's public key.

2. Prepare a security analysis report on the threats and vulnerabilities involved in an online examination system.
3. Examine the feasibility of launching an offline dictionary attack on the electronic passport with the goal of obtaining certain fields in it such as the Date of Birth. Let S represent the concatenation of three fields –DOB, expiry date and passport number.
   Assuming each character is possible and equally likely, calculats the total number of possible values of S.
   Recalculate the total number of possible values of S under the following assumptions: (i) The holder of the passport being targeted is less than 80 years old. (ii) The passport validity period is 5 years. (iii) The passport number uses numeric characters only. (iv) About 1million passports have been issued in India and the passport numbers are aligned in sequence.

Concept Map



Syllabus

Basics of Information Security – Perspectives and Impact, Threats and vulnerabilities, Attacks, Security Services -CIA Triad and Security Models, Internet Law and Cyber Crimes

Cryptography - Mathematics for Cryptography – Number Theory - Modulo Arithmetic - Euclidean and extended Euclidean Theorem - Chinese Remainder Theorem - Euler and Fermat theorem , Symmetric Key Cryptosystems –Hill Cipher, Data Encryption Standard and Advanced Encryption Standard, Public Key Cryptography - RSA , Elliptic Curve Cryptosystems , Integrity – Message Authentication Code and Hash, Block Chain Technology, Digital Signatures.

Authentication of Key Exchange – One way Authentication- Mutual Authentication- Dictionary Attacks- Kerberos- Biometrics- Multifactor Authentication. Key management – Digital certificates- Public Key Infrastructure.

Security Protocols Security at Application Layer – PGP, Security at Transport Layer –SSL and TLS, Security at Network layer –IP Sec, Electronic Payments – SET

Network Defense Tools -Firewalls, Intrusion Prevention and Detection Systems

Secure Software Development -Software Vulnerabilities – Phishing, Buffer Overflows, Format String Attacks, Cross Site Scripting, SQL injection.

Non cryptographic Protocol Vulnerabilities –DoS, DDoS, Session Hijacking and Pharming Attacks. Viruses, Worms and Malware Analysis- Case Studies

Learning Resources

- Behrouz. A. Foruzan and Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata McGraw Hill , Third Edition, 2016.
- William Stallings, "Cryptography and Network Security: Principles and Practice", Prentice Hall,Seventh Edition, 2017.
- Bernard L Menezes, and Ravinder Kumar "Cryptography, Network Security and Cyber Laws", Cengage Learning India Pvt Limited, 2018.
- Charlie Kaufman and Radia Perlman, Mike Speciner, "Network Security, Private Communication in Public World", Prentice Hall India, Second Edition, 2002.
- William Stallings, "Network Security Essentials: Applications and Standards", Prentice Hall, Sixth Edition, 2016.
- Man Young Rhee, "Internet Security Cryptographic Principles, Algorithms and Protocols", Wiley, First Edition, 2003.
- Douglas R. Stinson, "Cryptography Theory and Practice", Third Edition, Chapman & Hall/CRC, 2006.
- http://cse.iitkgp.ac.in/~debdeep/courses_iitkgp/Crypto/index.htm
- http://nptel.ac.in/courses/106105031/
- https://canvas.uw.edu/courses/1064488

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lectures	COs
0	**BASICS OF INFORMATION SECURITY**		
0.1 0.2	Perspectives and Impact, Attacks, Threats and vulnerabilities Security Services -CIA Triad and Security Models	1	CO1
0.3	Internet Law and Cyber Crimes	1	CO1
1	**CRYPTOGRAPHY**		
1.1 1.1.1.	**Mathematics for Cryptography- Number Theory** Modulo Arithmetic - Euclidean and extended Euclidean Theorem	1	CO1
1.1.2 1.1.3	Chinese Remainder Theorem Euler and Fermat theorem	1	CO1
1.2.1 1.2.1.1	**Symmetric Key Cryptography** Hill Cipher	1	CO1/CO3
1.2.1.2	Data Encryption Standard	2	CO1/CO3
1.2.1.2	Advanced Encryption Standard	2	CO1/CO3
1.2.2 1.2.2.1	**Public Key Cryptography** RSA	2	CO1/CO3
1.2.2.2	Elliptic Curve Cryptosystems	2	CO1/CO3

1.3 1.3.1	**Integrity** Message Authentication Code and Hash	1	CO2
1.3.2	SHA -512	1	CO2/CO3
1.3.3	Block Chain Technology	1	CO2
1.4 1.4.1	**Digital Signatures** Digital Signature Standard	1	CO2/CO3
2	**AUTHENTICATION AND KEY EXCHANGE**		
2.1 2.2	One way Authentication Mutual Authentication	1	CO4
2.3	Dictionary Attacks	1	CO4
2.4	Kerberos	1	CO4
2.5	Biometrics	1	CO4
2.6	Multifactor Authentication.	1	CO4
2.7	Key management –Digital certificates	1	CO4
2.8	Public Key Infrastructure	1	CO4
3	**SECURITY PROTOCOLS**		
3.1	Security at Application Layer – PGP	1	CO5
3.2	Security at Transport Layer –SSL and TLS	1	CO5
3.3	Security at Network layer –IP Sec	1	CO5
3.4	Electronic Payments – SET	1	CO5
4	**NETWORK DEFENSE TOOLS:**		
4.1	Firewalls	1	CO6
4.2	Intrusion Prevention and Detection Systems	1	CO6
5	**SECURE SOFTWARE DEVELOPMENT**		
5.1 5.1.1 5.1.2	**Software Vulnerabilities** Phishing Buffer Overflows	1	CO6
5.1.3 5.1.4 5.1.5	Format String Attacks Cross Site Scripting SQL injection.	1	CO6
5.2 5.2.1	**Non cryptographic Protocol Vulnerabilities** DoS, DDoS	1	CO6
5.2.2 5.2.3	Session Hijacking Pharming Attacks	1	CO6
5.3	**Malicious Code** Viruses, Worms and Malware Analysis - Case Studies	2	CO6

Course Designers:

1. C.Jeyamala jeyamala@tce.edu
2. S.Sujitha sujithait@tce.edu

18IT530	DATA MINING

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

The course on data mining provides an emphasis on data processing techniques, rule mining, classification, clustering and in the development of prediction models. It also facilitates the student by interpreting the real world problems by examining with appropriate mining tools.

Prerequisite

Nil

Course Outcomes

On successful completion of the course, students will be able to

Course Outcomes		**Weightage in %**
CO1	Describe the fundamental concepts of data mining.	11
CO2	Apply appropriate data pre-processing techniques for the given dataset.	22
CO3	Produce Association rules using algorithms like Apriori and Frequent Pattern tree for the given problem.	16
CO4	Demonstrate the performance of different Classification algorithms (decision tree algorithms, naïve bayes., support vector machines and Neural Networks) and prediction algorithms (Linear Models and Logistic Regression) to solve the real world problem.	24
CO5	Illustrate various clustering and outlier techniques for grouping the given data.	17
CO6	Experiment various data pre-processing and mining techniques for the given application using Python, R, Weka and Rapid Miner etc.	10

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond		1.2,2.3.1,2.3.2
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.2, 2.3.1, 2.3.2, 3.1.4, 3.1.5
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.2, 2.3.1, 2.3.2, 3.1.4, 3.1.5
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.3.1, 2.3.2, 2.3.3, 4.4.1, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value	Mechanism	1.2, 4.3.4, 4.6.1
CO6	TPS4	Analyse	Organise	Complex Overt Responses	1.2,2.3.1, 2.3.2, 2.5.1, 3.1, 3.2.5, 4.1.2, 4.3.4, 4.4.1,4.4.2, 4.5.3, 4.5.6, 4.6.1

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L										M		
CO3	S	M	L		L							L	M	L	L
CO4	S	M	L		L							L	M	L	L
CO5	S	M	L		L							L	M	L	L
CO6	S	S	M	L	S	M		L	M			S	S	S	L

S- Strong; M-Medium; L-Low

*CO6 will be assessed through Mini Project / Assignment

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	30	20	20	0	0	0	20
Understand	20	20	20	0	0	0	20
Apply	50	60	60	100	100	60	60
Analyze	0	0	0	0	0	40	0
Evaluate	0	0	0	0	0	0	0
Create	0	0	0	0	0	0	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Assignment/Practical Component
Perception	-
Set	-
Guided Response	-
Mechanism	60
Complex Overt Responses	40
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):

1. Discuss the Issues and challenges in Data Mining.
2. Describe different types of data and give an example for each.
3. Explain various stages of KDD.

Course Outcome 2 (CO2):

1. Predict min – max normalization for the variable call duration and transform it to the range between [0.0 ,0.1]

User Id	Calls Duration	SMS	Data Counter
1	25000	24	4
2	49000	27	5
3	55000	32	7
4	27000	25	6
5	53000	30	5

2. Suppose that the data for analysis includes the attribute age. The age values for the data tuples are 75, 63, 55, 47, 77, 48, 63, 54, 60, 38, and 54.
   a. Find the mean, median and mid-range of the data.
   b. Can you find (roughly) the first quartile (Q1) and the third quartile (Q3) of the data?
   c. What is the mode of the data? Comment on the data's modality (i.e., bimodal, trimodal, etc.).
   d. Show a boxplot of the data.
   e. How is a quantile-quantile plot different from a quantile plot?

3. In a certain town, there are about one million eligible voters. A simple random sample of 10000 eligible voters was chosen to study the relationship between sex and participation in the last election. The results are summarized in the following 2 x 2 (read two by two) contingency table: check whether a man or a woman (columns) is independent of having voted in the last election (rows). In other words is "sex and voting independent"?

	Men	Women
Voted	2792	3591
Didn't Vote	1486	2131

Course Outcome 3 (CO3):

1. Take a look at the following table, where *T1*, *T2*, *T3*, *T4*, *T5*, and *T6* are the transaction ID's, and *A*, *B*, *C*, *D*, and *E* are the item ID's. Let the min_support = 20% and min_conf = 60%. Find all frequent item set using Apriori Algorithm and List all the strong association rules.

Transaction ID	*List of Item ID's*
T1	*A*, *B*, *E*
T2	*B*, *C*, *D*
T3	*B*, *D*, *E*
T4	*C*, *D*, *E*
T5	*B*, *C*, *D*, *E*
T6	*B*, *C*, *E*

2. A Database has seven transactions. Let *min_sup*=30% and *min_conf*=80%. Find all the frequent itemset using FP tree algorithm. Also list all the strong association rules.

T1: Beef, Chicken, Milk

T2: Beef, Cheese

T3: Cheese, Boots

T4: Beef, Chicken, Cheese

T5: Beef, Chicken, Clothes, Cheese, Milk

T6: Chicken, Clothes, Milk

T7: Chicken, Milk, Clothes

3. Illustrate how minimum support thresholds are defined at each level of abstraction, such as uniform support, reduced support, and group-based support. Explain multi dimensional and cluster based association rule mining.

Course Outcome 4 (CO4):

1. Consider the following phone purchasing database, let's phone_category is the class label. Construct the Decision Tree Using 'Gain Ratio' attribute selection Measures.

Screen	**SIM**	**Camera**	**RAM**	**Class: Phone_ Category**	**Screen**	**SIM**	**Camera**	**RAM**	**Class : Phone_ Category**
5.2 inch	Single	12 MP	2GB	Cheap	5.1 inch	Dual	12 MP	4 GB	Costly
5.7 inch	Single	16 MP	4GB	Costly	5.1 inch	Dual	16 MP	3GB	Costly
5.7 inch	Single	12MP	2GB	Cheap	5.7 inch	Single	16 MP	3GB	Costly
5.5 inch	Single	12 MP	4 GB	Cheap	5.5 inch	Dual	16 MP	4GB	Costly

2. Compute the value of 'Profit' attribute for the following test tuple using Naïve bayes Classification. X = (Age = Middle-aged, Competition = Yes, Type = Hardware, Profit = ?)

Age	Competition	Type	Profit
Senior	Yes	Software	Down
Senior	No	Software	Down
Senior	No	Hardware	Down
Middle-aged	Yes	Software	Down
Middle-aged	Yes	Hardware	Down
Middle-aged	No	Hardware	Up
Middle-aged	No	Software	Up
Youth	Yes	Software	Up
Youth	No	Hardware	Up

3. Let x_i indicates Height and y_i indicates weight. What linear regression equation best predicts Weight based on Height?

X_i=Height (in cm) : 160,151, 174, 138, 186, 136, 179, 163, 152,170
Y_i=Weight (in kg) : 55, 63, 81, 56, 91, 57, 76, 72, 62,73

If a person has i) 155cm height ii) 139cm height iii) 190cm height, what weight would we expect? Also recall when linear regression and logistic regressions are used?

Course Outcome 5 (CO5):

1. Cluster the following flower data set into 3 clusters. The distance function is Euclidean distance. Use K-Means algorithm to show the final three clusters

Flower No	Sepal Length	Sepal Width	Petal Length	Petal Width
1.	5.1	3.5	1.3	0.2
2.	4.6	3.1	1.4	0.2
3.	4.5	2.3	1.5	0.2
4.	7.0	3.2	1.7	0.4
5.	5.2	2.7	1.4	0.1
6.	5.7	2.8	1.5	0.3
7.	6.5	3.0	1.7	0.2
8.	6.9	3.1	1.4	0.3

.

2. Consider ε = 3 units and Minpts = 4. Apply the DBSCAN algorithm to cluster the following points: A(2,2), B(3,1), C(3,4), D(5,3), E(9,8), F(10,7), G(10,10), H(12,8), I(3,14), J(10,14), K(11,13), L(12,15), M(14,15).

3. Apply COBWEB Algorithm to cluster the following dataset. Also Analyze in what way, the working of COBWEB algorithm is differed from Partition and Hierarchical Clustering Algorithms.

Object Identifier	**Gender**	**Fever**	**Cough**
A	Male	Y	N
B	Female	N	N
C	Male	Y	Y
D	Female	Y	N

Course Outcome 6 (CO6):

*CO6 will be assessed through Mini Project / Assignment

Guidelines for the Mini-Project:

Group formation: Students are split into project groups with around 3 members in each group. A team can execute the project using appropriate data mining algorithms and improve the efficiency of the algorithm by pre-processing methods using any of the data mining software like R tool, Rapid Miner and python etc.

At the end of the semester, the team members have to present their project, submit their report and share their lessons learnt/best practices with other teams. Some of the activities may include: (but not limited to)

✓Application identification and data set collection

✓Selecting relevant data mining algorithm to extract knowledge from the data set

✓Design diagram / Data Modeling

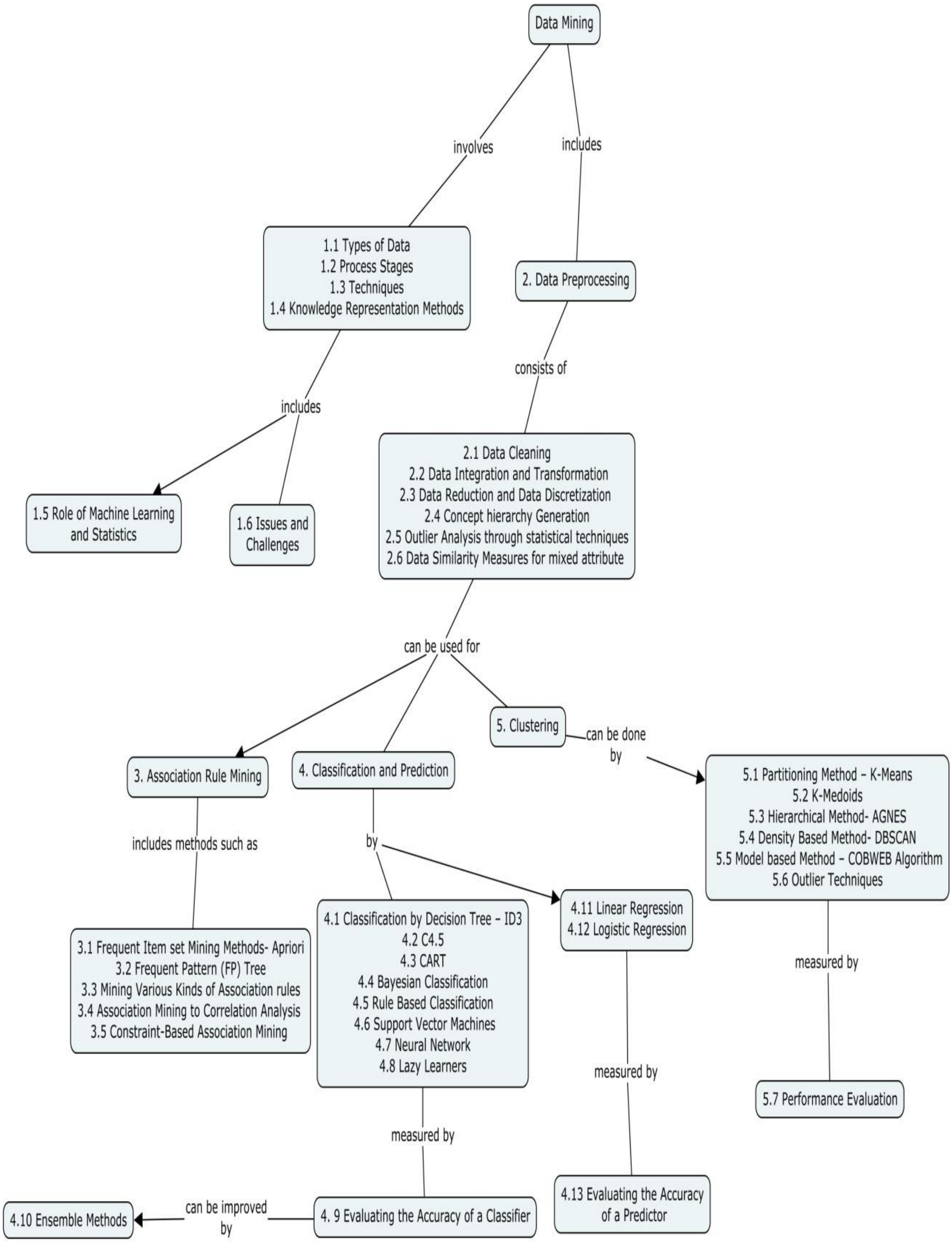
✓Results and performance analysis for the chosen data mining technique

✓Documentation

Some of the Mini-project titles may include: (but not limited to)

- Financial Data Analysis
- Retail Industry
- Telecommunication Industry
- Biological Data Analysis
- Other Scientific Applications
- Intrusion Detection
- Healthcare
- Market Basket Analysis
- Education
- CRM- Customer Relationship Management

Concept Map


Data Mining
involves
includes
1.1 Types of Data
1.2 Process Stages
1.3 Techniques
1.4 Knowledge Representation Methods
2. Data Preprocessing
consists of
includes
2.1 Data Cleaning
2.2 Data Integration and Transformation
2.3 Data Reduction and Data Discretization
2.4 Concept hierarchy Generation
2.5 Outlier Analysis through statistical techniques
2.6 Data Similarity Measures for mixed attribute
1.5 Role of Machine Learning and Statistics
1.6 Issues and Challenges
can be used for
5. Clustering
can be done by
3. Association Rule Mining
4. Classification and Prediction
5.1 Partitioning Method – K-Means
5.2 K-Medoids
5.3 Hierarchical Method- AGNES
5.4 Density Based Method- DBSCAN
5.5 Model based Method – COWEB Algorithm
5.6 Outlier Techniques
includes methods such as
by
4.11 Linear Regression
4.12 Logistic Regression
3.1 Frequent Item set Mining Methods- Apriori
3.2 Frequent Pattern (FP) Tree
3.3 Mining Various Kinds of Association rules
3.4 Association Mining to Correlation Analysis
3.5 Constraint-Based Association Mining
4.1 Classification by Decision Tree – ID3
4.2 C4.5
4.3 CART
4.4 Bayesian Classification
4.5 Rule Based Classification
4.6 Support Vector Machines
4.7 Neural Network
4.8 Lazy Learners
measured by
measured by
5.7 Performance Evaluation
measured by
4.10 Ensemble Methods
can be improved by
4. 9 Evaluating the Accuracy of a Classifier
4.13 Evaluating the Accuracy of a Predictor

Syllabus

Module No	Topic	No. of Lecture Hours	Course Outcome

Data Mining: Types of Data - Process Stages – Techniques - Knowledge Representation Methods - Role of machine learning and statistics - Issues and challenges in Data Mining.

Data Pre-processing: Data Cleaning - Data Integration and Transformation - Data Reduction and Data Discretization - Concept hierarchy Generation - Outlier Analysis through statistical techniques - Data Similarity Measures for mixed attribute - Case Study.

Association Rule Mining: Frequent Item set Mining Methods- Apriori, Frequent Pattern (FP) Tree - Mining Various Kinds of Association rules - Association Mining to Correlation Analysis - Constraint-Based Association Mining-—Case Study**.**

Classification: Classification by Decision Tree **–** ID3, C4.5, CART - Bayesian Classification, Laplacian Correction in Bayesian algorithm - Rule Based Classification - Support Vector Machines - Neural Network - Lazy learners - Evaluating the Accuracy of a Classifier- Ensemble Methods**-** Case Study.

Prediction: Linear Regression - Logistic Regression model - Evaluating the Accuracy of a Predictor -Case Study.

Clustering: Partitioning Method – K-Means, K-Medoids - Hierarchical Method- AGNES, Density Based Method- DBSCAN - Model based Method – COBWEB Algorithm - Outlier Techniques - Performance Evaluation - Case Study**.**

Learning Resources

- Jiawei Han, Micheline Kamper, Jian Pei, “Data Mining: Concepts and Techniques”, Morgan Kaufman, Third Edition, 2011.
- Parteek Bhatia , “Data Mining and Data Warehousing: Principles and Practical Techniques”, Cambridge University Press, First Edition, 2019.
- ArunK.Pujari, “Data Mining Techniques”, Universities Press, Third Edition, 2013.
- Ian H.Witten, Eibe Frank, Mark.A. Hall, “Data Mining Practical Machine Learning Tools and Techniques”, Elsevier, Fourth Edition, 2016.
- AdelchiAzzalini, Bruno Scarpa, “Data Analysis and Data Mining: An Introduction”, Oxford University Press, Third Edition, 2012.
- G. K. Gupta, “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall India Learning Private Limited, Second edition, 2011.
- https://nptel.ac.in/courses/106/105/106105174/ - Data Mining by Prof. Pabitra Mitra, IIT Kharagpur.

Course Contents and Lecture Schedule

1	**DATA MINING**		
1.1	Types of Data	1	CO1
1.2	Process Stages		
1.3	Data Mining Techniques	1	
1.4	Knowledge Representation Methods	1	
1.5	Role of machine learning and statistics		
1.6	Issues and challenges in Data Mining	1	
2	**DATA PREPROCESSING**		
2.1	Data Cleaning	1	CO2
2.2	Data Integration and Transformation	2	
2.3	Data Reduction and Data Discretization	1	
2.4	Concept hierarchy Generation	1	
2.5	Outlier Analysis through statistical techniques	1	
2.6	Data Similarity Measures for mixed attribute	2	
3	**ASSOCIATION RULE MINING**		
3.1	Frequent Item set Mining Methods- Apriori	2	CO3
3.2	Frequent Pattern (FP) Tree	2	
3.3	Mining Various Kinds of Association rules	1	
3.4	Association Mining to Correlation Analysis	2	
3.5	Constraint-Based Association Mining		
4	**CLASSIFICATION AND PREDICTION**		
4.1	Classification by Decision Tree – ID3	1	CO4
4.2	C 4 .5	1	
4.3	CART	1	
4.4	Bayesian Classification, Laplacian Correction in Bayesian algorithm	1	
4.5	Rule Based Classification	1	
4.6	Support Vector Machines		
4.7	Neural Network	1	
4.8	Lazy learners	1	
4.9	Evaluating the Accuracy of a Classifier	1	CO6
4.10	Ensemble Methods		
4.11	Linear Regression	2	CO4
4.12	Logistic Regression model		
4.13	Evaluating the Accuracy of a Predictor		CO6
5	**CLUSTERING**		
5.1	Partitioning Method – K-Means	1	CO5
5.2	K-Medoids	1	
5.3	Hierarchical Method- AGNES	1	
5.4	Density Based Method- DBSCAN		
5.5	Model based Method – COBWEB Algorithm	1	
5.6	Outlier Techniques	2	
5.7	Performance Evaluation	1	CO6

	Total Lectures	**36**	

Course Designers:

1. S. Sridevi sridevi@tce.edu
2. A. Sheik Abdullah asait@tce.edu
3. E. Ramanujam erit@tce.edu

18IT540	ACCOUNTING AND FINANCE

Category	L	T	P	Credit
HSS	3	0	0	3

Preamble

Engineering profession involves lots of decision making. The decisions may range from operation to non-operation. For taking decisions of these kinds, an engineer needs among other data about the organization routine operations and non-routine operations. Accounting is a science which provides all the data by recording, classifying, summarizing and interpreting the various transactions taking place in an organization and thereby helps an engineer in taking vital decisions in an effective manner. Finance is an allied but a separate field relying on accounting and enables engineers in taking useful financial and cost related decisions by providing well defined concepts, tools and techniques

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Prepare financial statements, common size statements and comparative statements.	20
CO2	Perform cost sheet, depreciation and its applications in business.	15
CO3	Compute various types of budgets in an organization	15
CO4	Practice break even analysis and activity based costing systems for a business applications.	15
CO5	Compute working capital requirements and long term investment decisions.	20
CO6	Apply the appropriate sources of finance and mobilize the right quantum of finance and use them in most profitable investment avenues	15

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1,3.2, 4.1.1, 4.1.2, 4.4.5, 4.6.5
CO2	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1,3.2, 4.1.1, 4.1.2, 4.4.5, 4.6.5
CO3	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1,3.2, 4.1.1, 4.1.2, 4.4.5, 4.6.5
CO4	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1,3.2, 4.1.1, 4.1.2, 4.4.5, 4.6.5
CO5	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1,3.2, 4.1.1, 4.1.2, 4.4.5, 4.6.5
CO6	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1,3.2, 4.1.1, 4.1.2, 4.4.5, 4.6.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	M	L	-	-	M	S	M	S	S	S	S	M	M
CO2	S	M	L	-	-	-	M	M	S	S	S	M	M	M
CO3	S	M	L	-	-	-	-	S	S	S	S	S	M	M
CO4	M	M	L	-	M	M	L	S	S	S	S	M	-	S
CO5	M	M	L	-	S	M	M	S	S	S	M	M	-	-
CO6	L	M	L	-	-	M	M	S	M	M	M	S	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	20	20	20	-	-	-	20
Understand	30	30	30	-	-	-	20
Apply	50	50	50	100	100	100	60
Analyse	-	-	-	-	-	-	-
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	**Mini project/Assignment/Practical Component**
Perception	
Set	
Guided Response	
Mechanism	Assignment
Complex Overt Responses	
Adaptation	
Origination	

Sample Questions for Course Outcome Assessment**

Course Outcome 1(CO1):

1. Prepare Trading Account, Profit and Loss Account and Balance Sheet from the following

S.NO	PARTICULARS	Debit balances (in Rs)	Credit balances(in Rs)
1	Capital		300000
2	Bank	15000	
3	Plant and machinery	40000	
4	Land and building	60000	
5	Debtors	20000	
6	Creditors		40000
7	Cash	70000	
8	Purchases and sales	35000	50000

9	Purchase returns and sales returns	7000	4000
10	Bills receivable	3000	
11	Bills payable		5000
12	Wages	40000	
13	Salaries	30000	
14	Discount		4000
15	Stock on Jan 2017	10000	
16	Furniture	7000	
17	Carriage inwards	5000	
18	Carriage outwards	6000	
19	Advertising	10000	
20	Travelling expense	3000	
21	Loans		60000
22	Vans	100000	
23	Telephone	2000	
	Total	**463000**	**463000**

2. From the following particulars, prepare comparative balance sheet of Malar Ltd as on 31st March 2017 and 31st March 2018.

Particulars	31st March 2017	31st March 2018
I EQUITY AND LIABILITIES		
1. Shareholders' fund		
a) Share capital		
b) Reserves and surplus	2,00,000	2,50,000
2. Non-current liabilities	50,000	50,000
Long-term borrowings		
3. Current liabilities	30,000	60,000
Trade payables		
	20,000	60,000
Total	**3,00,000**	**4,20,000**
II ASSETS		
1. Non-current assets		
a) Fixed assets	1,00,000	1,50,000
b) Non - current investments	50,000	75,000
2. Current assets		
a)Inventories	75,000	1,50,000
b) Cash and cash equivalents	75,000	45,000
Total	**3,00,000**	**4,20,000**

Course Outcome 2(CO2):

1. Classify the cost according to function.
2. Prepare cost sheet in the book of Vimi from the following particulars.

Opening stock: -	Raw material	=	Rs 5,000
	Finished goods	=	Rs 4,000
Closing stock:	Raw material	=	Rs 4,000
	Finished goods	=	Rs 5,000

Raw material purchased	=	Rs 50,000
Wages paid to laboures	=	Rs 20,000
Chargeable expenses	=	Rs 2,000
Rent and Taxes	=	Rs 7,400
Power	=	Rs 3,000
Experimental expenses	=	Rs 600

Sale of wastage of material	=	Rs 200
Office management salary	=	Rs 4,000
Office printing & stationery	=	Rs 200
Salaries to salesman	=	Rs 2,000
Commission to traveling agents	=	Rs 1,000
Sales	=	Rs 1, 00,000

Course Outcome 3(CO3):

1. Explain the advantages and applications of budgetary control.
2. From the forecast of income and expenditure prepare a cash budget for the months from April to June 2019.

Month	Sales Rs	Purchases Rs	Wages Rs	Office expenses Rs	Selling expenses Rs
Feb	70,000	45,000	4,500	2,700	1,800
Mar	72,000	43,000	4,700	3,000	2,000
Apr	75,000	44,000	4,900	2,900	2,200
May	71,000	40,000	5,000	3,000	2,100
Jun	70,000	42,000	5,000	2,800	1,900

- Plant worth Rs25, 000 purchased in June. 40% payable immediately and the remaining in two equal instalments in subsequent months.
- Advance tax payable in April Rs 4500
- Period of credit allowed
  - By suppliers 2 months
  - To customer 1 month
- Dividend payable Rs 7000 in June
- Delay in payment of wages and office expenses 1 month and selling expenses 1 month. Expected cash balance on 1st April Rs 30,000

Machinery expected to sell on May is Rs 20,000

Course Outcome 4 (CO4):

1. From the following information calculate the Breakeven point in terms of units and breakeven point in terms of sales. Sales....Rs.10,000, Variable costs Rs.6,000,fixed costs Rs.2000:profit Rs.2,000;No. Of units produced 1,000 units.
2. Calculate the breakeven point and margin of safety from the following information Fixed cost .Rs.10,000, sales in Rs.25,000,selling price per unit Rs.30; variablecost per unit Rs.10.

Course Outcome 5(CO5):

1. From the following information extracted from the books of a manufacturing company, compute the operating cycle in days and the amount of working capital required:

Period Covered	365 days
Average period of credit allowed by suppliers	16 days
Average Total of Debtors Outstanding	480
Raw Material Consumption	4,400

Total Production Cost	10,000
Total Cost of Sales	10,500
Sales for the year	16,000
Value of Average Stock maintained:	
Raw Material	320
Work-in-progress	350
Finished Goods	260

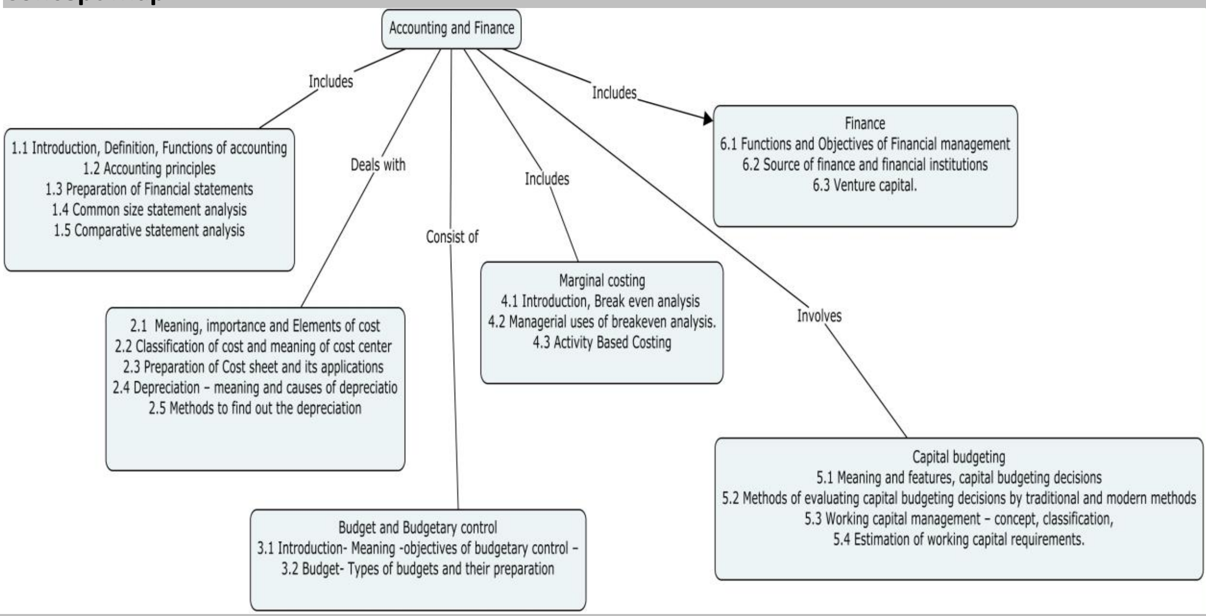
2. From the following data of a project, Calculate IRR and suggest whether the project is to be undertaken or not if the cut off rate is 9%.

Cash Out flow (Rs.)		1,50,000
Cash Inflow(Rs.)	**Year 1**	41,000
	Year 2	50,000
	Year 3	50,000
	Year 4	42,000

Course Outcome 6(CO6):

1. Analyse the sources of finance to start small scale business.
2. Suggest suitable sources of finance to start a business with a capital of 60 crores.

Concept Map



Syllabus

Accounting Introduction definition, functions of accounting, accounting principles. Preparation of financial statements and study them with common size and comparative statements.

Cost Accounting - Meaning and importance -Elements of cost- classification of cost- Cost centre, Preparation of cost sheet and its applications .Depreciation – meaning and causes of depreciation, Methods to find out the depreciation

Budget and Budgetary control- Introduction-Meaning -objectives of budgetary control – Budget-Types of budgets and their preparation.

Marginal costing- Introduction, Break even analysis –Managerial of breakeven analysis. Activity based Costing.

Capital budgeting- Meaning and features, capital budgeting decisions, Methods of

evaluating capital budgeting decisions by traditional and modern methods. Working capital management - concept, classification, and Estimation of working capital requirements.
Finance: Functions, Objectives of financial management and Sources of finance and financial institutions, Venture capital.

Module No	Topic	No. of Lectures	Cos
1	**Accounting**		CO1
1.1	Introduction, Definition, Functions of accounting	1	
1.2	Accounting principles	1	
1.3	Preparation of Financial statements	3	
1.4	Common size statement analysis	1	
1.5	Comparative statement analysis	1	
2	**Cost Accounting**		CO2
2.1	Meaning, importance and Elements of cost	1	
2.2	classification of cost and meaning of Cost centre,	1	
2.3	Preparation of Cost sheet and its applications	3	
2.4	Depreciation – meaning and causes of depreciation	1	
2.5	Methods to find out the depreciation	2	
3	**Budget and Budgetary control**		CO3
3.1	Introduction- Meaning -objectives of budgetary control –	1	
3.2	Budget- Types of budgets and their preparation	4	
4	**Marginal costing**		CO4
4.1	Introduction, Break even analysis	2	
4.2	Managerial uses of breakeven analysis.	1	
4.3	Activity Based Costing	2	
5	**Capital budgeting**		CO5
5.1	Meaning and features, capital budgeting decisions	1	
5.2	Methods of evaluating capital budgeting decisions by traditional and modern methods	4	
5.3	Working capital management – concept, classification,	1	
5.4	Estimation of working capital requirements.	1	
6	**Finance**		CO6
6.1	Functions and Objectives of Financial management	1	
6.2	Sources of finance and financial institutions	3	
6.3	Venture capital.	1	
	Total	**36 hrs**	

Learning Resources

1. M.C.Shukla,T.S.Grewal,“AdvancedAccounts-Volume-I,2010 Reprint, S. Chand & company Ltd.,2010.
2. Prasanna Chandra, “Financial Management-Theory and practice” seventh Reprint,Tata McGraw-Hill publishing company Limited,2010.
3. P.S.BoopathiManickam “Financial and Management Accounting” PSG publications 2009.
4. Don R. Hansen and Maryanne M. Mowen “Cost Management: Accounting and Control, Fifth Edition” Thomson, 2006.
5. Michael C . Ehrhardt and Eugene F . Brigham, “Financial Management: Theory and Practice -thirteenth edition” South-Western cengage learning, 2011
6. Pandey, “Financial Management”, Vikas Publishing House Pvt. Ltd., 2007
7. Paramasivan.C, Subramanian.T, “Financial management” New Age international Publishers, 2014.

8. https://nptel.ac.in/courses/110/106/110106135/: Decision making using financial accounting, Prof. G Arun Kumar, IIT Madras
9. https://nptel.ac.in/courses/110/101/110101131/ : Financial Accounting, Dr. Varadraj Bapat, IIT Bombay.
10. https://nptel.ac.in/courses/110/107/110107127/: Management Accounting, Prof. Anil K. Sharma, IIT Roorkee.
11. https://www.youtube.com/watch?v=P9JIBbZas3w: Introduction to accounting, Dr.S.Vaidhyasubramanian, Adjunct professor, Sastra University.

Course Designers:

1.	Mr.B.Brucelee	bbmech@tce.edu
2.	Dr.R.Sivasankaran	rssmech@tce.edu
3.	Mr.S.Rajkumar	srmech@tce.edu

18IT570	WEB TECHNOLOGIES LAB	Category	L	T	P	Credit
		PC	0	0	2	1

Preamble

The objective of this laboratory is to motivate the students to learn how to choose their communication approach by considering platform, dynamically updating the web contents based on the client requirements. It provides strong foundation in scripting languages, XML and web developer tools. This course emphasizes the working principles of web services and security.

Prerequisite

- NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Construct web page design using HTML5 tags.	13
CO2	Develop static webpage and provide aesthetic view using CSS.	13
CO3	Develop web based data exchange applications using XML in distributed environment	17
CO4	Develop web based applications using appropriate framework and technologies.	29
CO5	Build web services using REST APIs	8
CO6	Analyze different types of injection flaws in web applications	20

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.1.3, 2.1.5, 2.2.3, 2.3.3, 2.3.4,3.2.3
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.5, 2.3.4, 2.2.3, 3.2.3
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.2.3, 2.3.1, 3.1.1, 3.2.3
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.2.3, 2.3.1, 3.1.1, 3.2.3
CO5	TPS3	Create	Characterize	Origination	1.2, 2.1.1, 2.1.2, 2.2.3, 2.3.1, 3.1.1, 3.2.3
CO6	TPS4	Analyze	Organise	Complex Overt Response	1.2, 3.1.5, 2.3.3, 2.3.4, 3.2.3, 2.2.3, 3.2.6

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		S	L			S	S			M	M	L
CO2	S	M	L			M			S	S	M	M	M	L	M
CO3	S	M	L		S	M			S	S	L	L	M	S	M
CO4	S	M	L		M			M	L			M	M	L	L
CO5	S	S	S	S	S	M	L	L	S	S	M	M	S	S	M
CO6	S	S	M	L	S				S	S	L	L	S	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	-	-
Understand	-	-
Apply	60	70
Analyse	20	10
Evaluate	10	10
Create	10	10

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Practical Component/Observation
Perception	-
Set	-
Guided Response	10
Mechanism	50
Complex Overt Responses	10
Adaptation	10
Origination	10

List of Experiments / Activities with CO Mapping

S.No	List of experiments	Course Outcomes	Total lecture hours
1.	Basic – HTMS 5 & CSS3 tags	CO1,CO2	2
2.	Develop Static web site using HTML5.	CO1	2
3.	Provide the aesthetic view using CSS 3.	CO2	2
4.	Design XML document – formatting, styling, schema	CO3	4
5.	Develop Back-end of application	CO4	4
6.	Front end for server side applications	CO4	3
7.	Convert back-end into RESTful service	CO5	2
8.	Hijack a session between server and client (Intercept the traffic, Attain a session, ARP Poisoning, Modify Cookies and Hijack a session)	CO6	3
9.	Simulation of SQL injection using DVWA Tool	CO6	2
	Total Lab Hours		**24**

Learning Resources

1. Getting started with Github by Peter Bell, Brent Beer, O'Reilly, 2014
2. Learning PHP, MySQL, JavaScript, CSS & HTML5 by Robin Nixon, O'Reilly 3rd Edition, 2014
3. Achyut S Godbole and Atulkahate, "Web Technologies", Tata McGraw Hill, Second Edition, 2008.
4. RESTful Web Services by Leonard Richardson & Sam Ruby. O'Reilly, 2007
5. DafyddStuttard, Marcus Pinto, "The Web Application Hacker's Handbook, Wiley Publishing, Inc, Second Edition, 2011.
6. https://angularjs.org/
7. https://www.javatpoint.com/restful-web-services
8. https://www.cs.uct.ac.za/mit_notes/web_programming.html
9. https://crypto.stanford.edu/cs155/syllabus.html
10. http://www.comp.nus.edu.sg/~prateeks/teaching/sp16/cs5331-sp16.html

Course Designers:

1. R.Suganya rsuganya@tce.edu
2. C.Santhiya csit@tce.edu

18IT580	INFORMATION SECURITY LAB

Category	L	T	P	C
PC	0	0	2	1

Preamble

The laboratory course on Information security aims to provide hands on experience in using various crypto libraries for securing computer applications. Practical exposure on usage of various network security tools for analyzing security vulnerabilities and protection is provided.

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Utilize symmetric and public key cryptography to offer confidentiality in simple application development	21
CO2	Perform message and entity authentication using hashing and digital signatures	13
CO3	Use standard crypto libraries for crypt analysis	12
CO4	Configure and manage network defense tools like Firewalls and Intrusion Detection Systems	21
CO5	Identify software vulnerabilities such as SQL injection and provide solutions for prevention and detection	12
CO6	Analyze the network attacks and identify the malwares in the network	21

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.1.5, 2.3.1, 2.5.1, 3.1.1, 3.2.2, 3.2.3
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.1.5, 2.3.1, 2.5.1, 3.1.1, 3.2.2, 3.2.3
CO3	TPS4	Analyze	Organize	Complex Overt Response	1.2, 2.1.1, 2.1.2, 2.1.5, 2..13, 2.4.4, 2.5.1, 3.1.1, 3.2.2, 3.2.3
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.2.3, 2.3.1, 2.4.1, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 4.1.1, 4.2.2, 4.5.5
CO5	TPS4	Analyze	Organize	Complex Overt Response	1.2, 2.1.1, 2.1.2, 2.1.5, 2.3.1, 2.4.4, 2.5.1, 3.1.1, 3.2.2, 3.2.3
CO6	TPS4	Analyze	Organize	Complex Overt Response	1.2, 2.1.1, 2.1.2, 2.1.5, 2.3.1, 2.4.4, 2.5.1, 3.1.1, 3.2.2, 3.2.3

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO3

CO 1	S	M	L		M			M	L			M	M	M	L
CO 2	S	M	L		M			M	L			M	M	M	L
CO 3	S	S	M	L	M			M	L			M	S	M	L
CO 4	S	M	L		M			M	L			M	M	M	L
CO 5	S	S	M	L	M			M	L	L		M	S	M	L
CO 6	S	S	M	L	M			M	L	L		M	S	M	L

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember		
Understand		
Apply	60	60
Analyse	40	40
Evaluate		
Create		

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Practical Component/Observation
Perception	
Set	
Guided Response	
Mechanism	50
Complex Overt Responses	50
Adaptation	
Origination	

List of Experiments/Activities with CO Mapping

Exp No.	Topic	No. of Lab Hours	COs
1	Implementation and Crypt analysis of Hill Cipher	2	CO1/ CO3
2	Develop a secure client server communication using symmetric key algorithms (Use Standard crypto Libraries)	2	CO1/C O3
3	Implement RSA cryptosystem with key management	2	CO1/ CO3
4	Verify integrity of client server communication using Hashing techniques	3	CO2
5	Perform Man in the middle attack in Diffie Hellman Key Exchange protocol	2	CO1
6	Perform password extraction, cracking and recovery from target system	1	CO4
7	Simulation of SQL Injection attack - Testing Web applications for SQL injection vulnerabilities, Scanning web servers, analyzing logs, Securing web application	3	CO5
8	Configuration of Firewalls in system environment / using OPNET or	1	CO4

	equivalent tool.		
9	Simulation of Virtual Private Network using OPNET or equivalent tool.	1	CO4
10	Security analysis of network traffic using Wireshark or equivalent tool.	1	CO4
11	Configure Intrusion Detection System tool for monitoring events in a host to detect malicious activities.	1	CO4
12	Creation, Detection and Prevention of Buffer overflow attack	1	CO6
13	Post attack analysis as Incidence Response	1	CO6
14	Study on detection and analyzes of Malwares	1	CO6
15	Study on software tool used to validate Internet Security Protocols and Applications (AVISPA or equivalent tools)	2	CO6
	Total Lab Hours	**24**	

Learning Resources

1. Michael Gregg, “The Network Security Test Lab”, Wiley Publication, 2015.
2. Randall Boyle, Jeffery G.Proudfoot, “Applied Information Security”, Second Edition, Pearson Publication, 2013.

Course Designers

1.	C.Jeyamala	jeyamala@tce.edu
2.	M.Thangavel	mtit@tce.edu
3.	S.Sujitha	sujithait@tce.edu

18ES590	SYSTEM THINKING

Category	L	T	P	Credit
ES	1	-	2	2

Preamble

Systems thinking is the integrated paradigm for systems science and system approaches to practice. It is concerned with understanding or intervening in problem situations, based on the principles and concepts of the system model. It can help to provide a common language and an intellectual foundation and make practical system concepts, principles, patterns and tools accessible to systems engineering. System thinking considers the similarities between systems from different domains in terms of a set of common systems concepts, principles, and patterns. The scope of systems thinking is a starting point for dealing with real-world situations using a set of related systems concept. The system thinking is viewed as both a set of founding ideas for the development of systems theories and practices and also as a pervasive way of thinking need by those developing and applying them. This systems approach is a way of tackling real-world problems and making use of the concepts, principle, patterns of systems thinking to enable the systems to be engineered and used.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Explain the concepts of systems thinking, System engineering and Systems Life Cycle	10
CO2	Identify system elements, interactions, boundary and environment for the given system descriptions	10
CO3	Develop a functional architecture with appropriate primary function(s) and sub-functions of the identified system	15
CO4	Develop a physical architecture with appropriate sub-systems and components of the identified system	15
CO5	Prepare a system requirement specification review documents for the various stages of acquisition phase of the identified system	20
CO6	Develop a system model with logical and physical architecture using system modelling tool like SysML	30

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	-	1.1, 2.3.1, 2.3.2
CO2	TPS3	Apply	Value	-	1.1, 2.1.1, 2.3.1,2.3.2, 2.3.3, 2.3.4, 2.4.4, 4.3.1,
CO3	TPS3	Apply	Value	Mechanism	1.1, 2.1.1, 2.3.1,2.3.2, 2.3.3, 2.3.4, 2.4.4, 3.1.2, 3.2.3, 3.2.4, 3.2.5, 3.2.6, 4.3.1, 4.3.2, 4.3.3, 4.4.5, 4.5.1
CO4	TPS3	Apply	Value	Mechanism	1.1, 2.1.1, 2.3.1,2.3.2, 2.3.3, 2.3.4, 2.4.4, 3.1.2, 3.2.3, 3.2.4, 3.2.5, 3.2.6, 4.3.1, 4.3.2, 4.3.3, 4.4.5, 4.5.1
CO5	TPS3	Apply	Value	Mechanism	1.1, 2.1.1, 2.3.1,2.3.2, 2.3.3,

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
					2.3.4, 2.4.4, 3.1.2, 3.2.3, 3.2.4, 3.2.5, 3.2.6, 4.3.1, 4.3.2, 4.3.3, 4.4.5, 4.5.1
CO6	TPS3	Apply	Value	Mechanism	1.1, 2.1.1, 2.3.1,2.3.2, 2.3.3, 2.3.4, 2.4.4, 3.1.2, 3.2.3, 3.2.4, 3.2.5, 3.2.6, 4.3.1, 4.3.2, 4.3.3, 4.4.5, 4.5.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	-	-	-	-	-	-	-	-	-	-
CO2	S	M	L	-	-	L	L	L	L	L	-	M
CO3	S	M	L	-	-	M	M	M	L	M	M	S
CO4	S	M	L	-	-	M	M	M	L	M	M	S
CO5	S	M	L	-	-	M	M	M	L	M	M	S
CO6	S	M	L	-	S	M	M	M	L	M	M	S

S- Strong; M-Medium; L-Low

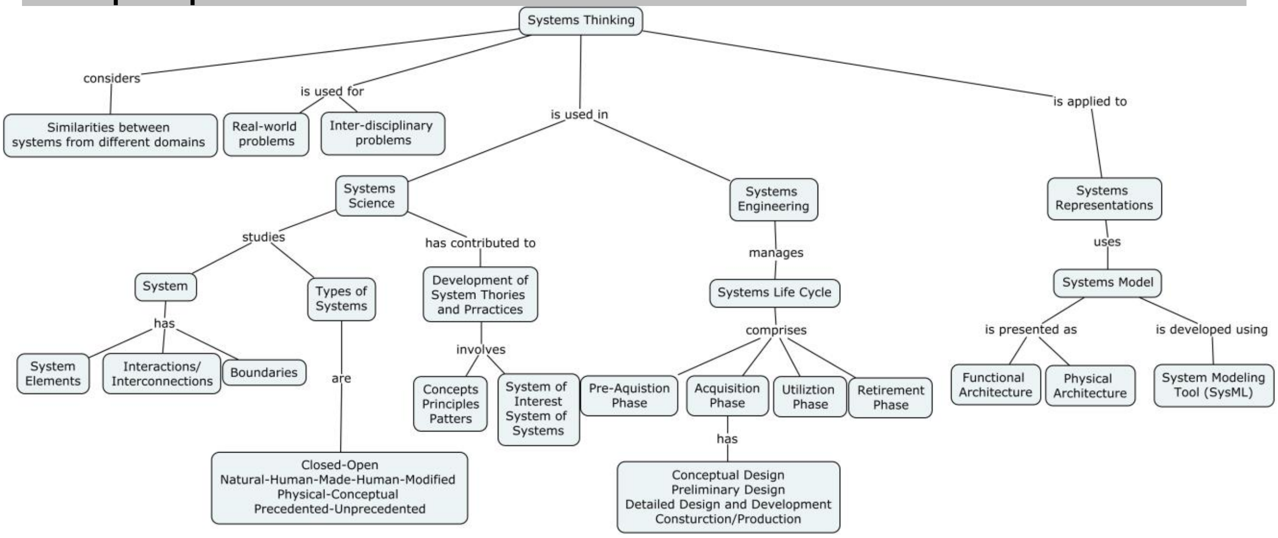
Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Test -2
Remember	20
Understand	40
Apply	40
Analyse	-
Evaluate	-
Create	-

Phases	Deliverables	Marks	Course Outcomes
Continuous Assessment			
Continuous Assessment Test-1		10	CO1 and CO2
Review 1 – Functional & Physical Architecture and System Requirement Specification	Technical Report	25	CO3, CO4 and CO5
Review 2 – Systems Modeling	Technical Report	15	CO6
End-Semester Examination			
Demonstration	Virtual Prototype with simulation	60	CO1, CO2, CO3, CO4 CO5 and CO6
Poster Presentation	Poster	40	

- Reports are to be submitted at each review. The report and presentation will be evaluated based on Rubrics.
- Demonstration of Virtual Prototype with simulation and Poster presentation will be evaluated by two faculty members nominated by their respective Head of the Department.

Concept Map



Syllabus

1.0 Systems Fundamentals: System - Definition, System Elements, Interactions, System Boundary, - Types of Systems: Closed-Open, Natural-Human-Made-Human-Modified, Physical-Conceptual and Precedented-Unprecedented. Systems science - Systems approaches. Systems Thinking: Concepts, principles and pattens. System of Interest - Systems of System. Systems Engineering: Product, Service, Enterprise. System Life Cycle: Pre-acquisition phase, Acquisition Phase, Utilization Phase and Retirement Phase.
2.0 Acquisition Phase: Conceptual Design: Business needs and requirements, Stakeholder needs and requirements, System Requirement Specification, Functional Base Line, System Requirement Review – Functional Architecture. Preliminary Design: Configuration items, Allocated Baseline, Preliminary Design Review – Physical Architecture. Detailed Design and Development: System Modeling, Product Base Line, Critical Design Review. Construction/Production: Formal Qualification Review, Acceptance Test and Evaluation.
3.0 Systems Modeling: System Model - Types of models – System Modeling Concepts – Modeling Standards. System Architecture: Logical Architecture Model – Physical Architecture Model. Systems Life Cycle Process Model: Vee model.

Learning Resources

1. A Guide to Guide to the Systems Engineering Body of Knowledge (SEBoK), version 2.2, INCOSE Systems Engineering Research Center and IEEE Computer Society, Released 31 October 2019 – https://www.sebokwiki.org/w/images/sebokwiki-farm!w/8/8b/SEBoK_v2.1.pdf
2. Systems Engineering Handbook, A Guide for Systems Life Cycle Processes and Activities, 4th Edition, INCOSE-TP-2003-002-04, 2015.
3. R. Ian Faulconbridge, Michael Ryan, “Systems Engineering Practice”, Argos Argos Press, 2014.
4. Jon Holt and Simon Perry, “SysML for Systems Engineering”, The Institution of Engineering and Technology, London, United Kingdom, 2008.
5. Sanford Friedenthal, Alan Moore and Rick Steiner, “A Practical Guide To SysML: The Systems Modeling Language, Third edition, Morgan Kaufmann, an imprint of Elsevier, 2015
6. Coursera course on Introduction to Systems Engineering - R. Ian Faulconbridge, Michael Ryan of The University of New South Wales, Sydney.
7. NPTEL Course: Systems Engineering Theory and Practice – IIT Kanpur – Prof. Deepu Philip (Last offered in 2019) - https://nptel.ac.in/courses/110/104/110104074/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours		Course Outcome
		In-Class	Hands-on	
1.	**Systems Fundamentals:** System - Definition, System Elements, Interactions, System Boundary	1	-	CO1
1.1	Types of Systems: Closed-Open, Natural-Human-Made-Human-Modified, Physical-Conceptual and Precedented-Unprecedented.	1	2	CO1
1.2	Systems science - Systems approaches.	1	-	CO1
1.3	Systems Thinking: Concepts, principles and pattens.	1	-	CO1
1.4	System of Interest - Systems of System. Systems Engineering: Product, Service, Enterprise System Life Cycle: Pre-acquisition phase, Acquisition Phase, Utilization Phase and Retirement Phase.	2	2	CO2
2.	**Acquisition Phase**			
2.1	Conceptual Design: Business needs and requirements, Stakeholder needs and requirements, System Requirement Specification, Functional Base Line, System Requirement Review – Functional Architecture.	1	4	CO3
2.2	Preliminary Design: Configuration items, Allocated Baseline, Preliminary Design Review – Physical Architecture.	1	4	CO3
2.3	Detailed Design and Development: System Modeling, Product Base Line, Critical Design Review.	1	4	CO4
2.4	Construction/Production: Formal Qualification Review, Acceptance Test and Evaluation.	1	4	CO5
3.	**Systems Modeling**			
3.1	System Model - Types of models – System Modeling Concepts – Modeling Standards.	1	2	CO6
3.2	System Architecture: Logical Architecture Model – Physical Architecture Model.	1	4	CO6
3.3	Systems Life Cycle Process Model: Vee model.	1	2	CO6
	Total	14	28	

Course Designers:

1. Dr.S.J.Thiruvengadam sjtece@tce.edu
2. Dr.S.Saravana Perumaal sspmech@tce.edu
3. Dr.C.Jeyamala jeyamala@tce.edu

18CHAC0	ESSENCE OF INDIAN KNOWLEDGE	Category	L	T	P	Credit
		AC	2	0	0	0

Preamble

On the successful completion of the course, the students will be able to explain the concept of Indian Traditional Knowledge along with Indian Modern Knowledge. Traditional Knowledge Systems or Indigenous Knowledge Systems are a body of knowledge, which is very ancient and deep rooted. They have their origins in the remote past. Their systematisation and canonisation gave rise to the elite (the Greater Tradition) science. The nature of Traditional Knowledge System is diverse. It covers, among other things, literary, artistic and scientific works; songs, dances, medical treatments and practices; manufacturing and industry; and agricultural technologies and techniques. There is a dramatically growing national and international interest in incorporating Traditional Knowledge Systems, including Traditional Ecological Knowledge, into truly participatory approaches to development.

Course Outcome:

On the successful completion of the course students will be able to

CO1	Explain the concept of Traditional Knowledge and Modern knowledge of India.	Understand
CO2	Explain the need and importance of protecting Traditional Knowledge, Knowledge sharing, and Intellectual property rights over Traditional Knowledge.	Understand
CO3	Explain about the use of Traditional Knowledge to meet the basic needs of human being.	Understand
CO4	Explain the rich biodiversity materials and knowledge preserved for practicing traditional lifestyle.	Understand
CO5	Explain the use of Traditional Knowledge in Manufacturing and Industry.	Understand
CO6	Explain about the cultural expression and modern applications of Traditional Knowledge	Understand

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L	-	-	-	S	M	M	M	M	-	L	M	-	M
CO2	M	L	-	-	-	S	M	M	M	M	-	L	M	-	M
CO3	M	L	-	-	-	S	M	M	M	M	-	L	M	-	M
CO4	M	L	-	-	-	S	M	M	M	M	-	L	M	-	M
CO5	M	L	-	-	-	S	M	M	M	M	-	L	M	-	M
CO6	M	L	-	-	-	S	M	M	M	M	-	L	M	-	M

S- Strong; M-Medium; L-Low

Syllabus

Traditional and Modern Knowledge: Two Worlds of Knowledge - Phase of Explorers, Sir Arthur Cotton and Irrigation, Smallpox Vaccination, Late Nineteenth Century, Voelcker, Howard and Agriculture, Havell and Indian Art; Indians at the Encounter - Gaekwad of Baroda and Technical Education, Science Education and Modern Industries, Hakim Ajmal Khan and Ayurveda, R. N. Chopra and Indigenous Drugs, Gauhar Jaan and Indian Classical Music; Linking Science and the Rural - Tagore's Sriniketan Experiment, Marthandam, the YMCA Model, Gandhi's Thoughts on Development, Nehru's View of Growth; Post-Independence Era - Modernization and Traditional Knowledge, Social Roots of Traditional Knowledge Activism, Global Recognition for Traditional Knowledge. **Global Mechanisms of Protection and Sharing:** For Recognition and Protection - United Nations Educational, Scientific and Cultural Organization (UNESCO), World Health Organization (WHO), International Labour Organization (ILO), UN Working Group on Indigenous Populations, Evolution of Other Organizations; Norms of Sharing - United Nations Environment Programme (UNEP), World Intellectual Property Organization (WIPO), World Trade

Organization (WTO); IPR and Traditional Knowledge - Theoretical Background, Positive Protections of TK, Defensive Strategies, IPR Facilitation for TK. **Traditional Knowledge for Basic Needs:** Indian Midwifery Tradition—The Dai System, Surface Flow Irrigation Tanks, Housing - A Human Right, Changing Priorities—Niyamgiri. **Biodiversity and Genetic Resources:** Jeevani - The Wonder Herb of Kanis, A Holistic Approach - FRLHT, Basmati - In the New Millennium, AYUSH-Based Cosmetics. **Traditional Knowledge in Manufacturing and Industry:** Drug Discovery, A Sweetener of Bengal, The Sacred Ring of Payyanur, Channapatna Toys. **Traditional Cultural Expressions:** Banarasi Saree, Music, Built and Tangible Heritage, Modern Yoga, Sanskrit and Artificial Intelligence, Climate Change and Traditional Knowledge.

Assessment Pattern

Bloom's category	Continuous Assessment Tests		Seminar
	1	2	-
Remember	40	40	0
Understand	60	60	100
Apply	0	0	0
Analyze	0	0	0
Evaluate	0	0	0
Create	0	0	0

Learning Resources:

1. Nirmal Sengupta "Traditional Knowledge in Modern India Preservation, Promotion, Ethical Access and Benefit Sharing Mechanisms" Springer, 2019.
2. Amit Jha,"Traditional Knowledge System in India", Atlantic Publishers and Distributors Pvt Ltd, 2009.
3. Basanta Kumar Mohanta, Vipin Kumar Singh "Traditional Knowledge System and Technology in India", Pratibha Prakashan, 2012.
4. Kapil Kapoor, Michel Danino "Knowledge Traditions and Practices of India", Central Board of Secondary Education, 2012.
5. NPTEL video lecture on "Ayurvedic Inheritance of India", Video link: https://nptel.ac.in/courses/121/106/121106003/#.
6. Youtube video on "Introduction to Indian Knowledge Systems", Video link: https://www.youtube.com/watch?v=LZP1StpYEPM.
7. Youtube video on "12 Great achievements of Indian Civilization", Video link: https://www.youtube.com/watch?v=xmogKGCmclE.

Course Designers:

- Dr.S.J.Thiruvengadam sjtece@tce.edu
- Dr.V.R.Venkatasubramani venthiru@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH. INFORMATION TECHNOLOGY DEGREE PROGRAMME

SIXTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A GOVERNMENT AIDED ISO 9001:2008 CERTIFIED
AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY)
MADURAI – 625 015, TAMILNADU

PHONE: 0452 – 2482240, 41
FAX: 0452 2483427
WEB: WWW.TCE.EDU

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2018-19 onwards)

SIXTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
18IT610	Cloud Computing	PC	3	-	-	3
18YYEX0	Engineering Science Elective	ES	3	-	-	3
18ITPX0	Programme Elective	PE	3	-	-	3
18XXGX0	Open Elective	FE/GE	3	-	-	3
THEORY CUM PRACTICAL						
18IT630	Programming for Internet of Things	ES	2	-	2	3
18IT660	Mobile Application Development	PC	2	-	2	3
PRACTICAL						
18IT670	Cloud Computing Lab.	PC	-	-	2	1
18ES690	Engineering Design Project	Project	-	-	6	3
Total			**16**	**-**	**12**	**22**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective
AC :Audit Course

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
2 Hours Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

Scheme of Examinations
(For the candidates admitted from 2018-19 onwards)

SIXTH SEMESTER

S.No.	Course Code	Name of the Course Type your text	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	18IT610	Cloud Computing	3	50	50	100	25	50
2	18YYEX0	Data Analytics	3	50	50	100	25	50
3	18ITPX0	Programme Elective	3	50	50	100	25	50
4	18XXGX0	Open Elective	3	50	50	100	25	50
THEORY CUM PRACTICAL								
5	18IT630	Programming for Internet of	3	50	50	100	25	50
6	18IT660	Mobile Application	3	50	50	100	25	50
PRACTICAL								
7	18IT670	Cloud Computing Lab.	3	50	50	100	25	50
8	18ES690	Engineering Design Project	-	50	50	100	25	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** Terminal Examination will be conducted for maximum marks of 100 and subsequently be reduced to 50 marks for the award of terminal examination marks

18IT610	CLOUD COMPUTING

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

Cloud computing paradigm covers a range of distributed computing, hosting and access solutions, including service-based computing. The objective of the course is to provide comprehensive view of cloud computing concepts, technologies, architecture, security breaches, corrective measures, deploying applications and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and deployments

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain the key technologies, strengths, limitations and applications of cloud computing	11
CO2	Apply suitable virtualization concept for the given scenario	17
CO3	Categorize the cloud service types, architecture, contract negotiations needed for cloud service delivery and cloud software development	25
CO4	Identify the necessity, appropriate cloud architecture/model for deploying an application in a cloud environment based on the given requirements	22
CO5	Develop a cloud application with a user interface and diagnose the suitable data components	17
CO6	Outline the emerging technologies in cloud computing platforms	8

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2, 2.3.1, 2.4.6
CO2	TPS2	Apply	Value	Mechanism	1.2, 2.3.1, 2.3.2, 2.3.4
CO3	TPS4	Analyze	Organize	Complex Overt Response	1.2, 2.4.5, 2.4.6, 3.2.1 -3.2.6, 4.3.1, 4.3.2
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO6	TPS2	Understand	Respond	Guided Response	1.2, 2.3.1, 2.4.6

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO1	M	L											L		
CO2	S	M	L		S	L			S	S			M	M	L
CO3	S	S	M	L					S	S		M	M		M
CO4	S	M	L			L			S	S	L	M	M	L	S
CO5	S	M	L		S	M	L	L	S	S	M	S	M	S	S
CO6	M	L											L		

S- Strong; M-Medium; L-Low

- CO4 and CO5 partially evaluated through assignments/min projects

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	10	10	10				10
Understand	30	30	20				20
Apply	40	60	60	50	50	100	60
Analyse	20		10	50	50		10
Evaluate							
Create							

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Assignment/Practical Component
Perception	
Set	
Guided Response	
Mechanism	80
Complex Overt Responses	20
Adaptation	
Origination	

Sample Questions for Course Outcome Assessment**

** (2 to 3 at the cognitive level of course outcome)

Course Outcome 1(CO1):

1. Define Cloud computing and explain essential characteristics of cloud computing.
2. What is self service provisioning?
3. Discuss the benefits of cloud computing with respect to conventional computing.

Course Outcome 2(CO2):

1. Explain some of the common pitfalls that come with virtualization.
2. Show the difference between process virtual machines, host VMMs and native VMMs.

3. Contrast the virtual machine as perceived by a traditional operating system processes and a system VM.

Course Outcome 3(CO3):

1. Explain the services provided by the Amazon infrastructure cloud from a user perspective.
2. What is cloud computing? Enlist and explain three service models, and four deployment models of cloud computing.
3. How to deploy a web application in a Google App Engine? Explain

Course Outcome 4 (CO4):

1. Identify when to use cloud application and explain how architecture affects the performance
2. Compare the differences between an internal application and a cloud application.
3. Propose several samples of risk/benefit assessments when selecting applications

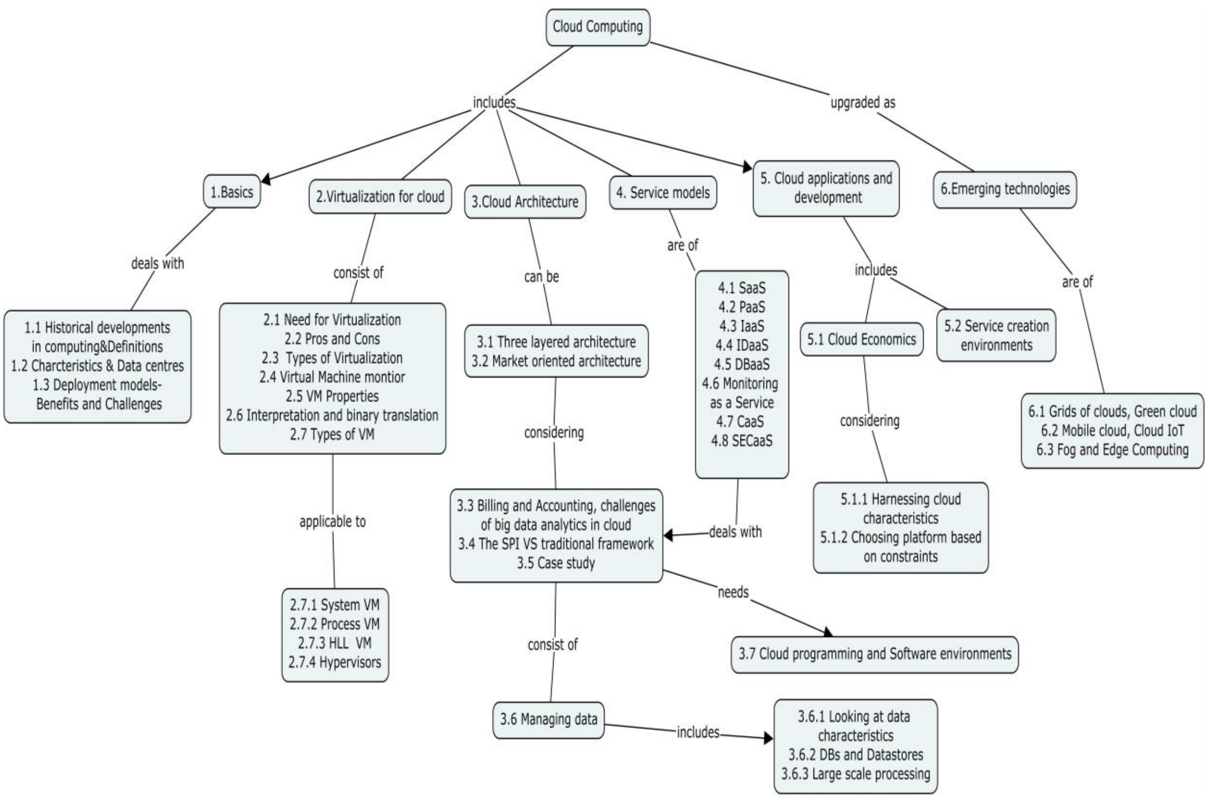
Course Outcome 5 (CO5):

1. Deploy cloud application with user interface that to be used on a smart phone
2. Adapt suitable data component for E-Governance applications
3. Design an interface for rural development system using suitable cloud platform

Course Outcome 6(CO6):

1. Compare the difference between fog and edge computing
2. Outline the benefits of cloud in IoT applications
3. Explain the key characteristics of mobile cloud computing
4. Infer the role of using green cloud in IT services

Concept Map



Syllabus

Basics of Cloud: Historical developments in computing- Definition of Cloud Computing, Essential Characteristics- Data centres-Cloud deployment models-benefits and challenges

Virtualization for cloud
Need for Virtualization, Pros and cons of Virtualization, Types of Virtualization, Virtual Machine monitor, Virtual machine properties, Interpretation and binary translation, Types of VM: System VM, Process VM, , HLL VM, Hypervisors : Xen, KVM , VMWare, Virtual Box, Hyper-V.

Cloud architecture
Three layer cloud architecture-market oriented cloud architecture ,SLA-billing and Accounting, challenges of big data analytics in cloud-The SPI Framework vs. the Traditional IT Model-Case study : Openstack, Nimbus, Microsoft Azure-Managing Data: Looking at Data, Scalability & Cloud Services-Database & Data Stores in Cloud-Large Scale Data Processing- cloud programming and software environments- Hadoop, GFS, Spark, map reduce, Big Table, Hbase, Libvirt ,openVswitch-.

Service Models
SaaS – Multi-tenant, OpenSaaS, SOA. PaaS – IT Evolution, Benefits, Disadvantages. IaaS – Improving performance, System and storage redundancy, Cloud based NAS devices, Advantages, Server types. IDaaS – Single Sign-on, OpenID. Database as a Service, Monitoring as a Service, Communication as services- Security as a Service (SECaaS)-ISO/IEC Standards

Cloud applications and development
Cloud Economics-Harnessing cloud characteristics in application design- Cloud Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs-Service creation environments to develop cloud based application-Case study: Meghdoot, Amazon, Azure, Google App, Docker, IBM, Sales force.

Emerging technologies
Grid of Clouds, Green Cloud- Mobile cloud Computing, Cloud in IoT applications, Fog and Edge computing

Learning Resources

- John Rittinghouse& James Ransome, “Cloud Computing, Implementation, Management and Strategy”, CRC Press, 2010.
- Cloud Computing Principles and Paradigms, RajkumarBuyya,JamesBroberg, AndrzejGoscinski, Wiley Publishers,2011
- Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, SubraKumaraswamy, ShahedLatif,O’Reill,2010.
- RajkumarBuyya, Christian Vecchiola, S.ThamaraiSelvi, “Mastering cloud computing”, Morgan Kaufman, 2013.
- Dr. Kris Jamsa, “Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More”, Jones and Bartlett learning, First edition, 2013.
- ArshdeepBahga, Vijay Madisetti, “Cloud Computing: A Hands-On Approach”, CreateSpace Independent Publishing Platform, 1st edition, 2013.
- Massimo Cafaro (Editor), Giovanni Aloisio (Editor), “Grids, Clouds and Virtualization” Springer; edition, 2011.
- GautamShroff, “Enterprise Cloud Computing Technology Architecture Applications”, Cambridge University Press; 1 edition, 2010.
- Barrie Sosinsky, “ Cloud Computing Bible” John Wiley & Sons, 2010
- Cloud Security Alliance, “Security Guidance for Critical Areas of Focus in Cloud Computing” 2011

- Cloud Security Alliance, “Top Threats to Cloud Computing”, 2013.
- http://nptel.ac.in/courses/106105167/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	Basics of Cloud		
1.1	Historical developments in Computing, Definition of Cloud Computing	1	CO1
1.2	Essential Characteristics, Data centres	1	
1.3	Deployment models -Benefits, Challenges	2	
2.	Virtualization for cloud		CO2
2.1	Need for Virtualization	1	
2.2	Pros and cons of Virtualization		
2.3	Types of Virtualization	1	
2.4	Virtual Machine monitor		
2.5	Virtual machine properties	2	
2.6	Interpretation and binary translation		
2.7	Types of VM		
2.7.1	System VM	1	
2.7.2	Process VM		
2.7.3	HLL VM		
2.7.4	Hypervisors :Xen, KVM , VMWare, Virtual Box, Hyper-V.	1	
3.	Cloud architecture		
3.1	Three layer cloud architecture	2	CO4
3.2	Market oriented cloud architecture, SLA		
3.3	Billing and Accounting, Challenges of big data analytics in cloud	1	
3.4	The SPI Framework vs. the Traditional IT Model	2	
3.5	Case study : Eucalyptus, Nimbus, Microsoft Azure		
3.6	Managing Data		
3.6.1	Looking at Data, Scalability & Cloud Services	1	
3.6.2	Database & Data Stores in Cloud	1	
3.6.3	Large Scale Data Processing	1	
3.7	Cloud programming and software environments		
4.	Service models		CO3
4.1	SaaS – Multitenant, OpenSaaS, SOA	1	
4.2	PaaS – IT Evolution, Benefits, Disadvantages	2	
4.3	IaaS – Improving performance, System and storage redundancy, Cloud based NAS devices, Advantages, Server types	2	
4.4	IDaaS – Single Sign-on, OpenID.	1	
4.5	Database as a Service	1	
4.6	Monitoring as a Service	1	
4.7	Communication as services	1	
4.8	SECaaS-ISO/IEC Standards		
5.	Cloud applications and development		CO5
5.1	Cloud Economics	2	
5.1.1	Harnessing cloud characteristics in application design		
5.1.2	Cloud Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs	2	
5.2	Service creation environments to develop cloud based applications—Meghdoot, Amazon, Azure, Google App,	2	

	Docker, IBM, Sales force		
6.	Emerging technologies		CO6
6.1	Grid of Clouds, Green Cloud	1	
6.2	Mobile cloud Computing, Cloud in IoT	1	
6.3	Fog and Edge computing	1	
	Total Lectures	36	

Course Designers:

1. Dr.S.Padmavathi spmcse@tce.edu

18ITEA0	DATA ANALYTICS	Category	L	T	P	Credit
		ES	3	0	0	3

Preamble

This course provides an in-depth knowledge on managing, handling and analysing structured or unstructured data. The course focuses on concepts, methods, principles, techniques, tools applicable to any technology environment and establishes a baseline that can be enhanced by practice and additional real-world experience.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain the analytic process model and perform suitable statistical test for the processed data.	20
CO2	Implement statistical modelling and make inferences for real time applications.	20
CO3	Apply predictive modelling using regression analysis, ensemble methods and descriptive modelling using sequence rules, segmentation for any given data.	15
CO4	Examine the type of unstructured data, content analysis, frequency analysis with lexical relations and sentiment analysis.	15
CO5	Illustrate the use of survival analytics models, measurements and its evaluation to real time applications.	10
CO6	Demonstrate big data analytics platform such as Hadoop, No SQL with a key understanding on quality, standards and ethical guidelines.	10
CO7	Develop simple applications using big data analytic platform, data modelling methods and data analytic tools.	10

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3
CO2	TPS3	Apply	Value	Mechanism	1.3,2.1.2,2.1.3
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.1.2,
CO4	TPS4	Analyse	Organise	Complex Overt Responses	1.3,2.2.3,2.2.4
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.1.2,2.1.3
CO6	TPS2	Understand	Respond	Guided Response	1.3,2.2.3
CO7	TPS6	Apply	Value	Mechanism	1.3, 2.1.2,2.2.3, 2.2.4,3.1.2, 4.1, 4.2, 4.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		S	M		M				M	M	S	L
CO3	S	M	L		S	M		M				M	M	S	L
CO4	S	S	M	L	S	S		M	M			M	M	S	L
CO5	S	M	L		L	L		L				M	M	L	L
CO6	M	L			L	M		L				L	L	M	
CO7	S	M	L		S	S		S	S	S		S	M	S	M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	Ass 1	Mini Project		
Remember	20	20	10	-	-	-	10
Understand	20	20	20	-	-	-	30
Apply	60	50	60	100	50	50	50
Analyse	-	10	10	-	50	50	10
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-		-

AssessmentPattern: Psychomotor

Psychomotor Skill	Mini project/Assignment/Practical Component
Perception	-
Set	20
Guided Response	20
Mechanism	60
Complex Overt Responses	-
Adaptation	-
Origination	

Sample Questions for Course Outcome Assessment**

Course Outcome1 (CO1):

1. Explain Analytics Process Model with suitable examples.
2. Describe about analytical model requirements.
3. Prepare about the methods of scaling a variable and clearly justify with your reasons why scaling is important and Infer the concepts related to coarse classification. Give an example.

Course Outcome2 (CO2):

1. Two samples are drawn from two normal populations. compute whether the two samples have same variance at 5% level.

I	60	65	71	74	76	82	85	87	-	-
II	64	66	67	85	78	88	86	85	63	91

- Organize null and alternate hypothesis and compute the degrees of freedom.
- Solve for F Test-Statistic
- Use the following critical value of F at 0.05 for various degrees of freedom.

2. Lin Xiang, a young banker, has moved from Saskatoon, Saskatchewan, to Winnipeg, Manitoba, where she has recently been promoted and made the manager of City Bank, a newly established bank in Winnipeg with branches across the Prairies. After a few weeks, she has discovered that maintaining the correct number of tellers seems to be more difficult than it was when she was a branch assistant manager in Saskatoon. Some days, the lines are very long, but on other days, the tellers seem to have little to do. She wonders if the number of customers at her new branch is simply more variable than the number of customers at the branch where she used to work. Because tellers work for a whole day or half a day (morning or afternoon), she collects the following data on the number of transactions in a half day from her branch and the branch where she used to work:

Winnipeg branch: 156, 278, 134, 202, 236, 198, 187, 199, 143, 165, 223

Saskatoon branch: 345, 332, 309, 367, 388, 312, 355, 363, 381

Consider the scenario, Perform F-Test statistic and also test whether the two Winnipeg and Saskatoon attributes have same variance.

3. For the above given scenario, organize null and alternate hypothesis and compute the degrees of freedom.

Course Outcome 3 (CO3):
Consider the assumptions of linearity for a curvature using various plots.

- Scatter plot of residuals versus the fitted values
- Scatter plot for residuals versus each predictor

The plot for residuals versus the predictor suggests that there is a non-linear relationship.
1. Identify the type of regression analysis model that suits best for the above problem
2. Differentiate Hierarchical and non-hierarchical segmentation models with an illustrative example.
3. Elaborate the algorithmic steps of the regression model.
4. Consider there are about 1000 tuples of record with binary class labels. Out of 1000 data tuples 580 belongs to class A and 420 data tuples belongs to class B. The data records have been trained and tested over Neural Network algorithm. The confusion matrix shows that out of 1000 tuples of records only 620 records has been correctly classified by the classifier which then corresponds 341 of class A and 279 of class B.
Calculate the following:

- Classification Accuracy
- Error Rate
- Sensitivity
- Specificity
- Precision

Course Outcome 4 (CO4):
1. Consider a set of unstructured textual data given for analysis. Summarize the sub tasks and components in which a text analysis process must contain. Make use of tagging and annotation for the textual data analysis process.
2. Consider the logical view of a document from a full text to a set of index terms and compute the following for text processing:
   (a) Parts of speech tagging
   (b) Tokenization
   (c) Stemming

3. Produce the pseudo code for computing tokenization, stemming using any text processing language for the below.
I love this movie! It's sweet, but with satirical humor. The dialogue is great and the adventure scenes are fun… It manages to be whimsical and romantic while laughing at the conventions of the fairy tale genre. I would recommend it to just about anyone. I've seen it several times, and I'm always happy to see it again whenever I have a friend who hasn't seen it yet!

Course Outcome 5 (CO5):

1. Consider 200 subjects of certain types were tracked over a period of time to determine how many survived for one year, two years, and so forth. If all the subjects remained accessible throughout the entire length of the study, the estimation of survival probabilities for subjects would be easy. Calculate the Kaplan Meier Survival probability estimate for the data provided and find the total number of subjects at risk during the end of sixth year.

Time period	At Risk	Become Unavailable (censored)	Died	Survived
Year 1	200	6	10	?
Year 2	?	6	20	?
Year 3	?	6	30	?
Year 4	?	6	40	?
Year 5	?	6	50	?
Year 6	?	6	60	?

2. Apply the following data for non-parametric maximum likelihood estimator for the variable *S(t)*. Incorporate the concepts of censoring and no censoring with respect to the total number of individuals d_j, for an event to occur.
Suppose there are 10 customers of a certain type who were tracked over a a period of time to determine how many have churned, censored and at risk $t(n_t)$. out of 10 customers at the beginning of the study, the following conditions holds with respect to the time of the event *S(t)*:

Time	**Customers at risk $t(n_t)$**	**Customers churned $t(d_t)$**	**Customers censored at t**
0	10	0	0
3	?	1	1
6	?	1	0
9	?	0	1
12	?	3	0
15	?	1	1
18	?	0	1

(i) Derive the KM estimator for *S(t).*
(ii) Find the total number of customers who are at risk at the end of the time period, say 18.

3. Relate the concept of product limit estimator for s(t) with censoring for churn prediction with 10 individuals and compute the following for the data provided:
(i) Examine when the customers churn.
(ii) Interpret the data when customers make next purchase.
(iii) Solve for s(t) when customers are in default state.

Customer	**Time of churn**	**Churn or censored**
C1	6	Churn
C2	3	Censored
C3	12	Churn
C4	15	Censored
C5	18	Censored
C6	12	Churn

C7	3	Churn
C8	12	Churn
C9	9	Censored
C10	15	Churn

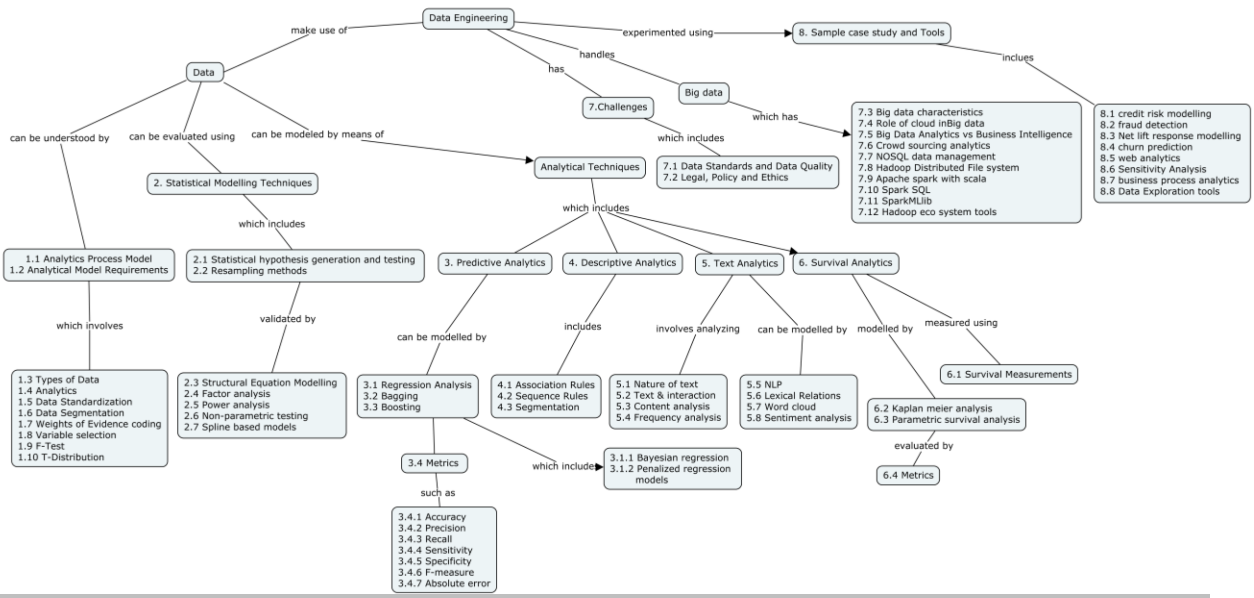
Course Outcome 6 (CO6):

1. Describe data replication for HDFS with replica selection and placement.
2. Illustrate the working paradigm of map reduce programming for a simple word count program. Clearly state the map, shuffle and reduce phase with an example.
3. Illustrate the concept of anatomy of map reduce with the code determining the execution of map and reduce jobs separately. Mention the steps corresponding to each map phase during execution. The execution workflow must contain the following:
   - What does the user gives?
   - How many map and reduce task?
   - How to launch map task?
   - Mention the flow of execution timeline.

Course Outcome 7 (CO7):

CO7 would be evaluated through Mini-project implementation using tools and case study presentation that may include but not limited to the following topics:
1. Credit risk Prediction
2. Fraud detection
3. Churn prediction

Concept Map



Syllabus

Data Analytics – Analytics Process Model – Analytical Model Requirements - Types of Data - Analytics – Standardizing and categorizing - Data Segmentation – weights of evidence coding – variable selection - F-Test –T-Distribution.

Statistical modelling – Statistical hypothesis generation and testing **-** Resampling methods – Structural Equation Modelling – Factor analysis – Power analysis – Non-parametric testing – Spline based models.

Predictive Analytics – Target definition – Regression Analysis –Bayesian regression – Penalized regression models – Improvisation methods- Evaluating Predictive Models

Descriptive Analytics – Association Rules – Sequence rules – segmentation.

Text Analytics –Nature of text – text & interaction – content analysis – frequency analysis - NLP - lexical relations and topics – word cloud – sentiment analysis.

Survival Analytics – survival analysis measurements – Kaplan meier analysis – parametric survival analysis – evaluating survival analysis models.

Data Engineering and its challenges: Data Standards and Data Quality - Legal, Policy and Ethics. Big data characteristics – Role of cloud inBig data – Big Data Analytics vs Business Intelligence -crowd sourcing analytics – NOSQL data management – Hadoop Distributed File system – Apache spark with scala - Spark SQL – SparkMLlib - Hadoop eco system tools.

Case Study and Tools:– Credit risk modelling – Fraud detection – Net lift response modelling – churn prediction – web analytics – Sensitivity Analysis - business process analytics-Data exploration Tools: Hadoop and its platforms -R tool-Rapid miner-Mongo DB-POS taggers.

Learning Resources

1.Bart Baesens, "Analytics in a Big Data World", The Essential Guide to Data Science and its Applications, Wiley, First edition,
2014.
2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", Massachusetts Institute of Technology, 2012.
3. Trevor Hastie and Robert Tibshirani and Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and
Prediction, Second Edition", Secon edition, Springer, 2017.
4. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic
Trends for Today's Businesses", Wiley, 2013.
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012. Eric Sammer, "Hadoop Operations", O'Reilley,
2012.
6. Thomas H. Davenport, Jeanne G. Harris, "Competing on Analytics: The New Science of Winning", Harvard Business Review
Press ,First edition,2007
7. Paul C. Zikopoulos, Chris Eaton, "Understanding Big Data", McGraw-Hill, 2012 (eBook from IBM).
8. https://www.edx.org/learn/data-analysis
9. https://www.coursera.org/browse/data-science/data-analysis
10.https://www.udemy.com/courses/business/data-and-analytics/
11.https://online-learning.harvard.edu/subject/data-analysis

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**Data Analytics**		
1.1	Analytics Process Model		
1.2	Analytical Model Requirements	1	
1.3	Types of Data	1	**CO1**
1.4	Analytics		

1.5	Standardizing and categorizing	1	
1.6	Data Segmentation		
1.7	weights of evidence coding		
1.8	variable selection	1	
1.9	F-Test	1	
1.10	T-Distribution.	1	
2.	**Statistical modelling**		
2.1	Statistical hypothesis generation and testing	1	
2.2	Resampling methods	1	
2.3	Structural Equation Modelling	1	
2.4	Factor analysis	1	**CO2**
2.5	Power analysis		
2.6	Non-parametric testing	1	
2.7	Spline based models	1	
3.	**Predictive Analytics**		
3.1	Target definition	1	
3.2	Regression Analysis – Bayesian regression, Penalized regression analysis.	1	
3.3	Improvisation Methods	1	
3.4	Evaluating Predictive Models	1	**CO3**
4.	**Descriptive Analytics**		
4.1	Association rules	1	
4.2	Sequence rules	1	
4.3	Segmentation		
4.	**Text Analytics**		
4.1	Nature of text	1	
4.2	Text & interaction		
4.3	Content analysis		**CO4**
4.4	Frequency analysis	1	
4.5	NLP		
4.6	Lexical relations	1	
4.7	Word cloud		
4.8	Sentiment analysis	0.5	
5.	**Survival Analytics**		
5.1	Survival analysis measurements	1	
5.2	Kaplan meier analysis	1	
5.3	Parametric survival analysis	1	**CO5**
5.4	Evaluating survival analysis models.	0.5	
6	**Data Engineering and its challenges**		
6.1	Data Standards and Data Quality	1	
6.2	Legal, Policy and Ethics		
6.3	Big data characteristics	1	
6.4	Role of cloud in Big data		**CO6**
6.5	Big Data Analytics vs Business Intelligence	1	
6.6	Crowd sourcing analytics		
6.7	NOSQL data management	1	
6.8	Hadoop Distributed File system		
6.9	Apache spark with scala	1	
6.10	Spark SQL		
6.11	SparkMLlib		
6.12	Hadoop eco system tools.	1	
7	**Case Study and Tools:**		
7.1	Credit risk modelling	3	

7.2	Fraud detection		CO7
7.3	Net lift response modelling		
7.4	churn prediction		
7.5	web analytics		
7.6	Sensitivity Analysis		
7.7	business process analytics		
7.8	Data Exploration Tools: Hadoop and its platforms –R tool-Rapid miner-Mongo DB-POS taggers.	2	
	Total no. of contact hrs.	36	

Course Designers:

1. A.Sheik Abdullah asait@tce.edu
2. S.Pudumalar spmit@tce.edu

18IT630	PROGRAMMING FOR INTERNET OF THINGS

Category	L	T	P	Credit
ES	2	0	2	3

Preamble

This course aims at providing basic knowledge and skills to engage in innovative design anddevelopment of IoT solutions. The IoT encompasses broader spectrum of technologies, It is not only to identify the things, rather than they participate in computations, connections and also sense the environment to react with the real world. It also aims at giving the students a view, connect and actuate the sensor through powerful interfaces and programs.

Prerequisite

- 18IT430 Computer Networks
- Any Programming Language

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Examine the evolution of IoT, its architecture and their protocols.	10%
CO2	Identify the domain-specific building blocks of IoT enabling technologies and characteristics and similarities.	10%
CO3	Exemplify IoT design methodology and System management.	20%
CO4	Apply logical design using pragmatic techniques for designing an IoT System	20%
CO5	Recommend cloud offerings and data analytics on IoT using case studies	20%
CO6	Build state of the art IoT architecture to solve the real world constraints.	20%

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2
CO2	TPS2	Understand	Respond	Guided Response	1.2
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.1.1,2.1.2,2.1.5
CO4	TPS3	Apply	Value	Mechanism	1.2,2.1.1,2.1.2,2.1.5
CO5	TPS4	Analyse	Organise	Complex Overt Responses	1.2, 2.4, 2.5, 3.1.1, 3.1.2, 3.2, 4.1.1, 4.2.1, 4.3.1, 4.3.2, 4.4.1 – 4.4.3, 4.5.1, 4.5.3, 4.5.5
CO6	TPS5	Create	Characterize	Origination	1.2, 2.4, 2.5, 3.1.1, 3.1.2, 3.2, 4.1.1, 4.2.1, 4.3.1, 4.3.2, 4.4.1 – 4.4.3, 4.5.1, 4.5.3, 4.5.5

Mapping with Programme Outcomesand Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	M	L											L		
CO3	S	M	M	M	S								M	S	
CO4	S	M	M	M	S								M	S	
CO5	S	S	M	L	M	S	S	S	S	S	S	S	M	L	M
CO6	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	20	20	0	-	-	-	20
Understand	30	30	20	-	20	-	30
Apply	50	50	80	100	50	50	50
Analyse	0	0	0	-	-	25	-
Evaluate	0	0	0	-	-	-	-
Create	0	0	0	-	10	25	-

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	-
Guided Response	40
Mechanism	40
Complex Overt Responses	10
Adaptation	-
Origination	10

Course Level Assessment Questions CO5 & CO6 are assessed through Mini -Project.

Mini Project Details

- Team formation (Team size: 3)
- Problem identification on various IT, societal, business and environmental needs
- Identify the appropriate components needed to build the microcontroller board.
- Assemble the components and program the board.
- Test the board with sample input.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Discuss the Evolution of IoT.
2. Label the architecture of IoT with a neat diagram
3. List the some of the protocols involved in IoT.
1. Describe web view 3.0

Course Outcome 2 (CO2):

1. Use Appropriate sensors to code for Motion Detection
2. Experiment various sensors and Actuators
3. Illustrate the usage of Drones for any specific problem
4. Demonstrate the Anatomy of Sensors and Actuators

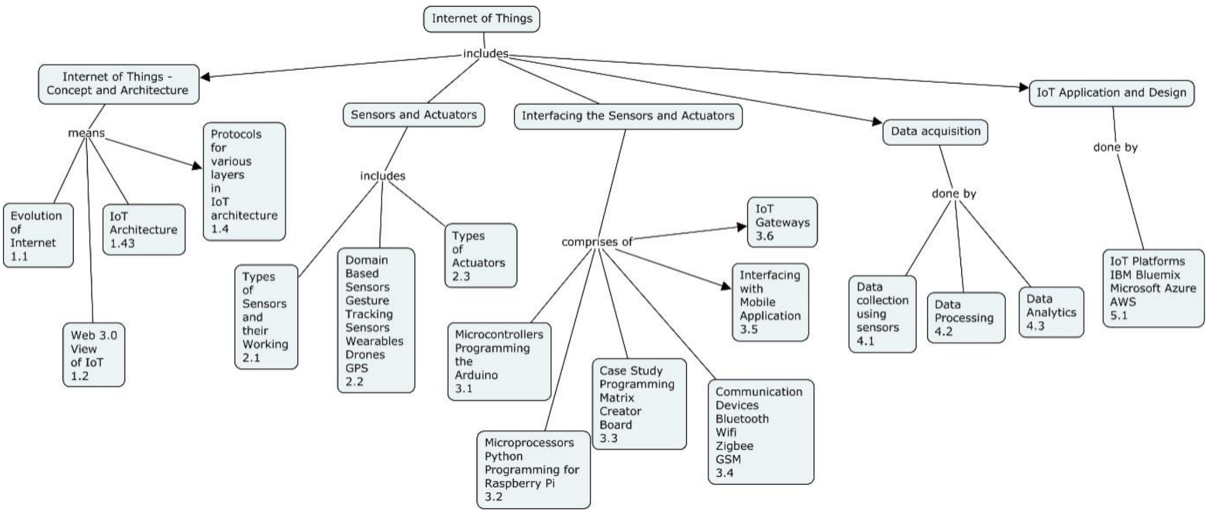
Course Outcome 3 (CO3):

1. Write a program for glowing an LED.
2. Write a program to automate electric appliances in a room using a microcontroller.
3. Simulate water overflow detection using a suitable microprocessor of your choice
4. Explain the interfacing of sensors and actuators to the controllers.

Course Outcome 4 (CO4):

1. Develop an IoT application to solve anomaly detection issue
2. Experiment various IoT platforms
3. Construct an IoT application for a societal problem of your choice
4. Show the connectivity of microcontroller with Bluetooth and USB

Concept Map



Syllabus

Internet of Things - Concept and Architecture: Evolution of Internet, Web 3.0 View of IoT, IoT Architecture, Protocols for various layers in IoT architecture

Sensors and Actuators: Types of Sensors and their Working, Domain Based Sensor: Gesture Tracking Sensors , Wearables , Drones, GPS, Types of Actuators

Interfacing the Sensors and Actuators: Microcontrollers : Programming the Arduino, Microprocessors : Python Programming for Raspberry Pi, Case Study: Programming Matrix Creator Board, Communication Devices : Bluetooth, Wifi , Zigbee , GSM, Interfacing with Mobile Application, IoT Gateways.

Data acquisition: Data collection using sensors, Data Processing, Data Analytics

IoT Application and Design: IoT Platforms: IBM Bluemix, Microsoft Azure, AWS,Case Studies :Industrial Revolution 4,Smart Energy Systems,Digital Food ,Smart Entertainment,SmartManufacturing,Mini Project

Text Books

- RajkumarBuyya, Amir VahidDastjerdi, ”Internet of Things Principles and Paradigms”, Elsevier , First edition ,2016
- ArshdeepBahga, Vijay Madisetti, “Internet of Things, A Hands-on Approach”, Universities Press, First Edition, 2015

References

- https://www.edx.org/course/introduction-to-the-internet-of-things-iot
- http://www.instructables.com/technology/
- https://aws.amazon.com/iot/
- https://azure.microsoft.com/en-in/services/iot-hub/
- https://www.ibm.com/cloud/internet-of-things

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours
1	**Internet of Things - Concept and Architecture**	
1.1	Evolution of Internet	
1.2	Web 3.0 View of IoT	1
1.3	IoT Architecture	1
1.4	Protocols for various layers in IoT architecture	2
2	**Sensors and Actuators**	
2.1	Types of Sensors and their Working	2
2.2	Domain Based Sensors: Gesture Tracking Sensors , Wearables , Drones,GPS	2
2.3	Types of Actuators	1
3	**Interfacing the Sensors and Actuators**	
3.1	Microcontrollers : Programming the Arduino	2
3.2	Microprocessors : Python Programming for Raspberry Pi	2
3.3	Case Study: Programming Matrix Creator Board	1
3.4	Communication Devices : Bluetooth, Wifi , Zigbee , GSM	2
3.5	Interfacing with Mobile Application	2
3.6	IoT Gateways	1
4	**Data acquisition**	
4.1	Data collection using sensors	1
4.2	Data Processing	1
4.3	Data Analytics	1
5	**IoT Application and Design**	
5.1	IoT Platforms: IBM Bluemix, Microsoft Azure,AWS	1
5.2	Case Study : Industrial Revolution 4,Smart Energy systems,Digital Food ,Smart Entertainment,Smart Manufacturing	1
	Total Lectures	**24**

List of Experiments

Exp. No.	Topic	No of Practical Hours
1	Installation of Arduino Ide and Environment Setup	2
2	Implement simple programs using Arduino	
3	Data Collection and storage from PIR Sensor, Temperature Sensor	2
4	Data Collection and storage from Ultrasonic sensor, Moisture sensor and Water level sensor	2
4	Experiment with GPS,RFID	2
5	Practice Interfacing of GSM and Bluetooth with Mobile Application	2
6	Practice Interfacing with Zigbee Shield	2
7	Installation of OS in Raspberry pi	2
8	Implement simple programs using Raspberry Pi	
9	Interfacing sensor with Raspberry Pi	2
10	Interfacing Communication Device with Raspberry Pi	2
11	Storing and Retrieving Data From Cloud(Wifi)	2
12	Mini Project Review I,II,III	4
	Total Lectures	**24**

Course Designers

1. Ms.C.V.Nisha Angeline cvnait@tce.edu
2. Mr.M.Manikanda Kumar mmrit@tce.edu

18IT660	MOBILE APPLICATION DEVELOPMENT	Category	L	T	P	Credit
		PC	2	0	2	3

Preamble

This course provides knowledge and skill on recent technologies in mobile application development. It includes APIs for UI design, location based services, storage mechanism, multimedia, camera, Bluetooth, WiFi, sensor and Gesture support.

Prerequisite

- 18IT320 Object Oriented Programming

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Apply the UI components and location based services for the given problem	40
CO2	Choose the suitable storage mechanisms such as shared preferences, files, SQLite database for the given requirements	12
CO3	Apply multimedia, graphics and animation Application Programming Interfaces (APIs) for the suitable problems	10
CO4	Produce applications with the support of Camera, Bluetooth, WiFi and Sensor	10
CO5	Examine the usage of XML parsing, JSON parsing, Web services, Kotlin, React Native, Material Design and RSSFeedReader in application development	12
CO6	Develop a mobile application with appropriate API based on the societal or business requirements	16

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 3.2, 4.4.1 – 4.4.3
CO2	TPS3	Apply	Value	Mechanism	1.2, 3.2, 4.4.1 – 4.4.3
CO3	TPS3	Apply	Value	Mechanism	1.2, 3.2, 4.4.1 – 4.4.3
CO4	TPS3	Apply	Value	Mechanism	1.2, 3.2, 4.4.1 – 4.4.3
CO5	TPS4	Analyse	Organise	Complex Overt Responses	1.2, 2.4, 2.5, 3.1.1, 3.1.2, 3.2, 4.1.1, 4.2.1, 4.3.1, 4.3.2, 4.4.1 – 4.4.3, 4.5.1, 4.5.3, 4.5.5
CO6	TPS6	Create	Characterize	Origination	1.2, 2.4, 2.5, 3.1.1, 3.1.2, 3.2, 4.1.1, 4.2.1, 4.3.1, 4.3.2, 4.4.1 – 4.4.3, 4.5.1, 4.5.3, 4.5.5

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	S	M	L		M			L	L	L		L	M	L	L
CO2	S	M	L		M			L	L	L		L	M	L	L
CO3	S	M	L		M			L	L	L		L	M	L	L

CO 4	S	M	L		M			L	L	L		L	M	L	L
CO 5	S	S	M	L	M			M	M	M		S	M	L	M
CO 6	S	S	S	M	M			S	S	S		S	S	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Test			Mini Project			Terminal Laboratory Examination
	CAT 1	Lab Test 2	Lab Test3	Review 1	Review 2	Review 3	
Remember	20	-	-	30	-	-	-
Understand	60	20	20	40	20	-	40
Apply	20	80	80	30	50	50	40
Analyze	-	-	-	-	20	25	20
Evaluate	-	-	-	-	10	15	-
Create	-	-	-	-	-	10	-

CO6 will be assessed only through Mini Project.

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project/ Assignment/ Practical Component
Perception	-
Set	-
Guided Response	20
Mechanism	50
Complex Overt Responses	10
Adaptation	10
Origination	10

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):

1. Write an android code for generate a notification when the particular location reached.
2. Design a Feedback form of an event and perform validation. Write code.
3. Design two activities to with proper navigation mechanisms such as link, button, menu etc. Write code.

Course Outcome 2 (CO2):

1. Design an app to enter the Name of the book and ISBN number and click on Add Book. Write code.
2. Design an app to click on Show Books to view the contents added so far.
3. Design an app to search for a book from querying author details.

Course Outcome 3 (CO3):

1. Design an app with music player.
2. Design an app to play, stop, and pause a video.

3. Design an animated app for demonstrating the working principle of an algorithm.

Course Outcome 4 (CO4):

1. Implement a camera enabled application for capturing video or image.
2. Implement a Bluetooth enabled application for controlling a system.
3. Design an app with WiFi support API for transmitting signals to a system.

Course Outcome 5 (CO5):

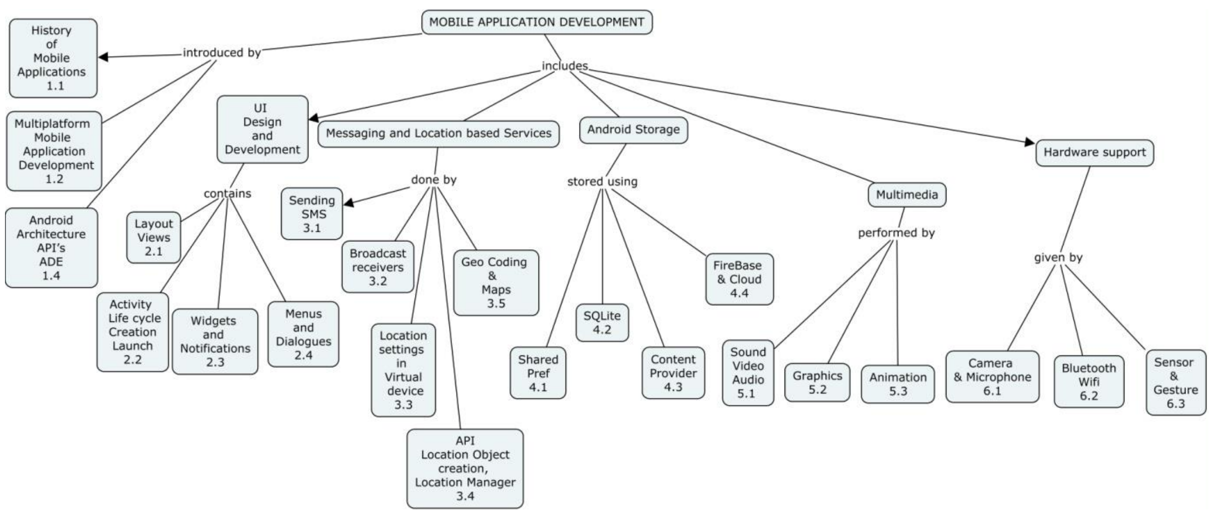
1. Outline a web service for providing a hall booking service in a company.
2. Illustrate JSON parsing of a book store application.
3. Experiment XML parsing for a bus reservation application.

Course Outcome 6 (CO6):

Mini-Project

- Form a team of 2/3 persons
- Pick-up a societal, business problem
- As per the design thinking process, develop a design
- Implement and test the problem
- Upload the basic version of the application in playstore

Concept Map



Syllabus

Introduction - History of Mobile Applications - Multiplatform Mobile Application Development Android Architecture, API's, ADE
UI Design and Development - Layout, Views – Activity – Lifecycle, creation, launch - Widgets & Notifications, Menus & Dialogues
Messaging andLocation based Services - Sending SMS – Broad cast receivers- Location settings in virtual devices – API – Location Object creation, Location manager -Geo Coding & Maps
Android Storage - Shared Pref – SQLite – Content provider - FireBase& Cloud
Multimedia - Sound - Video – Audio– Graphics - Animation
Hardware Support - Camera & Microphone – Bluetooth – Wifi - Sensor – Gesture
Case Study –Xml Parsing, JSON Parsing,RSSFeedReader,Web Services**,** Kotlin**,** React Native, Material Design, Android Game Development

Learning Resources

1. RetoMeier, "Professional Android Application Development 4", Wrox, 2012.
2. Dawn Griffiths, David Griffiths, "Head First Android Development", Shroff/O'Reilly 2nd Edition, 2017.
3. https://developer.android.com

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcome
1	**Introduction**		CO1
1.1	History of Mobile Applications	1	
1.2	Multiplatform Mobile Application Development	1	
1.3	Android Architecture , API's , ADE	1	
2	**UI Design and Development**		
2.1	Layout, Views	1	
2.2	Activity - Life cycle, Creation, Launch		
2.3	Widgets and Notifications	2	
2.4	Menus and Dialogues	2	
3	**Messaging and Location based Services**		
3.1	Sending SMS	1	
3.2	Broad cast receivers	1	
3.3	Location settings in Virtual device	1	
3.4	API - Location Object creation, Location Manager	1	
3.5	Geo Coding &Maps	1	
4	**Android Storage**		CO2
4.1	Shared Preferences	1	
4.2	SQLite	1	
4.3	Content Provider	1	
4.4	FireBase& Cloud	1	
5	**Multimedia**		CO3
5.1	Sound, Video, Audio	1	
5.2	Graphics	1	
5.3	Animation		
6	**Hardware support**		CO4
6.1	Camera & Microphone	1	
6.2	Bluetooth, Wifi	1	
6.3	Sensor & Gesture	1	
7	**Case Study**		CO5
7.1	Xml Parsing, JSON Parsing	1	
7.2	RSS FeedReader,Web Services		
7.3	Kotlin, React Native	1	
7.4	Material Design, Android Game Development		
	Total Hours	**24**	

Exp No	Topic	No. of Practical Hours	Course Outcome
Problem and requirements identification in team		2	CO6
1	UI Design with Layout, Activity and Widgets	2	CO1
Mini project Review 1			CO6

2	Notifications, Menu and Dialogues	2	CO1
3	Location based services	2	CO1
4	Data storage	2	CO2
5	Multimedia	2	CO3
Mini project Review 2		2	CO6
6	Graphics and Animation	2	CO3
7	Hardware support - Camera/Bluetooth/WiFi/Sensor	2	CO4
8	Case Study – XML Parsing, JSON Parsing	2	CO5
9	Case Study – RSS FeedReader, Web Services etc	2	CO5
Mini project Review 3 - Complete project demonstration		2	CO6
Total Hours		**24**	

Course Designers:

1. Dr.P.Karthikeyan karthikit@tce.edu
2. Mrs.C.V.Nisha Angeline cvnait@gmail.com

18IT670	CLOUD COMPUTING LAB

Category	L	T	P	Credit
PC	0	0	2	1

Preamble

This laboratory course will make the students to experience the key techniques and concepts of cloud computing such as live migration, configuring the Virtual machines on different platforms and container technology. The students will be competent with the design, programming and application of cloud computing systems through hands-on experience.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Examine system requirements for the cloud deployment and application development.	29
CO2	Implement virtualization techniques for the data intensive computing applications	25
CO3	Develop and Implement applications using Dockers Containers	8
CO4	Develop and Deploy cloud applications on mobile devices	9
CO5	Design and Deploy a web application in PaaS environment	17
CO6	Simulate a cloud environment to implement new schedulers by analyzing the parameters affecting performance	12

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS4	Analyze	Organise	Complex Overt Response	1.2, 2.1.1, 2.1.2, 2.1.3, 2.1.5, 2.2.3, 2.3.3, 2.3.4,3.2.3, 3.2.6
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.5, 2.3.4, 2.2.3, 3.2.3, 3.2.6
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.2.3, 2.3.1, 3.1.1, 3.2.3, 3.2.6
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.2.3, 2.3.1, 3.1.1, 3.2.3, 3.2.6
CO5	TPS6	Create	Characterize	Origination	1.2, 2.1.1, 2.1.2, 2.2.3, 2.3.1, 3.1.1, 3.2.3, 3.2.6
CO6	TPS4	Analyze	Organise	Complex Overt response	1.2, 3.1.5, 2.3.3, 2.3.4, 3.2.3, 2.2.3, 3.2.6

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	L					S	S		M	S		M
CO2	S	M	L		S	L			S	S			M	M	L
CO3	S	M	L			M			S	S	M	M	M	L	M
CO4	S	M	L		S	M			S	S	L	L	M	S	M
CO5	S	S	S	S	S	M	L	L	S	S	M	M	S	S	M
CO6	S	S	M	L	S				S	S	L	L	S	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	-	
Understand	-	
Apply	50	50
Analyse	30	30
Evaluate		
Create	20	20

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Practical Component/Observation
Perception	
Set	
Guided Response	
Mechanism	50
Complex Overt Responses	30
Adaptation	
Origination	20

List of Experiments/Activities with CO Mapping

S.No	List of experiments	Course Outcomes	Total lecture hours
1.	Virtual Machine Management using Hypervisor i. VM-VM Ping ii. VM-External Host Ping iii. VM migration	CO2	2
2.	Implementation of Para Virtualization using virtualization tools i. Windows over Linux Platforms ii. Linux over windows platform	CO2	2
3.	Creating Azure Cloud Virtual Machines	CO1	2

4.	Launch a web application in PaaS environment such as IBM Bluemix, Google App Engine	CO5 (Upto Apply level)	2
5.	Open stack Installation and VM Configuration	CO1,CO2	2
6	Cloud Stack Installation and VM Configuration	CO1,CO2	2
7	Hadoop Installation and Configuration and Implementing a simple Program using Map Reduce Framework.	CO1	3
8	Develop any one cloud application using smartphones.	CO4	2
9	Deploy an application in a Docker container	CO3	2
10	Simulate a cloud scenario using CloudSim and run a new scheduling algorithm	CO6	2
11	Case Study based on the real time applications using Amazon Web Services, IBM Blue mix etc..	CO1-CO6	1
12	Mini project	CO5	2
	Total lab hours		24

The project/ Case study (on the topic of choice of the student) will require possibly the implementation of a real/simulated system, a writer report, and an oral presentation. Projects/ Case study can fall in a number of different areas, which are related to data intensive distributed computing**.**

Some of the data intensive computing applications like (not limited to),

- Distributed file system
- Data ware scheduling algorithms
- Distributed Job management systems
- Distributed Monitoring systems

Some of the real time applications like (not limited to)

- E-Health care management system
- Library Management system
- Ticket booking system
- Online survey consolidation system
- E-Learning
- Tracking system

Software's that need to be considered for the specific project area are (not limited to),

- Operating systems: Linux, Windows
- Programming models: MapReduce (Hadoop)
- Cloud Middleware: Nimbus, OpenStack, Owncloud, Cloudstack
- Virtualization: VMWare, KVM, Zen

Learning Resources

1. ArshdeepBahga, Vijay Madisetti, "Cloud Computing: A Hands-On Approach", CreateSpace Independent Publishing Platform, 1st edition, 2013

2. John Rittinghouse& James Ransome, “Cloud Computing, Implementation, Management and Strategy”, CRC Press, 2010.
3. Barrie Sosinsky, “ Cloud Computing Bible” John Wiley & Sons, 2010

Course Designers:

1. Dr.S.Padmavathi spmcse@tce.edu

18ES690	ENGINEERING DESIGN PROJECT	Category	L	T	P	Credit
		Project	1	0	4	3

Preamble

An engineer must understand the economic, social, political, sustainability and environmental contexts in which the need arises. Engineering solutions are always created in response to some societal/industrial need. Understanding the societal/industrial need is central to success in engineering design. Therefore, the engineering students have been assigned on the problem identification phase of engineering design. Now, they have an opportunity to reflect and realise the knowledge that have been gained through the courses such as 18ES150 Engineering Exploration, 18ES290 Lateral Thinking, 18ES390 Design Thinking, 18XX490 Project Management and 18ES590 System Thinking. This course will enable the students to integrate CDIO Skill-based courses and their domain-specific courses. More specifically, by employing the broad knowledge they gain from experiences in foundation elective, general elective and audit courses, students are better equipped to provide engineering solution societal and/or industrial needs.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Execute different phases of engineering design project including functional composition and design specification in a team.	20
CO2	Evaluate the alternate engineering design approaches as per the performance criteria with design verification and validation.	20
CO3	Evaluate a design with the use of test verification matrix / Design Failure Mode Effect Analysis (DFMEA)/ Usability testing	15
CO4	Explain the significance of Intellectual Property rights and the procedure for searching and filing a patent.	15
CO5	Exhibit team work with appropriate conflict management strategies.	10
CO6	Prepare appropriate design documents and deliver effective technical presentations	10

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1.1, 3.1.2, 3.2.3, 3.2.6, 4.1.2
CO2	TPS5	Evaluate	Organise	Adaptation	1.1, 1.2, 2.1.2, 2.5.1, 2.5.2, 3.1.2, 3.2.3, 3.2.6, 4.1.2
CO3	TPS5	Evaluate	Organise	Adaptation	1.1, 1.2, 2.1.3, 3.1.2, 3.2.3, 3.2.6, 4.1.2, 4.3.1
CO4	TPS2	Understand	Respond	Guided Response	1.1, 1.2, 2.1.4, 3.1.2, 3.2.3, 3.2.6, 4.1.2, 4.4.1
CO5	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1.5, 3.1.2, 3.2.3, 3.2.6, 4.1.2, 4.4.1
CO6	TPS3	Apply	Value	Mechanism	1.1, 1.2, 2.1.4, 3.1.2, 3.2.3, 3.2.6, 4.1.2, 4.4.1

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L	-	-	M	M	M	S	S	S	S
CO2	S	S	S	M	-	M	M	M	S	S	S	S
CO3	S	S	S	M	S	M	M	S	S	S	S	S
CO4	M	L	-	-	-	M	M	-	-	-	-	S
CO5	S	M	L	-	-	M	M	S	S	S	M	S
CO6	S	M	L	-	-	-	-	S	S	S	-	S

S- Strong; M-Medium; L-Low

Assessment Pattern:

Phases	Deliverables	Marks	Course Outcomes
Continuous Assessment			
Review 1 – Engineering Design Project Selection, functional decomposition and Specification	Technical Report	10	CO1, C06
Review 2 – Evaluation of Design Approaches	Technical Report	20	CO2, CO5, CO6
Review 3 – Design Verification and validation	Technical Report	20	CO3, CO4, CO6
End-Semester Examination			
Demonstration	Prototype	60	CO1, CO2, CO3, CO4 CO5, CO6
Design Portfolio Presentation	Portfolio Document	40	
• Reports are to be submitted at each review. The report and presentation will be evaluated based on customized Rubrics for periodic reviews. • Demonstration and Design Portfolio presentation will be evaluated by two faculty members nominated by their respective Head of the Department.			

Syllabus

Project Selection – Search Phase, Preliminary Design Review (PDR) and Critical Design Review (CDR), Project Specification, Proposal Report, Proposal Presentation
Engineering Design Process - The NASA Design Approach, Design Verification and Validation ,Design Verification Plan – DFMEA, test verification matrix, Usability testing, DRIDS-V Design Approach and Plan
Intellectual Property Rights – Trademarks, Copyrights and Patents, Types of patents, Searching patents, Filing Patents
Team formation and Communication – Types of teams, Team Conflict Management – common causes, cultural styles and conflict, Project Team Evaluation, Conducting Meetings and Making Presentations

Learning Resources

- Harvey F. Hoffman, “The Engineering Capstone Course: Fundamentals for Students and Engineers”, Springer, 2014
- https://sharepoint.ecn.purdue.edu/epics/teams/Public%20Documents/EPICS_Design_Process.pdf?_ga=2.252800138.2089889711.1612784342-1089955741.1612784342

Course Contents and Lecture Schedule

Module No	Topic	No. of Lectures	Course Outcome
1	**Project Selection**		
	Search Phase, Preliminary Design Review (PDR) and Critical Design Review (CDR), Project Specification,	2	CO1, CO6

	Proposal Report, Proposal Presentation		
2	**Engineering Design Process**		
2.1	The NASA Design Approach	1	CO2
2.2	Design Verification and Validation	1	CO2
2.3	Design Verification Plan – DFMEA, test verification matrix, Usability testing,	2	CO3
2.4	DRIDS-V Design Approach and Plan	1	CO3
3	**Intellectual Property Rights**		
3.1	Trademarks, Copyrights and Patents,	1	CO4
3.2	Types of patents, Searching patents,.	1	CO4
3.3	Filing Patents	1	CO4
4	**Team formation and Communication**		
4.1	Types of teams, Team Conflict Management – common causes, cultural styles and conflict,	1	CO5
4.2	Project Team Evaluation, Conducting Meetings and Making Presentations	1	CO5, CO6
	Total	**12**	

Course Designers:

- Dr.S.J. Thiruvengadam sjtece@tce.edu
- Dr. S.Saravana Perumaal sspmech@tce.edu
- Dr.C.Jeyamala jeyamala@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH. INFORMATION TECHNOLOGY DEGREE PROGRAMME

SEVENTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A GOVERNMENT AIDED ISO 9001:2008 CERTIFIED
AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY)
MADURAI – 625 015, TAMILNADU

PHONE: 0452 – 2482240, 41
FAX: 0452 2483427
WEB: WWW.TCE.EDU

Passed in Board of Studies meeting on 16.11.2019 Approved in 59th Academic Council Meeting on 7.12.2019

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2018-19 onwards)

SEVENTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
18IT710	Human Computer Interaction	PC	3	-	-	3
18ITPX0	Programme Elective	PE	3	-	-	3
18ITPX0	Programme Elective	PE	3	-	-	3
18ITPX0	Programme Elective	PE	3	-	-	3
18ITPX0	Programme Elective	PE	3	-	-	3
PRACTICAL						
18IT770	Infrastructure Testing Lab	PC	-	-	2	1
18IT780	Human Computer Interaction Lab	PC	-	-	2	1
18ES790	System Thinking	ES	-	-	4	2
Total			**15**	**-**	**8**	**19**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective
AC :Audit Course

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
2 Hours Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

B.Tech. Information Technology Degree Programme

Scheme of Examinations
(For the candidates admitted from 2018-19 onwards)

SIXTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	18IT710	Human Computer Interaction	3	50	50	100	25	50
2	18ITPX0	Programme Elective	3	50	50	100	25	50
3	18ITPX0	Programme Elective	3	50	50	100	25	50
4	18ITPX0	Programme Elective	3	50	50	100	25	50
5	18ITPX0	Programme Elective						
PRACTICAL								
7	18IT770	Infrastructure Testing Lab	3	50	50	100	25	50
8	18IT780	Human Computer Interaction Lab	3	50	50	100	25	50
9	18ES790	System Thinking	-	50	50	100	25	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** Terminal Examination will be conducted for maximum marks of 100 and subsequently be reduced to 50 marks for the award of terminal examination marks

18IT710	**Human Computer Interaction**	Category	L	T	P	Credit
		PC	3	0	0	3

Preamble

This course gives an introduction to contemporary user interfaces, including the basics of human-computer interaction, the user interface design/evaluation process, and the architectures within which user interfaces are developed. The hands on exposure to this course will be implemented with the design of how user interfaces are implemented for various real time projects.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Explain the fundamental concepts and needs for human computer interaction, User interface design, understanding human psychology and applications of HCI in various fields	14
CO2	Explain Human Physiology, perceptual, sensing, motor, memory characteristics and Modelling with GOMS	22
CO3	Illustrate the interface with interaction model considering the context, ergonomics, experience and engagement	17
CO4	Apply the Universal design principles with standards Norman, Seeheim model and DOET Principles with tools	19
CO5	Analyse the design issues with Nielsen's principles, experts, controlled psychological experiments and errors	17
CO6	Demonstrate the working of devices for normal, physical and cognitive impaired people along with case studies	11

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TSP2	Understand	Respond		1.2,2.3.1,2.3.2
CO2	TSP2	Understand	Respond		1.2, 2.2, 2.3.1,2.3.2,3.1.4, 3.1.5
CO3	TSP3	Apply	Value		1.2, 2.2, 2.3.1,2.3.2,3.1.4, 3.1.5
CO4	TSP3	Apply	Value		1.2,2.3.1, 2.3.2, 2.3.3, 4.4.1, 4.5.3, 4.5.5
CO5	TSP4	Analyse	Organise		1.2,4.3.4, 4.6.1
CO6	TSP3	Apply	Value		1.2,4.3.4, 4.5.3, 4.5.6, 4.6.1

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	M	L											L		
CO3	S	M	L			L		L				M	M	L	L
CO4	S	M	L		L	L		L				S	M	L	L
CO5	S	S	M	L	S	L		L	M	M	M	S	S	M	M
CO6	S	M	L		M	L	L	M	M	M	M	S	M	M	M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	10		-	-	-	10
Understand	20	30	30	-	-	-	20
Apply	60	40	40	50	50	50	40
Analyse	-	20	30	50	50	50	30
Evaluate							
Create							

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Practical Component/Observation
Perception	-
Set	-
Guided Response	-
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1(CO1):

1. Describe the taxonomy of HCI with an example
2. Summerise requirements of User Interface Design
3. Discuss the Sucess stoires of HCI Desin in Medical Field

Course Outcome 2(CO2):

1. Explain the ways in which the information is sensed, processed in human being
2. Describe the processing of opitcal illusion in human eye and its role for UI Design
3. Discuss about sensory memory

Course Outcome 3(CO3):

1. Draw the seven stages of Donald Normal Model for mobile device
2. Apply the Ergonomics for mobile for the left hand side user
3. Illustrate the look and feel effect in Mac OS and Windows OS

Course Outcome 4(CO4):

1. Apply Shneiderman's golden rule for designing the spectacles
2. Use MVC (Model View Controller) and PAC(Presentation Abstraction Control) for mouse design
3. Apply the story board for the game console you are developing

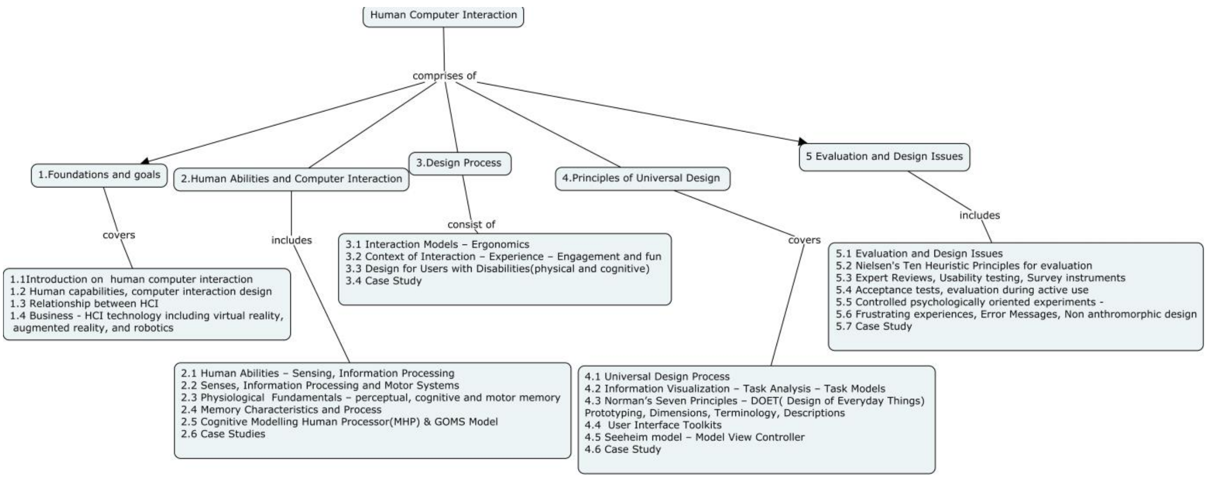
Course Outcome 5(CO5):

1. Analyse the cognitive walkthrough for the wheel chair desinged for the challenging people
2. Examine the importance of Heuristic Evaluation for OS development
3. Experiment the frsutrating experiences and error messages for the devices you have discussed and list the ways to improvise it for customer need

Course Outcome 6(CO6):

1. Design a User Interface for hand gestures as a mode of interaction for children with cognitive challenges
2. Illustrate the Speech Based Mobile Interface for the Textually Low Literate
3. Practice Interactive Information Platform for Remote Health Care

Concept Map



Syllabus

Foundations and goals of human computer interaction – human capabilities – computer interaction design - Relationship between HCI, User Experience design, human factors engineering, and psychology - Relevance of HCI to domains like healthcare, education, and Business - HCI technology including virtual reality, augmented reality, and robotics

Human Abilities and Computer Interaction – Senses, Information Processing and Motor Systems – Physiological Fundamentals – perceptual, cognitive and motor memory - Memory Characteristics and Process –Cognitive Modelling Human Processor(MHP) & GOMS Model

Design Process - Interaction Models – Ergonomics – Context of Interaction – Experience – Engagement and fun - Design for Users with Disabilities(physical and cognitive) – Software Engineering aspects of HCI

Principles of Universal Design – Design Process – - Information Visualization – Task Analysis – Task Models –Norman's Seven Principles – DOET(Design of Everyday Things) - Prototyping – Dimensions – Terminology – Descriptions – storyboarding –User Interface Toolkits – Seeheim model – Model View Controller

Evaluation and Design Issues– Nielsen's Ten Heuristic Principles for evaluation- Expert Reviews – Usability testing – Survey instruments – acceptance tests – evaluation during active use – controlled psychologically oriented experiments - Frustrating experiences–Error Messages - Non anthromorphic design – Evaluation of spastic devices interaction panels

Learning Resources

1. Don Norman, " The Design of Everyday Things" First Edition, Basic Books, 2013.
2. Alan Dix, Janet E.Finlay, Gregory D.Abowd, Russell Beale , " Human-Computer Interaction" (3rd Edition) , Prentice-Hall, Inc, 2009, ISBN : 0130461091
3. B. Shneiderman; Designing the User Interface, Addison Wesley, 5th Edition, 2014.
4. https://www.cc.gatech.edu/~stasko/6750
5. http://iitg.ac.in/uelab/courses.html

Course Content & Lecture Schedule

Module No.	Topic	No. of Lecture Hours	CO
1	**Foundations and goals**		
1.1	Introduction on human computer interaction	1	CO1
1.2	Human capabilities, computer interaction design	1	
1.3	Relationship between HCI, User Experience design, human factors engineering, and psychology	1	
1.4	Relevance of HCI to domains like healthcare, education	1	
1.4.1	Business - HCI technology including virtual reality, augmented reality, and robotics	1	
2	**Human Abilities and Computer Interaction**		
2.1	Human Abilities – Sensing, Information Processing	1	CO2
2.2	Senses, Information Processing and Motor Systems	2	
2.3	Physiological Fundamentals – perceptual, cognitive and motor memory	2	
2.4	Memory Characteristics and Process	1	
2.5	Cognitive Modelling Human Processor(MHP) & GOMS Model	2	
2.6	Case Studies	1	CO6
3	**Design Process**		
3.1	Interaction Models – Ergonomics	2	CO3
3.2	Context of Interaction – Experience – Engagement and fun	2	
3.3	Design for Users with Disabilities(physical and cognitive)	2	
3.4	Case Study	1	CO6
4	**Principles of Universal Design**		
4.1	Universal Design Process	1	CO4
4.2	Information Visualization – Task Analysis – Task Models	1	
4.3	Norman's Seven Principles – DOET(Design of Everyday	2	

	Things)		
4.4	Prototyping, Dimensions, Terminology, Descriptions	1	
4.5	Storyboarding, User Interface Toolkits	1	
4.6	Seeheim model – Model View Controller	1	
4.7	Case Study	1	CO6
5	**Evaluation and Design Issues**		
5.1	Evaluation and Design Issues	1	CO5
5.2	Nielsen's Ten Heuristic Principles for evaluation	1	
5.3	Expert Reviews, Usability testing, Survey instruments	1	
5.4	Acceptance tests, evaluation during active use	1	
5.5	Controlled psychologically oriented experiments -	1	
5.6	Frustrating experiences, Error Messages, Non anthromorphic design	1	
5.7	Case Study	1	CO6
	Total Hours	36	

Course Designers

Dr.D.Tamilselvi dtamilselvi@tce.edu
Mrs.T.Manju tmanju@tce.edu

18IT780	Human Computer Interaction Lab

Category	L	T	P	Credit
PC	0	0	2	1

Preamble

This laboratory course will make the students to design the user interface with required ethical standards and principles. The students will be competent in storyboarding the design and doing usability testing. They can also visualize the data acquired during research visit in the specific real world domains.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Design the interface with story boarding and interaction model considering the context, ergonomics, experience and engagement	25
CO2	Develop the prototype for the chosen problem	16.7
CO3	Visualize the Information using Information visualization tool.	8.2
CO4	Examine the societal, economic influences for the given problem	16.7
CO5	Analyse the design issues with user experience and usability testing	16.7
CO6	Report all the research findings with genuine design and development.	16.7

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TSP3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2, 2.1.3, 2.1.5, 2.2.3, 2.3.3, 2.3.4,3.2.3, 3.2.6
CO2	TSP3	Apply	Value	Mechanism	1.2, 2.1.5, 2.3.4, 2.2.3, 3.2.3, 3.2.6
CO3	TSP4	Analyze	Organize	Complex Overt Responses	.2, 2.1.1, 2.1.2, 2.2.3, 2.3.1, 3.1.1, 3.2.3, 3.2.6
CO4	TSP4	Analyze	Organize	Complex Overt Responses	.2, 2.1.1, 2.1.2, 2.2.3, 2.3.1, 3.1.1, 3.2.3, 3.2.6
CO5	TSP5	Evaluate	Organize	Adaptation	.2, 2.1.1, 2.1.2, 2.2.3, 2.3.1, 3.1.1, 3.2.3, 3.2.6
CO6	TSP6	Create	Characterize	Origination	.2, 2.1.1, 2.1.2, 2.2.3, 2.3.1, 3.1.1, 3.2.3, 3.2.6

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	S	M	L					S	S		M	M		M
CO2	S	M	L		S	L			S	S			L	L	L
CO3	S	M	L			M			S	S	M	M	L	L	M
CO4	S	M	L		S	M			S	S	L	L	L	L	M
CO5	S	M	L		S	M	L	L	S	S	M	M	L	M	M
CO6	S	M	L		S				S	S	L	L	L	L	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Model Examination	Terminal Examination
Remember	-	
Understand	-	
Apply	20	20
Analyse	20	20
Evaluate	30	30
Create	30	30

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject/Practical Component/Observation
Perception	-
Set	-
Guided Response	-
Mechanism	20
Complex Overt Responses	20
Adaptation	30
Origination	30

List of Experiments/Activities with CO Mapping

S.No.	List of Experiments	No. of Lecture Hours	Course Outcomes
1	Gather useful information about users and activities through asking, looking, learning, and trying	2	CO1
2	Organize information about users into useful summaries with affinity diagrams – Chart , Software	2	
3	User research findings with personas and scenarios	2	
4	Sketching as a process for user experience design – Chart, Software	2	CO2
5	Give and accept critiques of design ideas in a constructive manner – Peer Review	2	
6	Visualize the data gathered through any information visualization tool.	2	CO3
7	Demonstrate skills for low-fidelity prototyping and describe the strengths and weaknesses of a variety of prototyping methods – Software	2	CO4
8	Appreciate the process of user experience design as a-cyclical, iterative process	2	
9	Understand the differences between usability and user experience.	2	CO5
10	Analyze an interaction design problem and propose a user-centred process, justifying the process and identifying the trade-offs	2	CO2
11	Development of accessible, Gesture and user-adapted interfaces for people with sensory, motor/physical and	2	

	cognitive/language impairments.		
12	Prepare high quality, professional documentation and artifacts relating to the design process for preparation for a professional portfolio	2	CO6
	Total Hours	24	

Course Designers

Dr.D.Tamilselvi dtamilselvi@tce.edu
Mrs.T.Manju tmanju@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.TECH. INFORMATION TECHNOLOGY DEGREE PROGRAMME

EIGHTH SEMESTER

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A GOVERNMENT AIDED ISO 9001:2008 CERTIFIED
AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY)
MADURAI – 625 015, TAMILNADU

PHONE: 0452 – 2482240, 41
FAX: 0452 2483427
WEB: WWW.TCE.EDU

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

COURSES OF STUDY
(For the candidates admitted from 2018-19 onwards)

EIGHTH SEMESTER

Course Code	Name of the Course	Category	No. of Hours / Week			credits
			L	T	P	
THEORY						
18ITPX0	Programme Elective	PE	3	-	-	3
18ITPX0	Programme Elective	PE	3	-	-	3
PRACTICAL						
18IT810	PROJECT	PC	-	-	18	9
Total			**6**	**-**	**18**	**15**

BS : Basic Science
HSS : Humanities and Social Science
ES : Engineering Science
PC : Program Core
PE : Program Elective
GE : General Elective
AC :Audit Course

L : Lecture
T : Tutorial
P : Practical

Note:
1 Hour Lecture is equivalent to 1 credit
2 Hours Tutorial is equivalent to 1 credit
2 Hours Practical is equivalent to 1 credit

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

Scheme of Examinations
(For the candidates admitted from 2018-19 onwards)

EIGHTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Terminal Exam. in Hrs.	Marks			Minimum Marks for Pass	
				Continuous Assessment *	Terminal Exam **	Max. Marks	Terminal Exam	Total
THEORY								
1	18ITPX0	Programme Elective	3	50	50	100	25	50
2	18ITPX0	Programme Elective	3	50	50	100	25	50
PRACTICAL								
3	18IT810	Project	-	50	50	100	25	50

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** Terminal Examination will be conducted for maximum marks of 100 and subsequently be reduced to 50 marks for the award of terminal examination marks

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

PROGRAMME ELECTIVES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41
Fax: 0452 2483427
Web: www.tce.edu

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

List of Electives
(For the candidates admitted from 2018-19 onwards)

COURSE CODE	COURSE NAME
18ITPA0	Machine Learning
18ITPB0	Deep Learning
18ITPC0	Information Retrieval
18ITPD0	Distributed Application Development
18ITPE0	Fog Computing
18ITPF0	Software Defined Networks
18ITPG0	Services Oriented computing
18ITPH0	Computer Vision
18ITPJ0	Wireless and Mobile Communication
18ITPL0	Cyber Physical Systems
18ITPM0	Ethical Hacking
18ITPN0	Cyber forensics
18ITPP0	Block chain Technologies
18ITPQ0	Software Testing
18ITPR0	C# and .NET Programming
18ITPS0	Theory of Computation
18ITPT0	Principles of Compiler Design

PE : Program Elective

Note:

1 Hour Lecture is equivalent to 1 credit

2 Hours Tutorial is equivalent to 1 credit

2 Hours Practical is equivalent to 1 credit

18ITPA0	MACHINE LEARNING

Category	L	T	P	Credit
PE	3	0	0	3

Preamble

The course on machine learning provides an emphasis on data dimensionality reduction techniques, supervised, unsupervised and reinforcement learning models. It also facilitates the student by interpreting the real world problems by examining with appropriate machine learning tools.

Prerequisite

18IT530 - Data Mining

Course Outcomes

On successful completion of the course, students will be able to

Course Outcomes		Weightage in %
CO1	Describe theory underlying machine learning concepts and techniques.	11
CO2	Apply suitable dimensionality reduction techniques to select the features from the given dataset.	17
CO3	Construct algorithms to learn linear and non-linear classification and Regression models.	26
CO4	Implement data clustering algorithms such as Hierarchical Clustering, Gaussian Mixture Models, Expected Maximization and Hidden Markov Model to cluster the given dataset and hence identity the outliers.	15
CO5	Apply reinforcement learning techniques for real life problems especially medical data set.	17
CO6	Analyze the performance of various classifiers, regression models, clustering and reinforcement algorithms in terms of time and space complexity.	14

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond		1.3,2.3.1,2.3.2
CO2	TPS3	Apply	Value	Mechanism	1.3, 2.3.1, 2.3.2, 3.1.2,4.4.1,4.5.3
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.3.1, 2.3.2, 3.1.2,4.4.1,4.5.3
CO4	TPS3	Apply	Value	Mechanism	1.3, 2.3.1, 2.3.2, 3.1.2, 4.4.1, 4.5.3
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.3.1,2.3.2, 3.1.2, 4.4.1,4.5.3
CO6	TPS4	Analyse	Organise	Complex Overt Responses	1.3, 2.2.1, 2.2.3, 2.2,4, 2.3.1, 2.3.2, 2.4, 2.5, 3.1, 3.2 , 4.1.1,4.1.2,4.1.3, 4.3, 4.4, 4.5.3, 4.5.5, 4.5.6

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		M							M	M	L	L
CO3	S	M	L		M							M	M	L	L
CO4	S	M	L		M							M	M	L	L
CO5	S	M	L		M							M	M	L	L
CO6	S	S	M	L	S	M		M	M	M		S	S	S	M

S- Strong; M-Medium; L-Low

*CO6 will be assessed through Mini Project / Assignment

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	30	20	20	0	0	0	20
Understand	20	20	20	0	0	0	20
Apply	50	60	60	100	60	60	60
Analyze	0	0	0	0	40	40	0
Evaluate	0	0	0	0	0	0	0
Create	0	0	0	0	0	0	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Assignment/Practical Component
Perception	-
Set	-
Guided Response	-
Mechanism	60
Complex Overt Responses	40
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):

1. Describe different types of Learning Models.
2. Differentiate supervised, unsupervised and Reinforcement Learning.
3. Explain about PAC Framework.

Course Outcome 2 (CO2):

1. Compute the Linear Discriminant projection for the following two dimensional dataset.
   Samples for class **ω1** : **X1**=(x1,x2)={(4,2),(2,4),(2,3),(3,6),(4,4)}
   Sample for class **ω2** : **X2**=(x1,x2)={(9,10),(6,8),(9,5),(8,7),(10,8)}

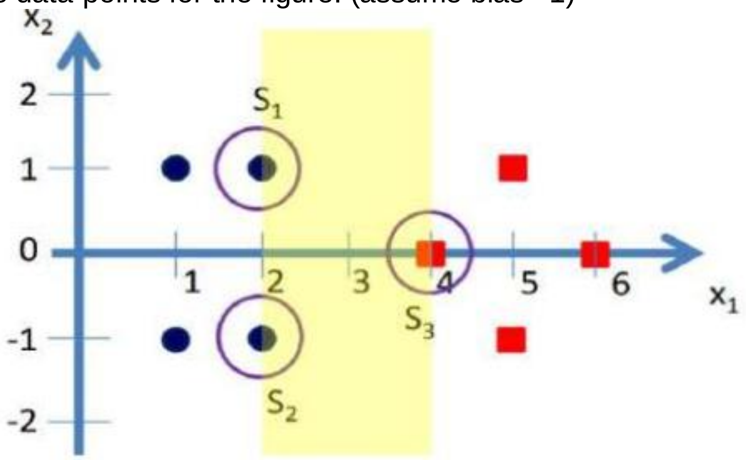
2. Determine the Principal Components for the given 3-Dimensional dataset. (1, 2,4), (2, 4,6), (3, 6,8) (4,8,10) (5,10,12) (6,12,14)

3. Apply Partial Least Squares in the following data and write the findings. Let us assume that dependent variables are J1 to J6, Explanatory variables are: Glucose, Fructose, Saccharose and Observation label is: Name of the Orange Juice.

Orange juice	Glucose	Fructose	Saccharose	J1	J2	J3	J4	J5	J6
pampryl amb.	25.32	27.36	36.45	2	1	2	4	2	2
tropicana amb.	17.33	20	44.15	2	3	3	4	3	4
fruvita fr.	23.65	25.65	52.12	3	3	4	4	2	5
joker amb.	32.42	34.54	22.92	2	2	2	2	2	3
tropicana fr.	22.7	25.32	45.8	4	4	3	4	3	3
pampryl fr.	27.16	29.48	38.94	3	1	1	2	2	3

Course Outcome 3 (CO3):

1. Apply SVM algorithm for the data-points and find dimension of hyper plane to classify the data-points for the figure. (assume bias =1)



2. Apply KNN classifier to classify the following Breast Cancer Dataset by considering 7 features in to account. Let diagnosis is the class label. Also compute the following
   a. Leave one cut cross validation error of 1NN
   b. 3 – folded cross validation error of 4NN

diagnosis	radius_ mean	texture_ mean	perimeter_ mean	area_ mean	smoothness_ mean	Concavity_ mean
M	17.99	10.38	122.8	1001	0.1184	0.3001
M	20.57	17.77	132.9	1326	0.08474	0.0869
M	19.69	21.25	130	1203	0.1096	0.1974
M	11.42	20.38	77.58	386.1	0.1425	0.2414
M	20.29	14.34	135.1	1297	0.1003	0.198

B	13.54	14.36	87.46	566.3	0.09779	0.06664
B	13.08	15.71	85.63	520	0.1075	0.04568
B	9.504	12.44	60.34	273.9	0.1024	0.02956

3. Apply Ridge and Lasso Regression in the '*Motor Trend* US magazine – mtcars' dataset and analyze their performance. The variable mpg - miles per gallon (or fuel efficiency) is the response variable.

model	**mpg**	**cyl**	**disp**	**hp**	**drat**	**wt**	**qsec**	**vs**	**am**	**gear**	**carb**
Mazda RX4	21	6	160	110	3.9	2.62	16.46	0	1	4	4
Mazda RX4 Wag	21	6	160	110	3.9	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108	93	3.85	2.32	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout	18.7	8	360	175	3.15	3.44	17.02	0	0	3	2
Valiant	18.1	6	225	105	2.76	3.46	20.22	1	0	3	1
Duster 360	14.3	8	360	245	3.21	3.57	15.84	0	0	3	4
Merc 240D	24.4	4	146.7	62	3.69	3.19	20	1	0	4	2

Course Outcome 4 (CO4):

1. Consider the following matrix and apply the hidden markov model. Class label is Climate A(hot,cold),Temperature is hidden node for climate- B(low,medium,high)

$$\Pi = [0.55, 0.45] \quad A = \begin{bmatrix} 0.1 & 0.9 \\ 0.4 & 0.6 \end{bmatrix} \quad B = \begin{bmatrix} 0.2 & 0.5 & 0.3 \\ 0.4 & 0.3 & 0.2 \end{bmatrix}$$

Find the probability of the 4 years sequence of [hot, cold, hot, hot] for [low, medium, high, medium]

2. Show the hierarchy of clustering created by the single-link clustering and complete-link clustering algorithms.

	P1	**P2**	**P3**	**P4**	**P5**	**P6**
P1	1.00	0.70	0.65	0.40	0.20	0.05
P2	0.70	1.00	0.95	0.70	0.50	0.35

P3	0.65	0.95	1.00	0.75	0.55	0.40
P4	0.40	0.70	0.75	1.00	0.80	0.65
P5	0.20	0.50	0.55	0.80	1.00	0.85
P6	0.05	0.35	0.40	0.65	0.85	1.00

3. Apply LOF (Local Outlier Factor) algorithm in the following dataset to detect the anomaly data.

user_id	load_ video	pause_ video	play_ video	seek_ video	speed_change_ video	stop_ video
0	2	1	4	1	0	1
1	6	14	14	0	0	1
2	1	0	0	0	0	0
3	2	2	2	0	0	1
4	1	3	22	18	0	0
5	4	1	5	9	0	1
6	1	5	9	6	1	1
7	2	1	18	16	0	0
8	3	7	9	2	0	1

Course Outcome 5 (CO5):

1. Apply temporal difference learning approach to the tic-tac-toe problem. Suppose that the probability of winning at a particular state is 0.6, the max probability value in the next set of states is 0.8, and based on our exploration policy, we choose a next state which has probability value 0.4. Should you backup the current state's probability value based on this choice of next state (i.e., move probability value 0.6 closer to 0.4) or not, given that the agent never stops exploring (i.e., the agent always makes an explanatory move some fraction of the time)? Justify your answer.

2. Suppose we want an RL agent to learn to play the game of golf. For training purposes, we make use of a golf simulator program. Assume that the original reward distribution gives a reward of +10 when the golf ball is hit into the hole and -1 for all other transitions. To aid the agents learning process, we propose to give an additional reward of +3 whenever the ball is within a 1 metre radius of the hole. Is this additional reward a good idea or not? Justify.
3. Implement Q- Learning .and SARSA algorithm for developing the game called "cliff". The cliff is a 2D world where a player (blue) has to reach the goal (green) by walking through the world while avoid to fall into the cliff (red).

Course Outcome 6 (CO6):

*CO6 will be assessed through Mini Project / Assignment

Group formation: Students are split into project groups with around 2 or 3 members in each group. A team can execute the project using appropriate Data dimension reduction and Learning algorithms. Students can use the software like R tool, Rapid Miner and python etc.

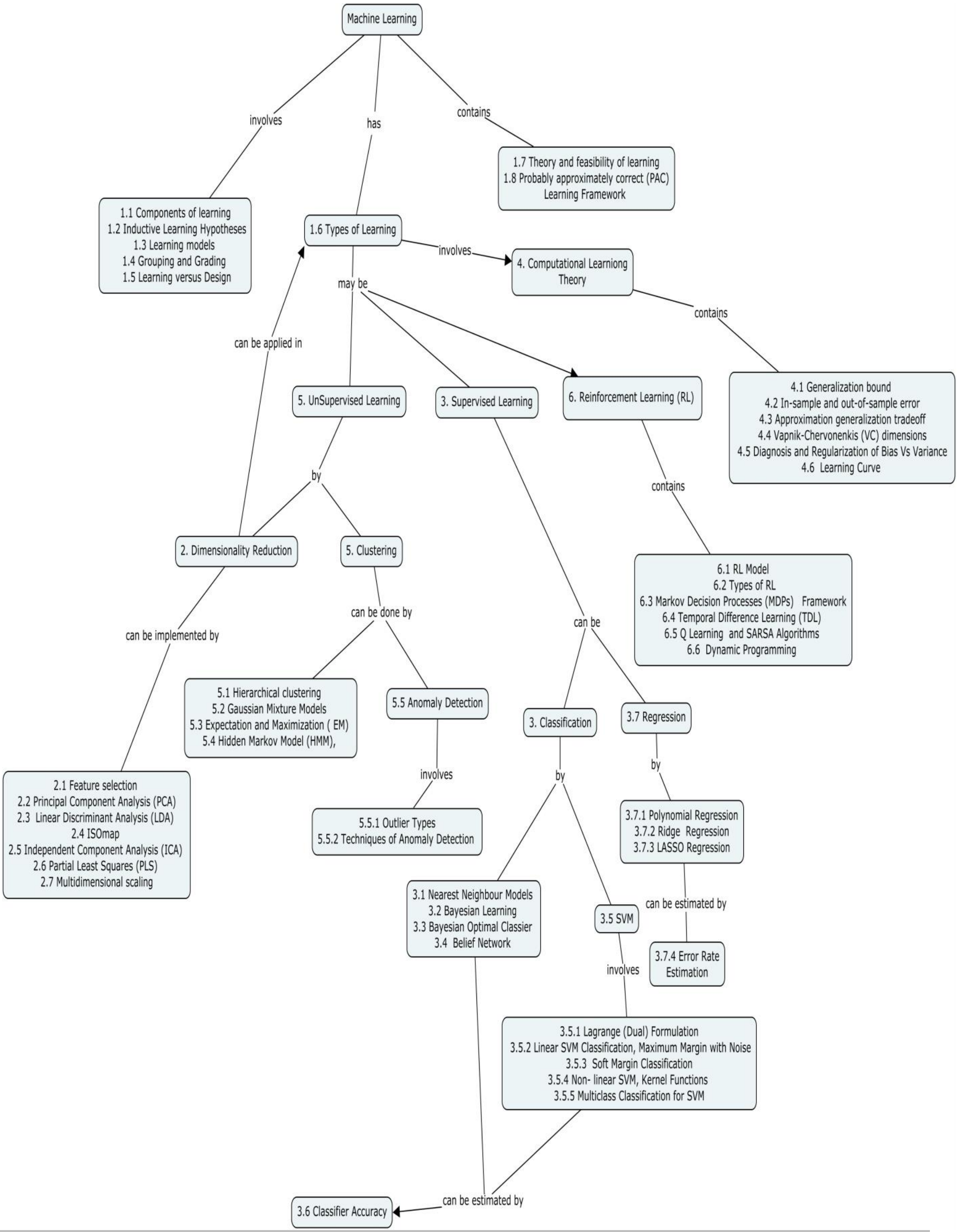
At the end of the semester, the team members have to present their project, submit their report and share their lessons learnt/best practices with other teams. Some of the activities may include: (but not limited to)

- Application identification and data set collection (Collect the real time dataset from Kaggle / UCI Repository / github etc)
- Design diagram or Data Modeling Diagram
- Applying Data dimensionality reduction algorithms
- Selecting relevant Learning algorithm to extract knowledge from the data set
- Execution of the algorithm
- Results and performance analysis
- Documentation

Some of the Mini-project titles may include: (but not limited to)

- Speech Recognition
- Automatic Recognition of Handwritten documents
- Healthcare Dataset
- Biological Data Analysis
- Intrusion Detection
- Internet of Things (IoT),
- Security Applications
- Financial Data Analysis
- Retail Industry
- Telecommunication Industry
- Education
- CRM- Customer Relationship Management

Concept Map



Syllabus

Machine Learning : Components of learning – Inductive Learning Hypotheses- Learning models – geometric models, probabilistic models, logic models – Grouping and Grading –

Learning versus Design – Types of learning – supervised , unsupervised , reinforcement – Theory and feasibility of learning - Probably approximately correct (PAC) Learning Framework

Dimensionality Reduction: Feature selection - Principal Component Analysis (PCA) - Linear Discriminant Analysis (LDA) – ISOmap - Independent Component Analysis (ICA) - Partial Least Squares (PLS) - Multidimensional scaling – Case Study

Supervised learning – Nearest Neighbour Models - Bayesian Learning - Bayesian Optimal Classier - Belief Network - SVM – Lagrange (Dual) Formulation, Linear SVM Classification, Maximum Margin with Noise, Soft Margin Classification, Non- linear SVM, Kernel Functions - Multiclass Classification for SVM - Classifier Accuracy Estimation - Case Study

Regression – Types - Polynomial Regression - Ridge and LASSO (Least Absolute Shrinkage and Selection Operator) Regression - Error Rate Estimation - Case Study

Computational Learning Theory: Generalization bound - In-sample and out-of-sample error - Approximation generalization tradeoff - Vapnik-Chervonenkis (VC) dimensions - Diagnosis and Regularization of Bias Vs Variance - Learning Curve - Case Study

UnSupervised Learning: Hierarchical clustering - Divisive and Agglomerative – Gaussian Mixture Models – Expectation Maximization (EM) algorithm – Hidden Markov Model (HMM), Anomaly Detection – Outlier Types, Techniques of Anomaly Detection - Case Study

Reinforcement Learning (RL): RL Model, Types of RL, Markov Decision Processes (MDPs) Framework, — Temporal Difference Learning (TDL) –Q Learning – SARSA (State-Action-Reward-State-Action) Algorithms – Dynamic Programming - Case Study

The following **use cases** will be applied during the discussion of the different Learning Models:
Speech Recognition, Automatic Recognition of Handwritten documents, Healthcare Dataset, Biological Data Analysis, Intrusion Detection, Internet of Things (IoT), Security Applications. Gaming etc.

Learning Resources

- Tom M Mitchell, “Machine Learning”, McGraw-Hill, Indian Edition, 2017.
- Manaranjan Pradhan, U Dinesh Kumar, “Machine Learning using Python”, Wiley, First Edition, 2019.
- Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, “Learning from Data”, AML Book Publishers, First Edition, 2012.
- P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, First Edition, 2012.
- K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, First Edition, 2012
- M. Mohri, A. Rostamizadeh, and A. Talwalkar, “Foundations of Machine Learning”, MIT Press, First Edition, 2012.
- C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, First Edition, 2007.
- https://nptel.ac.in/courses/106105152/ - Introduction to Machine Learning by Prof. Sudeshna Sarkar, IIT Kharagpur
- https://www.coursera.org/learn/machine-learning - Machine Learning by Prof. Andrew Ng, Standford University

Course Contents and Lecture Schedule			
Module No	**Topic**	**No. of Lecture Hours**	**Course Outcome**
1	**Machine Learning**		
1.1	Components of learning	1	CO1
1.2	Inductive Learning Hypotheses		
1.3	Learning models – geometric models , probabilistic models, logic models	1	
1.4	Grouping and Grading	1	
1.5	Learning Versus Design		
1.6	Types of learning – supervised, unsupervised and reinforcement	1	
1.7	Theory and feasibility of learning		
1.8	Probably approximately correct (PAC) Learning Framework		
2	**Dimensionality Reduction**		
2.1	Feature selection	1	CO2
2.2	Principal Component Analysis (PCA)	1	
2.3	Linear Discriminant Analysis (LDA)	1	
2.4	ISOmap	1	
2.5	Independent Component Analysis (ICA)		
2.6	Partial Least Squares (PLS)	1	
2.7	Multidimensional Scaling	1	
3	**Supervised Learning**		
3.1	Nearest Neighbour Models	1	CO3
3.2	Bayesian Learning	1	
3.3	Bayesian Optimal Classier		
3.4	Belief Network	1	
3.5	**SVM**		
3.5.1	Lagrange (Dual) Formulation	1	CO3
3.5.2	Linear SVM Classification ,Maximum Margin with Noise	1	
3.5.3	Non- linear SVM	1	
3.5.4	Kernel Functions		
3.5.5	Multiclass Classification for SVM	1	
3.6	Classifier Accuracy Estimation	1	CO6
3.7	Regression		
3.7.1	Types, Polynomial Regression	1	CO3
3.7.2	Ridge Regression	1	
3.7.3	LASSO (Least Absolute Shrinkage and Selection Operator) Regression		
3.7.4	Error Rate Estimation		CO6
4	**Computational Learning Theory**		

4.1	Generalization bound	1	CO6
4.2	In-sample and out-of-sample error		
4.3	Approximation generalization tradeoff	1	
4.4	Vapnik-Chervonenkis (VC) dimensions	1	
4.5	Diagnosis and Regularization of Bias Vs Variance	1	
4.6	Learning Curve		
5	UnSupervised Learning		
5.1	Hierarchical clustering - Divisive and Agglomerative	1	CO4
5.2	Gaussian Mixture Models	1	
5.3	Expectation - Maximization (EM) Algorithm	1	
5.4	Hidden Markov Model (HMM)	1	
5.5	Anomaly Detection		
5.5.1	Outlier Types	1	CO4
5.5.2	Techniques of Anomaly Detection	1	
6	Reinforcement Learning (RL)		
6.1	RL Model	1	CO5
6.2	Types of RL		
6.3	Markov Decision Processes (MDPs) Framework	1	
6.4	Temporal Difference Learning (TDL)	1	
6.5	Q Learning and SARSA (State-Action-Reward-State-Action) Algorithms	1	
6.6	Dynamic Programming	2	
	Total Lectures	**36**	

Course Designers:

1. C.Deisy cdcse@tce.edu
2. S. Sridevi sridevi@tce.edu

18ITPB0	DEEP LEARNING	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

This course aims to present the mathematical, statistical and computational challenges of building stable representations for high-dimensional data, such as images, text and data. This course highlights machine learning basics, deep learning fundamentals, Deep models and optimization, recent models from supervised and unsupervised learning. Special emphasis will be on Convolutional neural networks, Recurrent neural networks and its applications.

Prerequisite

- Probability and Basic Mathematical Foundations

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Identify the learning algorithms with appropriate estimation of hyper parameters.	11
CO2	Demonstrate various Architectural design of deep networks with activation functions	11
CO3	Illustrate the tuning of hyperparameters and optimization methods for deep models.	20
CO4	Show the working principle of deep Convolutional network models with appropriate hyperparameters.	25
CO5	Practice the necessity of Recurrent Neural Network for NLP process.	17
CO6	Discover the usage of deep learning models for real world applications using appropriate tools.	16

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond		1.3, 2.3.1, 2.3.2, 2.5, 3.1,3.2
CO2	TPS3	Apply	Value		1.3, 2.2, 2.5, 2.3.1, 2.3.2, 3.1, 3.2, 3.1.4, 3.1.5
CO3	TPS3	Apply	Value		1.3, 2.2, 2.5, 2.3.1, 2.3.2, 3.1, 3.2, 3.1.4, 3.1.5
CO4	TPS3	Apply	Value		1.3, 2.5, 2.3.1, 2.3.2, 2.3.3, 3.1, 3.2, 4.4.1, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value		1.3, 2.5, 3.1, 3.2.4, 3.4, 4.6.1
CO6	TPS4	Analyze	Organize	Type your text	1.3, 2.5, 3.1, 3.2, 4.3.4, 4.5.3, 4.5.6, 4.6.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L										M		
CO3	S	M	L		L							L	M	L	L

CO4	S	M	L		L							L	M	L	L
CO5	S	M	L		L							L	M	L	L
CO6	S	S	M	L	S	M		L	M			S	M	L	M

S- Strong; M-Medium; L-Low

Guidelines for the Mini-Project:

Group formation: Students are split into project groups with around 3 members in each group. A team can execute the project using appropriate deep learning techniques/ algorithms and improve the efficiency of the algorithm by any hybridization using any of the deep learning tools (open source) like Theano, Torch, Caffee, Ran Bi, CUDA, and PyLearn2. Students can also deploy some cloud based virtualization techniques to load their dataset (using Amazon AWS etc.,)

At the end of the semester, the team members have to present their project, submit their report and share their lessons learnt/best practices with other teams. Some of the activities may include: (but not limited to)

- ✓ Application identification and data set collection
- ✓ Selecting relevant deep learning technique to extract knowledge from the data set
- ✓ Design diagram of knowledge extraction from raw data
- ✓ Results and performance analysis for the chosen deep learning technique
- ✓ Documentation

Some of the Mini-project titles may include: (but not limited to)

- Face Recognition
- Voice and Speech Recognition
- Audio Recognition and calibration
- Signal processing
- Financial Data Analysis
- Retail Industry
- Telecommunication Industry
- Biological Data Analysis
- Other Scientific Applications
- Intrusion Detection
- Healthcare
- Education

Assessment Pattern: Cognitive Domain

Cognitive Levels	**Continuous Assessment Tests**			**Assignment**			**Terminal Examination**
	1	**2**	**3**	1	2	3	
Remember	20	20	10				0
Understand	50	40	30	20			20
Apply	30	40	40	80	80	80	60
Analyse	0	0	20		20	20	20
Evaluate	0	0	0				0
Create	0	0	0				0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project/Assignment/Practical Component
Perception	-
Set	-
Guided Response	-
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1):

1. Identify the needs for validation test.
2. Differentiate the various deep learning networks models highlighting their advantages and disadvantages.
3. Explain the roles of gradient based learning.

Course Outcome 2 (CO2):

1. Calculate the value of one gotcha with the cross-entropy when y = 0 or 1 for the given expression $-[y \ln a + (1-y)\ln(1-a)]$.
2. Compute an example showing explicitly that in a network with a sigmoid output layer, the output activations a_1^L won't always sum to 1.
3. Verify $\sigma'(z) = \sigma(z)(1-\sigma(z))$ for the estimator variable in MLE.

Course Outcome 3 (CO3):

1. There is a way of determining the bitwise representation of a digit by adding an extra layer to the three-layer deep network. The extra layer converts the output from the previous layer into a binary representation. Find a set of weights and biases for the new output layer. Assume that the first 3 layers of neurons are such that the correct output in the third layer (i.e., the old output layer) has activation at least 0.99, and incorrect outputs have activation less than 0.01.
2. Demonstrate a network with just two layers – an input and an output layer, no hidden layer – with 784 and 10 neurons, respectively. Train the network using stochastic gradient descent. Determine the classification accuracy of any arbitrary dataset.
3. Consider *C* is a function of two variables in gradient descent and it may be a combination of more than two variables. Experiment when *C* is a function of just one variable. Provide a geometric interpretation gradient descent in the one-dimensional case.

Course Outcome 4 (CO4):

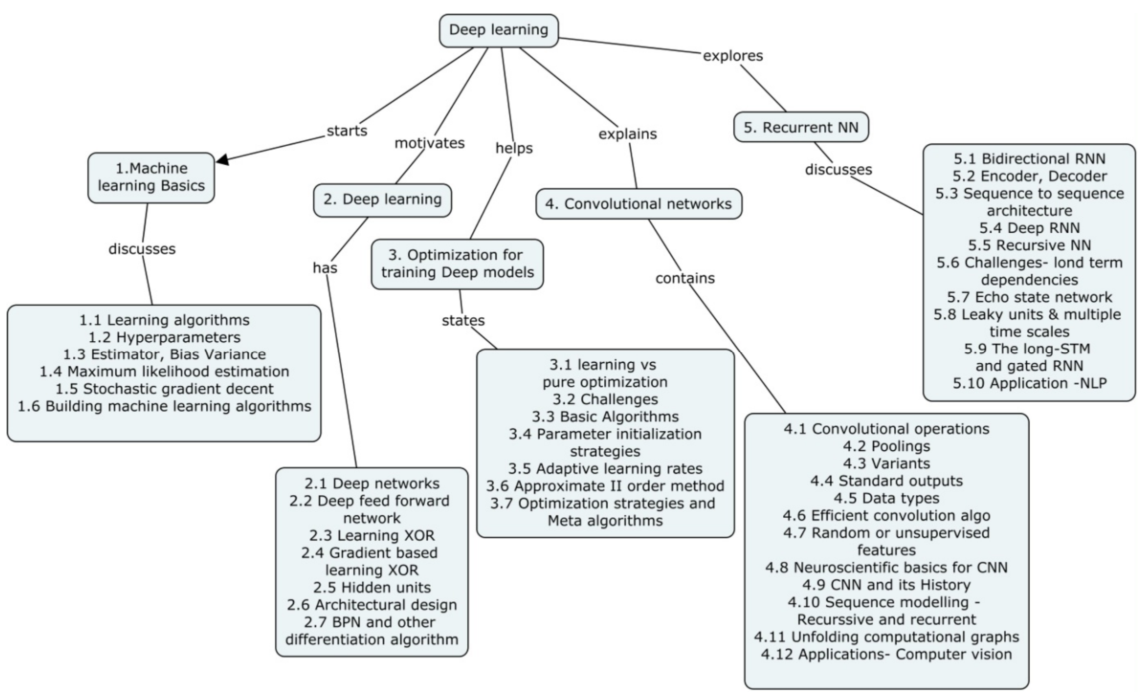
1. Add a Network method to return the accuracy on an arbitrary data set. Modify the SGD method to allow the learning rate to be a function of linear Gaussian function.
2. The SGD method requires the user to manually choose the number of epochs to train for. Draw the suitable method for automated way of selecting number of epochs to train for, known to be early stopping.

3. In a Sigmoid neurons simulating perceptrons, use all the weights and biases in a network of perceptrons, and multiply them by a positive constant, c>0. Show that the behavior of the network doesn't change or not.

Course Outcome 5 (CO5):

1. Suppose we have a network containing a Convolutional layer, a max-pooling layer, and a fully-connected output layer. Show the equations of back propagation modified if the Back propagation is utilized in a Convolutional network.
2. Consider classifying iris dataset. Show the classification accuracy of deep Convolutional network if you omit the fully-connected layer, and use the Convolutional-pooling layer and softmax layer. Does the inclusion of the fully-connected layer help?
3. One way of expanding the MNIST training data is to use small rotations of training images. Demonstrate the problem that might occur if we allow arbitrarily large rotations of training images.

Concept Map



Syllabus

Introduction -Machine Learning Basics - Learning Algorithms - Hyperparameters and Validation Sets - Estimators, Bias and Variance - Maximum Likelihood Estimation - Stochastic Gradient Descent- Building a Machine Learning Algorithm- Challenges.

Motivating Deep Learning- Deep Networks: Modern Practices - Deep Feed forward Networks - Example: Learning XOR - Gradient-Based Learning- Hidden Units- Architecture Design - Back-Propagation and Other Differentiation Algorithms.

Optimization for Training Deep Models - How Learning Differs from Pure Optimization- Challenges in Neural Network Optimization - Basic Algorithms - Parameter Initialization Strategies- Algorithms with Adaptive Learning Rates- Approximate Second-Order Methods Optimization Strategies and Meta-Algorithms.

Convolutional Networks- The Convolution Operation – Motivation – Pooling - Convolution and Pooling as an Infinitely Strong Prior - Variants of the Basic Convolution Function- Structured Outputs- Data Types- Efficient Convolution Algorithms- Random or Unsupervised Features- The Neuroscientific Basis for Convolutional Networks – Variants of Convolutional Networks - Sequence Modelling: Recurrent and Recursive Nets- Unfolding Computational Graphs- Applications – Computer Vision.

Recurrent Neural Networks- Bidirectional RNNs- Encoder-Decoder Sequence-to-Sequence Architectures - Deep Recurrent Networks - Recursive Neural Networks - The Challenge of Long-Term Dependencies- Echo State Networks- Leaky Units and Other Strategies for Multiple Time Scales- The Long Short-Term Memory and Other Gated RNNs- Applications – NLP.

Deep Learning Tools – Caffee, Theano, Torch, Ran Bi, CUDA, PyLearn2.

Learning Resources

1. Bengio, Y., Goodfellow, I., & Courville, A. (2017). Deep learning (Vol. 1). MIT press.
2. Francois Chollet, J. J. Allaire, Deep Learning with R (Meap edition), Manning Publications, 2017.
3. Francois Chollet, Deep Learning with Python, Manning Publications, 2017.
4. Bishop, C.,M., Pattern Recognition and Machine Learning, Springer, 2006.
5. Tom M. Mitchell, Machine Learning, McGraw Hill Publishers, 2017.
6. NPTEL Online course on Deep Learning – IIT Madras - https://nptel.ac.in/courses/106106184/
7. NPTEL Online course on Deep Learning – Part 2 – IIT Madras - https://nptel.ac.in/courses/106106201/
8. Coursera Online course on Deep Learning – Standford University - https://www.coursera.org/specializations/deep-learning

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Introduction -Machine Learning Basics**		
1.1	Learning Algorithms	1	CO1
1.2	Hyperparameters and Validation Sets	1	
1.3	Estimators, Bias and Variance		
1.4	Maximum Likelihood Estimation	1	
1.5	Stochastic Gradient Descent		
1.6	Building a Machine Learning Algorithm- Challenges.	1	
2	**Motivating Deep Learning**	1	CO2
2.1	Deep Networks: Modern Practices		
2.2	Deep Feed forward Networks - Example		
2.3	Learning XOR	1	
2.4	Gradient-Based Learning	1	
2.5	Hidden Units		
2.6	Architecture Design	1	
2.7	Back-Propagation and Other Differentiation Algorithms.		
3	**Optimization for Training Deep Models**		CO3
3.1	How Learning Differs from Pure Optimization	1	
3.2	Challenges in Neural Network Optimization	1	
3.3	Basic Optimization Algorithms	1	
3.4	Parameter Initialization Strategies	1	

3.5	Algorithms with Adaptive Learning Rates	1	
3.6	Approximate Second-Order Methods	1	
3.7	Optimization Strategies and Meta-Algorithms.	1	
4	**Convolutional Networks**		
4.1	The Convolution Operation – Motivation	1	CO4
4.2	Pooling - Convolution and Pooling as an Infinitely Strong Prior		
4.3	Variants of the Basic Convolution Function	1	
4.4	Structured Outputs		
4.5	Data Types	1	
4.6	Efficient Convolution Algorithms	1	
4.7	Random or Unsupervised Features	1	
4.8	The Neuro scientific Basis for Convolutional Networks	1	
4.9	Modelling Convolutional Networks	1	
4.10	Sequence Modelling: Recurrent and Recursive Nets	1	
4.11	Unfolding Computational Graphs	1	
4.12	Applications – Computer Vision.	3	CO6
5.	**Recurrent Neural Networks**		CO5
5.1	Bidirectional RNNs	1	
5.2	Encoder-Decoder	1	
5.3	Sequence-to-Sequence Architectures	1	
5.4	Deep Recurrent Networks	1	
5.5	Recursive Neural Networks	1	
5.6	The Challenge of Long-Term Dependencies		
5.7	Echo State Networks		
5.8	Leaky Units and Other Strategies for Multiple Time Scales	1	
5.9	The Long Short-Term Memory and Other Gated RNNs		
5.10	Applications – NLP.	3	CO6
	Total Hours Type your text	36	

Course Designers:

1. R.Suganya rsuganya@tce.edu
2. E.Ramanujam erit@tce.edu

18ITPC0	INFORMATION RETRIEVAL

Category	L	T	P	Credit
PE	3	0	0	3

Premble

The course focuses on the representation, storage, organization, and access to information items using various IR algorithms and techniques. The course emphasizes the building of information retrieval systems for documents so as to retrieve relevant or useful information from them.

Prerequisite

- Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Differentiate different retrieval algorithms and evaluation techniques	22
CO2	Illustrate various Information Retrieval models such as boolean, vector space and probabilistic models with its variants for the given textual data	10
CO3	Examine the performance of the various IR models	20
CO4	Simulate different classification and clustering algorithms for textual data using text operations	20
CO5	Investigate the usage of various text search engines with web crawling and link analysis using suitable tools and techniques	18
CO6	Solve for simple information retrieval systems for applications such as social network analysis, personalization, and recommender systems.	10

CO Mapping with CDIO Curriculum Framework

CO#	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Resopnd	Guided Response	1.3
CO2	TPS3	Apply	Value	Mechanism	1.3, 2.2.2
CO3	TPS4	Analyze	Organize	Complex Overt Responses	1.3
CO4	TPS3	Apply	Value	Mechanism	1.3,2.4.4, 2.4.6, 4.5.3, 4.5.5
CO5	TPS4	Analyze	Organize	Complex Overt Responses	1.3, 2.4.4, 2.4.6, 4.5.3, 4.5.5
CO6	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.1.5, 2.2.2, 2.4.4, 2.4.6, 2.5, 3.1.5, 3.2, 4.5.1, 4.5.3, 4.5.5

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	PO	PO	PSO1	PSO2	PSO3

										10	11	12			
CO1	M	L										L	L		L
CO2	S	M	L		S			S				L	M	M	L
CO3	S	S	M	L								L	S		L
CO4	S	M	L		S			S				S	M	M	L
CO5	S	S	M	L	S			S				S	S	M	L
CO6	S	M	L		S	S		S	S	S	S	S	M	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	30	20	20	-	-	-	20
Understand	30	40	40	-	-	-	20
Apply	40	30	30	100	100	50	50
Analyse	0	10	10	-	-	50	10
Evaluate	0	0	0	-	-	-	0
Create	0	0	0	-	-	-	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini-project/Assignment/Practical Component
Perception	-
Set	10
Guided Response	40
Mechanism	40
Complex Overt Responses	10
Adaptation	-
Origination	-

List of topics for Assignments (but not limited to)

Team Assignments

- Literature study on research papers on different IR models and their applications
- IR Model building using Python libraries/packages.
- Mini-project development for real time applications using IR models

Sample Questions for Course Outcome Assessment

Course Outcome1 (CO1):

1. Describe the differences between vector space and probabilistic model for the information retrieval of text documents.
2. Describe the differences between vector space relevance feedback and probabilistic relevance feedback for the information retrieval of text documents
3. Positive feedback is likely to be more useful than negative feedback. Justify

Course Outcome2 (CO2):

1. Consider the table of term frequencies for the set of documents. Compute tf-idf weights for the given terms.
2. Compute Euclidean normalized document vectors for each of the documents.
3. Suppose the query term is not in the document collection, how would one adapt the vector space representation to handle the situation

Course Outcome3 (CO3):

1. Explain how the Boolean query x and not y be handled.
2. Explain the principled approaches for assigning weights to query terms.
3. An IR system returns 8 relevant documents and 10 non relevant documents from the set of 20 documents. Compute precision, recall and F-measure values.

Course Outcome 4 (CO4):

1. Classify the given set of documents using Naive Bayes theorem.
2. Explain the process of spam filtering in email documents.
3. Use k-mean clustering algorithm to group the given set of review documents

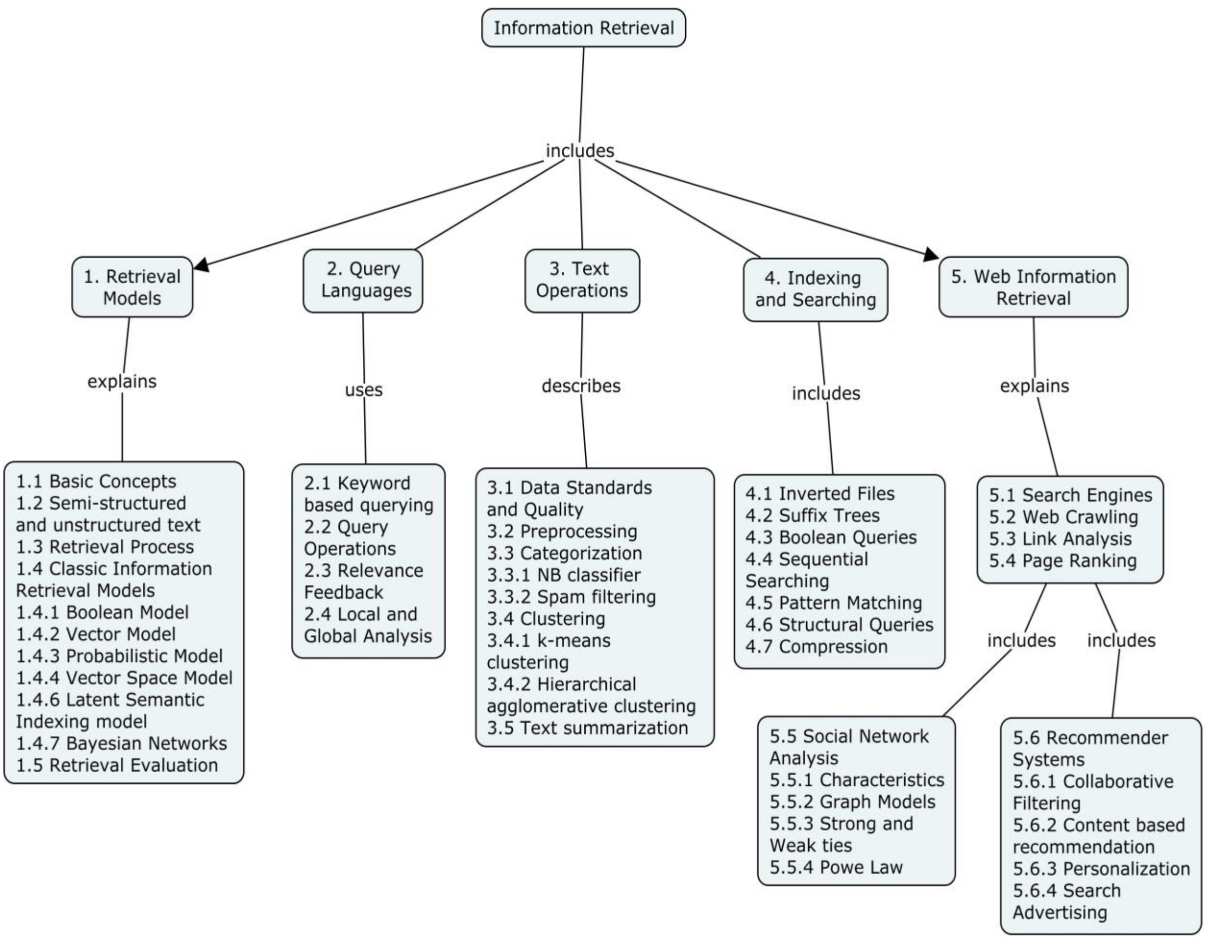
Course Outcome 5 (CO5):

1. Analyze the reasons why relevance feedback has been little used in web search.
2. A user uses links to traverse forward and back button to move backward. Justify whether Markov chain can be used as a model in this case.
3. Show that the page rank of every page is at least α/N.

Course Outcome 6(CO6):

1. Development of simple IR system for applications like social network analysis, recommender systems, etc

Concept Map



Syllabus

Retrieval Models Basic Concepts – Nature of unstructured and semi-structured text - Retrieval Process – Classic Information Retrieval Models – Boolean Model, Vector Model, Probabilistic Model, Vector Space Model, Latent Semantic Indexing model, Bayesian Networks - Retrieval Evaluation

Query Languages Key Word based Querying – Query Operations – User Relevance Feedback – Local and Global Analysis

Text Operations Data Standards and Data Quality - Legal, Policy and Ethics - Preprocessing – Categorization – Naïve Bayes Models, Spam Filtering – Clustering – k-means clustering, Hierarchical agglomerative clustering - Text summarization

Indexing and Searching Inverted files – Suffix trees - Boolean Queries – Sequential Searching – Pattern Matching - Structural queries - Compression

Web Information Retrieval Search Engines – Web Crawling – Link analysis – Page Ranking – Social Network Analysis - Real world network datasets – Characteristics – Graph Models - Strong and Weak ties –Power Law

Recommender Systems Collaborative Filtering – Content-based recommendation - Personalization – Search Advertising

Learning Resources

1. Ricardo Baeza-Yates, BerthierRibeiro-Neto, Modern Information Retrieval, Pearson Education, 2nd edition, 2011.
2. C. Manning, P. Raghavan, and H. Schutze, Introduction to Information Retrieval, Cambridge University Press, 2008.
3. NPTEL course Social Networks by Prof. SudhersanIyengar, IIT Ropar. https://swayam.gov.in/nd1_noc19_cs66/preview https://nptel.ac.in/courses/106106169/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Retrieval Models**		CO1, CO2
1.1	Basic Concepts	1	
1.2	Nature of unstructured and semi-structured text		
1.3	Retrieval Process	1	
1.4	Classic Information Retrieval Models	1	
1.4.1	Boolean Model		
1.4.2	Vector Model	1	
1.4.3	Probabilistic Model	1	
1.4.4	Vector Space Model	1	
1.4.5	Latent Semantic Indexing model	1	
1.4.6	Bayesian Networks	1	
1.5	Retrieval Evaluation	1	
2	**Query Languages**		CO2
2.1	Key Word based Querying	1	
2.2	Query Operations	1	

2.3	User Relevance Feedback		
2.4	Local and Global Analysis	1	
3	**Text Operations**		CO4
3.1	Data Standards and Data Quality - Legal, Policy and Ethics	1	
3.2	Preprocessing		
3.3	Categorization		
3.3.1	Naïve Bayes Models	1	
3.3.2	Spam Filtering	1	
3.4	Clustering	1	
3.4.1	k-means clustering	1	
3.4.2	Hierarchical agglomerative clustering	1	
3.5	Text summarization	1	
4	**Indexing and Searching**		CO2,CO3
4.1	Inverted files	1	
4.2	Suffix trees	1	
4.3	Boolean Queries	1	
4.4	Sequential Searching	1	
4.5	Pattern Matching	1	
4.6	Structural queries	1	
4.7	Compression		
5	**Web Information Retrieval**		CO5, CO6
5.1	Search Engines	1	
5.2	Web Crawling		
5.3	Link analysis	1	
5.4	Page Ranking		
5.5	Social Network Analysis	1	
5.5.1	Characteristics	1	
5.5.2	Graph Models	1	
5.5.3	Strong and Weak ties	1	
5.5.4	Power Law	1	
5.6	Recommender Systems	1	CO6
5.6.1	Collaborative Filtering	1	
5.6.2	Content-based recommendation	1	
5.6.3	Personalization	1	
5.6.4	Search Advertising		
	Total Lecture Hours	36	

Course Designers:

1. A.M. Abirami abiramiam.@tce.edu
2. A. Sheik Abdullah asait@tce.edu

18ITPD0	DISTRIBUTED APPLICATION DEVELOPMENT

Category	L	T	P	Credit
PE	3	0	0	3

Preamble

This course helps the students to understand various aspects that must be considered while designing and developing a distributed application. This course also provides necessary insights into various design patterns, frameworks, tools and technologies that could be leveraged for the development of Distributed applications

Prerequisite

- Basic knowledge in Application development

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain the concepts, components and key features of multi tier application architectures	10
CO2	Review various design patterns available for developing distributed applications	10
CO3	Solve challenges in co-ordinating distributed transactions using appropriate techniques and algorithms.	20
CO4	Use appropriate patterns for the design of distributed systems subject to specific design and performance constraints.	20
CO5	Perform Serverless application development with distributed databases such as Cassandra, DynamoDB at the backend	20
CO6	Develop and deploy applications using distributed frameworks such as Apache Zookeeper, Consul and Openwhisk	20

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3, 2.3.1, 4.3.2
CO2	TPS2	Understand	Respond	Guided Response	1.3, 2.2.2
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.1.5, 3.1.2, 4.4.1, 4.5.3
CO4	TPS3	Apply	Value	Mechanism	1.3, 3.1.2, 4.3.3, 4.4.1,4.5.3
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.1, 3.1.2, 4.3.2, 4.5.3
CO6	TPS3	Apply	Value	Mechanism	1.3, 2.4.6, 3.1.2, 3.2.3, 4.5.3

Mapping with Programme Outcomesand Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	M	L											L		
CO3	S	M	L										M		
CO4	S	M	L		S			S	S	S		L	M	M	M
CO5	S	M	L		S			S	S	S		L	M	M	M
CO6	S	M	L		S			S	S	S		L	M	M	M

S- Strong; M-Medium; L-Low

Passed in Board of Studies meeting on 16.11.2019 Approved in 59th Academic Council Meeting on 7.12.2019

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	30	10	10	-	-	-	10
Understand	50	30	30	20	20	20	30
Apply	20	60	60	80	80	80	60
Analyse	-		-	-	-	-	-
Evaluate	-		-	-	-	-	-
Create	-		-	-	-	-	-

Assignments may be used to evaluate CO3, CO4, CO5 and CO6

AssessmentPattern: Psychomotor

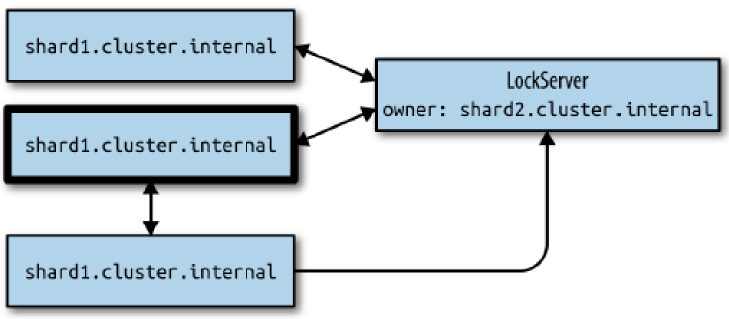
Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	-
Guided Response	20
Mechanism	80
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome1(CO1):
1. Review the differences and similarities between Cluster, Grid and Cloud
2. List the advantages of Serverless and Microservices architecture
3. Summarize the cluster and cloud computing concepts.

Course Outcome2(CO2):
1. Identify the differences between Single Node Patterns and Serving Patterns
2. Describe the use of Ambassadors and Adapters
3. Explain sharding a service using ambassadors

Course Outcome3(CO3):
1. Demonstrate implementation of synchronization and ownership in an distributed application
2. Consider the sharding scenario as in the below diagram, Predict the Ownership complications that may arise. Present alteast two cases



3. Show that Byzantine agreement can be reached for three generals, with one of them faulty, if the generals digitally sign their messages.

Course Outcome 4 (CO4):

1. S
   how the steps for building simple PaaS application using Side car Patterns
2. D
   emonstrate creation of replicated services and load balancer using Kubernetes
3. P
   resent the steps for deploying an Ambassador and Memcache for a Sharded Cache

Course Outcome 5 (CO5):

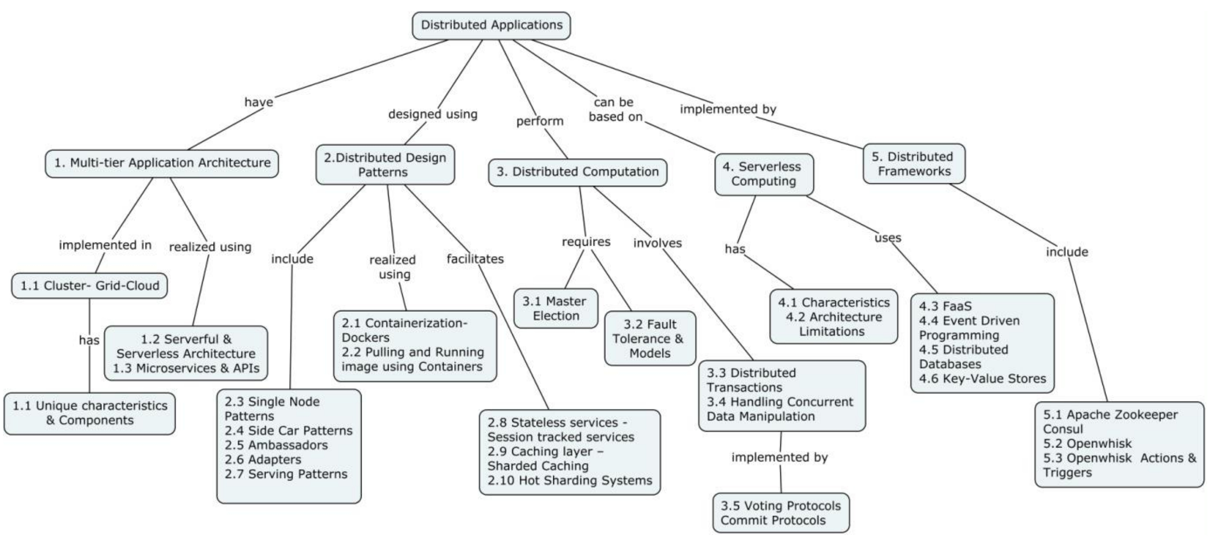
1. Demonstrate Function-as-a-Service(Faas) model with suitable example
2. Present the steps to configure Openwhisk functions ad trigger the same using events.
3. Consider that there is an application requirement to implement set of actions based on voice commands. Illustrate the design and basic components of the design in both Serverful and Serverless computing paradigms

Course Outcome6 (CO6):

Course Outcome 6 may be evaluated through assignment which may be based on – but not limited to - the following areas

1. Implementing concurrency in a distributed application using Apache Zookeeper
2. Creating Static Web pages using S3
3. Moving existing web applications to Serverless framework

Concept Map



Syllabus

Multi-Tier Application Architectures - Characteristics – Components – Cloud Computing– Cluster Computing – Grid Computing - Serverful Application Architectures – Serverless Application Architectures – Microservices – APIs

Distributed Design Patterns - Containerization - Docker - Pulling and Running image using Containers - Single Node Patterns – Sidecar Patterns – Ambassadors -Sharding Services – Service Brokering – Adapters - **Serving Patterns –** Stateless services – Session tracked services – Caching layer – Sharded Caching – Hot Sharding systems

Distributed Computation – Master Election –-Fault Tolerance - Fault Models –Distributed database concepts: Distributed Transactions-Handling Concurrent Data Manipulation - Commit Protocols – Voting Protocols

Serverless Computing - ServerfulvsServerless Computing - Serverless Platform Architecture – Characteristics – Event driven Programming – Function-as-a-Service – Limitations – Challenges – Serverless Databases – Key-Value Store Overview – Case Study on AWS Lambda – S3.

Deployment Frameworks: Apache Zookeeper – Consul - Openwhisk Architecture – Programming Model – Actions – Triggers and Rules – Sample Applications

Learning Resources

1. Brendon Burns, “Designing Distributed Systems”, OReilly Publication, First Edition, 2018
2. Andrew S. Tanenbaum, Maarten Van Steen, “Distributed Systems : Principles and Paradigms”, PearsonEducation, Third Edition, 2017
3. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair , "Distributed Systems: Conceptsand Design", Pearson Education, Fifth Edition, 2017
4. MaddieStaggler – “Beginning Serverless Computing: Developing with Amazon Web Services, Microsoft Azure and Google Cloud – Apress, 2018
5. Creating Serverless Application in Openwhisk - https://thenewstack.io/hands-guide-creating-first-serverless-application-apache-openwhisk/
6. Openwhisk Tutorial – https://github.com/apache/openwhisk-tutorial/blob/master/README.md
7. Openwhisk Documentation –https://openwhisk.apache.org/documentation.html

Course Contents and Lecture Schedule

Module No	Topic	No. of Lectures	Course Outcomes
1	**Multi-Tier Application Architectures**		
1.1	Cloud- Cluster- Grid – Characteristics and Components	2	CO1
1.2	Serverful and Serverless Application Architectures	1	CO1
1.3	Microservices and APIs	1	CO1
2	**Distributed Design Patterns**		
2.1	Containerization – Dockers	1	CO4
2.2	Pulling and Running image using Containers	1	CO4
2.3	Single Node Patterns	1	CO2
2.4	Sidecar Patterns	1	CO2
2.5	Ambassadors	1	CO2
2.6	Adapters	1	CO2
2.7	Serving Patterns	1	CO2
2.8	Stateless services - Session tracked services	1	CO4
2.9	Caching layer – Sharded Caching	1	CO4
2.10	Hot Sharding systems	1	CO4
3	**Distributed Computation**		
3.1	Master Election	2	CO3

3.2	Fault Tolerance - Fault Models	2	CO4
3.3	Distributed database concepts: Distributed Transactions	1	CO3
3.4	Handling Concurrent Data Manipulation	1	CO3
3.5	Commit Protocols – Voting Protocols	2	CO3
4	**Serverless Computing**		
4.1	ServerfulvsServerless Computing – Characteristics	1	CO5
4.2	Serverless Platform Architecture – Characteristics – Limitations	1	CO5
4.3	Function-as-a-service	2	CO5
4.4	Event Driven programming		CO5
4,5	Distributed Serverless Databases	1	CO5
4.6	Key- Value stores	1	CO5
4.7	Case Study on AWS Lambda – S3	2	CO5
5	**Deployment Frameworks**		
5.1	Apache Zookeeper, Consul	2	CO6
5.2	Openwhisk Architecture – Programming Model	2	CO6
5.3	Actions ,Triggers and Rules, Sample Applications	2	CO6
	Total Lectures	**36**	

Course Designers:

1. Dr.S.Padmavathi spmcse@tce.edu
2. Mrs.S.Thiruchadai Pandeeswari eshwarimsp@tce.edu

18ITPE0	FOG COMPUTING

Category	L	T	P	Credit
PE	3	0	0	3

Preamble

This course aims at providing students with the necessary fundamental concepts and knowledge on technologies that will enable them to explore the fog computing paradigm and apply the same in their prospective projects in the domains of IoT, 5G, Industry 4.0 and Stream Analytics.

Prerequisite

- 18IT430-Computer Networks
- 18IT610 - Cloud Computing

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain the concepts, characteristics and architecture of Fog Computing paradigm.	8
CO2	Recognize the enabling technologies of fog computing such as Software Defined Networking, Network function virtualization and Containerization.	6
CO3	Demonstrate the application of software definition in the networking for fog computing.	19
CO4	Select the appropriate Orchestration framework for a fog based application	28
CO5	Identify the suitable communication technologies and execution management functions of fog computing middleware based on the given design goal.	22
CO6	Experiment with the use cases of fog computing in IoT and 5G systems	17

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3
CO2	TPS2	Understand	Respond	Guided Response	1.3,2.3.1,3.1.1,3.2.4
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO4	TPS4	Analyse	Organise	Complex Overt Response	1.3, 2.4.5, 2.4.6, 3.2.1 -3.2.6, 4.3.1, 4.3.2
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO6	TPS3	Apply	Value	Mechanism	1.3, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2	PS O3
CO1	M	L											L		
CO2	M	L											L		
CO3	S	M	L		L				L	L		L	M	L	L
CO4	S	S	M	L					S	M		L	S		L
CO5	S	M	L		M	L	L	S	S	M	L	M	M	M	M
CO6	S	M	L		S	L	L	S	S	M	L	M	M	M	M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	10	-	-	-	20
Understand	50	20	30	-	-	-	20
Apply	30	40	40	100	100	-	50
Analyse	-	20	20	-	-	100	10
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	-
Guided Response	30
Mechanism	50
Complex Overt Responses	20
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1(CO1):

1. Describe the main characteristics of fog nodes.
2. Explain the fog reference architecture.
3. Discuss the significance of fog computing compared to cloud computing

Course Outcome 2(CO2):

1. How exactly containers are different from Hypervisor Virtualization (vsphere)? What Are The Benefits?
2. How Cloud Automation Overtake Containerization?
3. Discuss the problems that NFV (Network Functions Virtualization) addresses

Course Outcome 3(CO3):

1. Assume a chain of community colleges are linked by a MAN. A single campus might use a CAN (Campus Area Network), but the entire academic institution use a MAN to track students' progress across different classrooms and majors. Show what are the shortcomings the network is expected to suffer from? Select some SDN features you will adapt to rectify the identified problem.
2. An enterprise wants to set up a Data Center for its global operation, Provide a solution to implement it using SDN. Judge the effects of virtualization and its adaptability in Data Center Innovation and related issues.
3. Choose the best routing algorithm that can be exploited for topology abstraction and Point out a suitable example.

Course Outcome 4 (CO4):

1. Categorize the design patterns in orchestration.
2. Differentiate typed message and un-typed message in orchestration.
3. Select asuitable fog based Orchestration framework for health care application.

Course Outcome 5 (CO5):

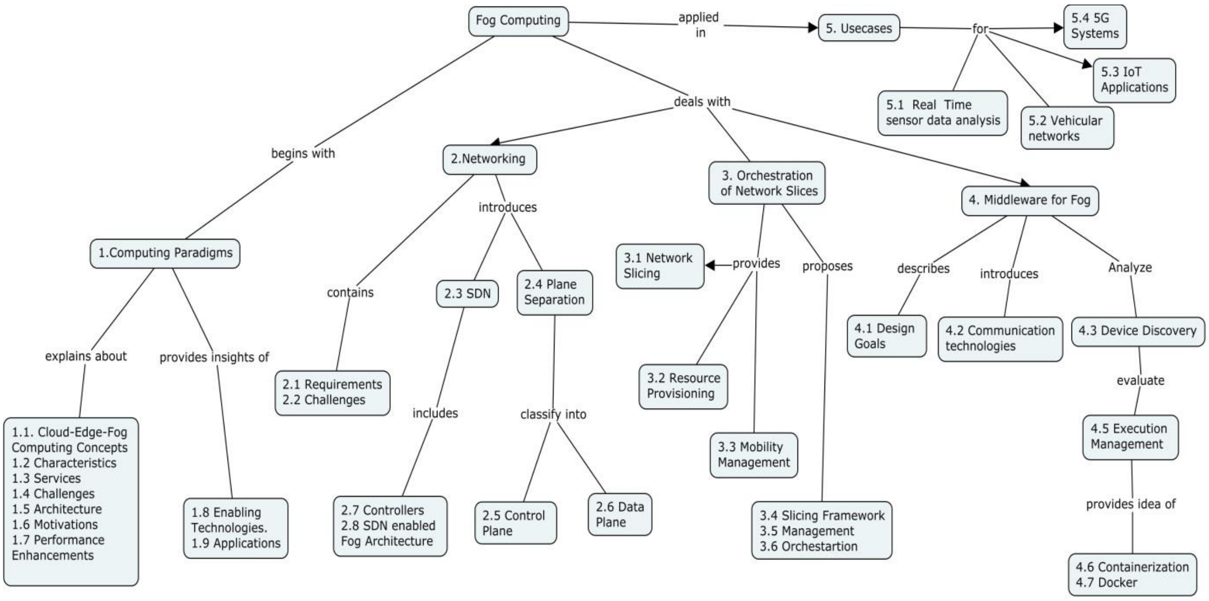
1. Sketch the taxonomy of network-aware VM/VNF Management in software-defined Clouds.
2. Show the network slice management in Fog computing architecture.
3. Prepare a system model with edge and fog devices for vehicular network.

Course Outcome 6(CO6):

CO6 would be evaluated through Assignments and Miniproject that may include but not limited to the following topics

1. Smart Nutrition monitoring system
2. Fog as a Data Analytics Engine
3. Fog in Health Monitoring
4. Smart City Applications
5. Fog in Vehicular Networks
6. Smart Surveillance systems
7. Intelligent Transportation systems

Concept Map



Syllabus

Computing Paradigms: Cloud vs Fog vs Edge computing Concepts - Characteristics- Services - Challenges - Fog Computing Architecture - Motivations - Performance Enhancements - Enabling Technologies - Fog based applications.

Networking for Fog: Fog networking requirements - Challenges - Software Definition of Networks - Plane Separation - Control Plane - Data Plane - SDN Controllers - SDN Enabled Fog Architecture - Case Study

Orchestration of Network Slices: Network Slicing - Resource provisioning- Mobility Management - Generic Slicing framework - Slicing Management and Orchestration - State of the art Orchestration frameworks

Middleware for Fog: Design Goals - Communication Technologies - Device Discovery - Context Monitoring - Execution Management - Containerization - Docker Container Orchestration

Fog - Use cases: Fog based real time sensor data analysis - Vehicular Networks - IoT Applications - 5G systems

Learning Resources

1. Buyya, Rajkumar, and SatishNarayanaSrirama, eds. Fog and edge computing: principles and paradigms. Wiley, 2019.
2. Mahmood, Zaigham, ed. Fog Computing: Concepts, Frameworks and Technologies. Springer, 2018.
3. Rahmani, Amir M., et al., eds. Fog computing in the internet of things: Intelligence at the edge. Springer, 2017.
4. Alenezi, Mamdouh, KhaledAlmustafa, and KhalimAmjadMeerja. "Cloud based SDN and NFV architectures for IoT infrastructure." Egyptian Informatics Journal 20.1 (2019): 1-10.
5. Manzalini, Antonio, CagatayBuyukkoc, Prosper Chemouil, SlawomirKuklinski, Franco Callegati, Alex Galis, Marie-PauleOdini et al. "Towards 5g software-defined ecosystems." IEEE, Software Defined Networks Whitepaper, 2016.
6. Chiang, Mung, and Tao Zhang. "Fog and IoT: An overview of research opportunities." IEEE Internet of Things Journal 3, no. 6: 854-864, 2016.

7. https://www.openfogconsortium.org/resources/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Computing Paradigms**		
1.1	Cloud vs Fog vs Edge computing Concepts	1	CO1
1.2	Characteristics		
1.3	Services		
1.4	Challenges	1	CO1
1.5	Fog Computing Architecture		
1.6	Motivations	1	CO1
1.7	Performance Enhancements		
1.8	Enabling Technologies	1	CO2
1.9	Fog based applications		
2	**Networking for Fog**		
2.1	Fog Networking requirements	1	CO2
2.2	Challenges		
2.3	Software Definition of Networks	1	CO3
2.4	Plane Separation	1	
2.5	Control Plane	1	
2.6	Data Plane	1	
2.7	SDN Controllers	1	
2.8	SDN Enabled Fog Architecture	1	CO3
2.9	Case Study	1	CO3
3	**Orchestration of Network Slices**		
3.1	Network Slicing	1	CO4
3.2	Resource provisioning	2	
3.3	Mobility Management	2	
3.4	Generic Slicing framework	2	CO4
3.5	Slicing Management and Orchestration	2	
3.6	State of the art Orchestration frameworks	1	
4	**Middleware for Fog**		
4.1	Design Goals	1	CO5
4.2	Communication Technologies	1	
4.3	Device Discovery	1	
4.4	Context Monitoring	1	
4.5	Execution Management	2	
4.6	Containerization	1	
4.7	Docker Container Orchestration	1	
5	**Fog - Use cases**		
5.1	Fog based real time sensor data analysis	1	CO6
5.2	Vehicular Networks	2	
5.3	IoT Applications	2	
5.4	5G systems	1	
	Total Lectures	**36**	

Course Designers:

1. Dr.S.Padmavathi spmcse@tce.edu
2. Mrs. C.Santhiya csit@tce.edu

18ITPF0	SOFTWARE DEFINED NETWORKS

Category	L	T	P	Credit
PE	3	0	0	3

Preamble

This course presents the architecture, fundamental mechanisms and technical challenges of the emerging software-defined networking (SDN) paradigm. Also, this course introduces necessary tools and technologies required to develop SDN based applications.

Prerequisite

18IT430 – Computer Networks

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Recognize the need for SDN in Cloud, Fog, IOT and Big Data Applications	10
CO2	Summarize plane separation and implementation approaches	20
CO3	Examine traditional and SDN based Network topological information abstraction approaches	20
CO4	Implement Controller- Switch Communication using OpenFlow	10
CO5	Use Controller and Switch Implementations for realizing SDN based applications	20
CO6	Enhance Datacenter Networks, Campus Networks, Hospitality Networks, Mobile Networks using SDN Concepts	20

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3, 2.3.1, 2.1.1
CO2	TPS2	Understand	Respond	Guided Response	1.3, 2.3.1, 2.1.5
CO3	TPS3	Analyze	Organize	Complex Overt Response	1.3, 2.2.2, 4.5.3
CO4	TPS3	Apply	Value	Mechanism	1.3, 2.3.1, 4.5.3
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.3.1 3.1.2, 4.3.2
CO6	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.5, 3.1.2, 3.2.3,4.3.2, 4.5.3

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	M	L											L		
CO3	S	S	M	L									S		
CO4	S	M	L		S			S	S	S			M		
CO5	S	M	L		S			S	S	S			M	M	M
CO6	S	M	L		S			S	S	S		L	M		S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	10	30	-	-	10
Understand	40	20	30	70	-	20	30
Apply	40	40	60	-	40	80	40
Analyse	-	20	-	-	60	-	20
Evaluate	-		-	-	-	-	-
Create	-		-	-	-	-	-

CO3, CO5 and CO6 may be evaluated using Miniproject/Assignments

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Assignment/Practical Component
Perception	-
Set	-
Guided Response	20
Mechanism	80
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1(CO1):

1. Describe the role of SDN in facilitating VM Mobility
2. Outline the various motivations for Software definition of Networks
3. Identify the shortcomings of traditional Networks in the context of Modern technologies such as Big data and IoT.

Course Outcome 2(CO2):

1. Identify the differences between traditional Networks and Software Defined Networks
2. Review the fundamental traits of Software Defined Networks
3. Recognize the control functions of traditional switches and SDN Controller

Course Outcome 3(CO3):

1. Employ Ping/trace route commands and devise a suitable algorithm Network topology abstraction given that you have access to a DNS Server's database
2. How an routing algorithm can be exploited for topology abstraction and Point out a suitable example
3. Relate the abstract idea of Traffic Engineering Databases presented in ALTO into an application offering routing information as a service using SDN concepts

Course Outcome 4 (CO4):

1. Present the treatment meted out to data packets in Openflow switches with detailed flow of messages in three different cases
   a) Matching flow is found
   b) Matching flow entry not found
   c) The packet has to be dropped
2. Show the initiation of communication between Controller and Switch

3. Use appropriate Openflow messages and demonstrate modification of an existing flow entry

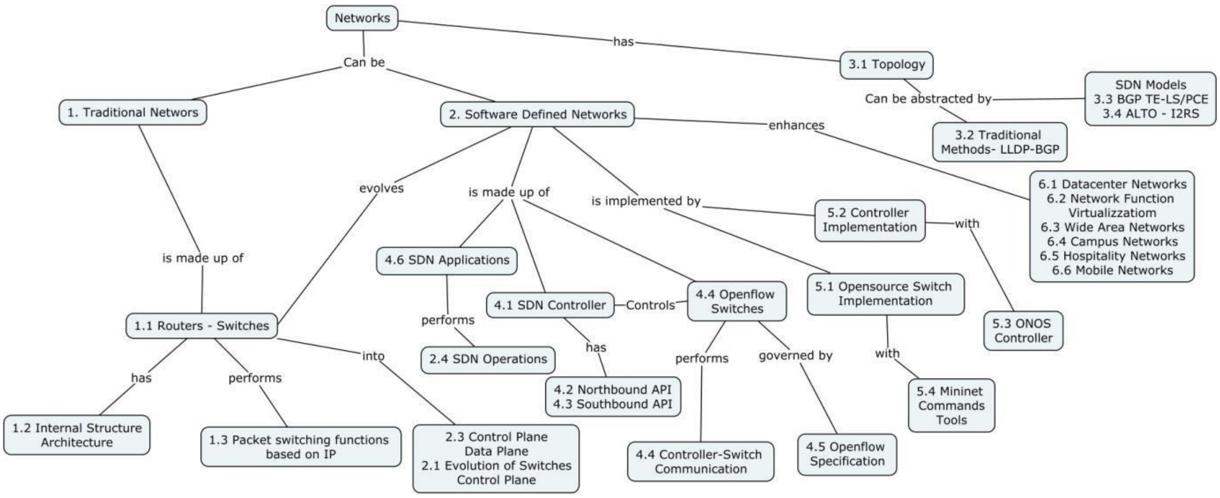
Course Outcome 5 (CO5):

1. Demonstrate the unique characteristics of OpenFlow 1.0, 1.1, 1.2 and 1.3?
2. Experiment with messaging between controller and switch using OpenFlow.
3. Illustrate the Controller Programming Flow Table for the given network.

Course Outcome 6(CO6):

1. Implement Network Captive portals in campus Networks
2. Demonstrate traffic suppression in Hospitality Networks with SDN
3. An online retail company wants to set up a Data center for its global operation, Provide a solution to implement it using SDN. Illustrate the concept of virtualization and its adaptability in Data Center Innovation and related issues

Concept Map



Syllabus

Fundamentals of Traditional Networks - Routers – Switches - Internal Structure and Architecture- Packet Switching Functions - IP

Fundamentals of SDN - Evolution of Switches and Control planes – Motivations and Challenges of SDN –Plane Separation - Control Plane Functions**-**Data Plane Functions – SDN Operation and Devices

Network Topology and Topological Information Abstraction - Network Topology - Traditional Methods**-**LLDP**-**BGP-TE/LS**-** PCE- ALTO**-**I2RS

SDN APIs - SDN Controller – Northbound APIs – Southbound APIs – Openflow Switches - Controller Switch Communication: OpenFlow - Overview, Basics and Limitations – SDN Applications

SDN Implementations– SDN Open source switch Implementation– Controller Implementations – ONOS Controller – Mininet – Mininet Commands - Tools.

SDN Usecases –SDN in Data Center Networks, NFV vs SDN, Wide Area Networks, Campus Networks, Hospitality Networks, Mobile Networks

Learning Resources

1. Paul Goransson and Chuck Black – Software Defined Networks-A Comprehensive Approach – Morgan Kaufmann.- 2016 – Second Edition

2. Thomas D Nadeau and ken Gray- "SDN"- O'Reilly publication- First Edition- 2014
3. Road to SDN - http://queue.acm.org/detail.cfm?id=2560327
4. Routing Control - http://www.cs.princeton.edu/~jrex/papers/rcp-nsdi.pdf
5. ONOS - https://onosproject.org/
6. Open Networing - https://www.opennetworking.org/onos/

Course Contents and Lecture Schedule

Module No	Topic	No. of Lectures	Course outcome
1	**Fundamentals of Traditional Networks**		
1.1	Routers – Switches	2	CO1
1.2	Internal Structure and architecture	1	
1.3	Packet Switching Functions - IP	1	
2	**Fundamentals of SDN**		
2.1	Evolution of Switches and Control planes	1	CO2
2.2	Motivations and Challenges of SDN	1	
2.3	Plane Separation Control Plane Functions Data Plane Functions	2	
2.4	SDN Operation and Devices	1	
3	**Network Topology and Topological Information Abstraction**		CO3
3.1	Network Topology	2	
3.2	Traditional Methods- LLDP	2	
3.3	BGP - TE/LS- PCE	1	
3.4	ALTO - I2RS Topology	1	
4	**SDN APIs**		
4.1	SDN Controller	1	CO4
4.2	Northbound APIs	1	
4.3	Southbound APIs	1	
4.4	Openflow Switches Controller Switch Communication	2	
4.5	OpenFlow Specification	2	
4.6	SDN Applications	1	
5	**SDN Implementation**		
5.1	SDN Open source switch Implementation	1	CO5
5.2	Controller Implementations	2	
5.3	ONOS Controller	2	
5.4	Mininet – Mininet Commands - Tools	2	
6	**SDN Use cases**		CO6
6.1	SDN in Data Center Networks	1	
6.2	NFV vs SDN	1	
6.3	Wide Area Networks	1	
6.4	Campus Networks	1	
6.5	Hospitality Networks	1	

6.6	Mobile Networks	1	
	Total Lectures	**36**	

Course Designers:

1. S.Thiruchadai Pandeeswari eshwarimsp@tce.edu
2. K. Indira kiit@tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

PROGRAMME ELECTIVES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41
Fax: 0452 2483427
Web: www.tce.edu

THIAGARAJAR COLLEGE OF ENGINEERING: MADURAI – 625 015
B.Tech. Information Technology Degree Programme

List of Electives
(For the candidates admitted from 2018-19 onwards)

COURSE CODE	COURSE NAME
18ITPG0	Service Oriented Computing

PE : Program Elective

Note:

1 Hour Lecture is equivalent to 1 credit

2 Hours Tutorial is equivalent to 1 credit

2 Hours Practical is equivalent to 1 credit

18ITPG0	SERVICES ORIENTED COMPUTING

Category	L	T	P	Credit
PE	3	0	0	3

Preamble

This course provides understanding on architectural styles such as SoA, RESTful and Microservices that are used to develop software applications as services that are autonomous and platform independent. Also, insights into the tools such as Docker containers and Kubernetes is provided for deploying and managing the microservices are provided.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain Monolith, RESTful and Microservices architectural styles for web based application development	10
CO2	Develop web services using standards such as SOAP over HTTP, WSDL, UDDI and BPEL	10
CO3	Build APIs and access resources using RESTful architecture	20
CO4	Evolve single function modules from a monolith software and develop them as microservices using Microservices architecture	20
CO5	Containerize an application by creating Docker config files and build processes to produce all the necessary Docker images	20
CO6	Use Kubernetes to manage deploying, scaling, and updating applications	20

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2,2.3.1,2.3.2
CO2	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6,2.5, 4.1, 4.5.3
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6,2.5, 4.1, 4.5.3
CO4	TPS4	Analyze	Organize	Complex Overt Responses	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6,2.5, 3.1, 3.2, 4.1, 4.5.3
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6,2.5, 4.1, 4.5.3
CO6	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6,2.5, 4.1, 4.5.3

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		L			L	S	S		S	M	L	M
CO3	S	M	L		L			L	S	S		S	M	L	M
CO4	S	S	M	L	L			L	S	S		S	S	L	M
CO5	S	M	L		S			S	S	S		S	M	M	M
CO6	S	M	L		S			S	S	S		S	M	M	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	20	-	-	-	-	-	-
Understand	20	20	20	-	-	-	10
Apply	60	60	70	10	10	10	70
Analyse	-	20	10	-	-	-	20
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-

CO2, CO3, CO4, CO5 and CO6 are evaluated by laboratory sessions/assignments
Attainment of course outcome 6 is evaluated through mini project which involves design and development of simple applications in Distributed Framework.

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Assignment/Practical Component
Perception	-
Set	-
Guided Response	10
Mechanism	90
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1(CO1):

1. Describe about Monolith Architecture in the web application.
2. Discuss the drawbacks of Monolithic Architecture.
3. Summarize the importance of Monolithservices and Microservices.

Course Outcome 2(CO2):

1. Build a web service with a standardized way of including the address of the intended Recipient in SOAP headers.
2. Develop a Service Orchestration Engine (workflow) using WS-BPEL and implement Service composition. For example, a business process for planning business travels will invoke several services. This process will invoke several airline companies to check the airfare price and buy at the lowest price.
3. Generate WSDL file in the appropriate format for a interface computing currency exchange rate

Course Outcome 3(CO3):

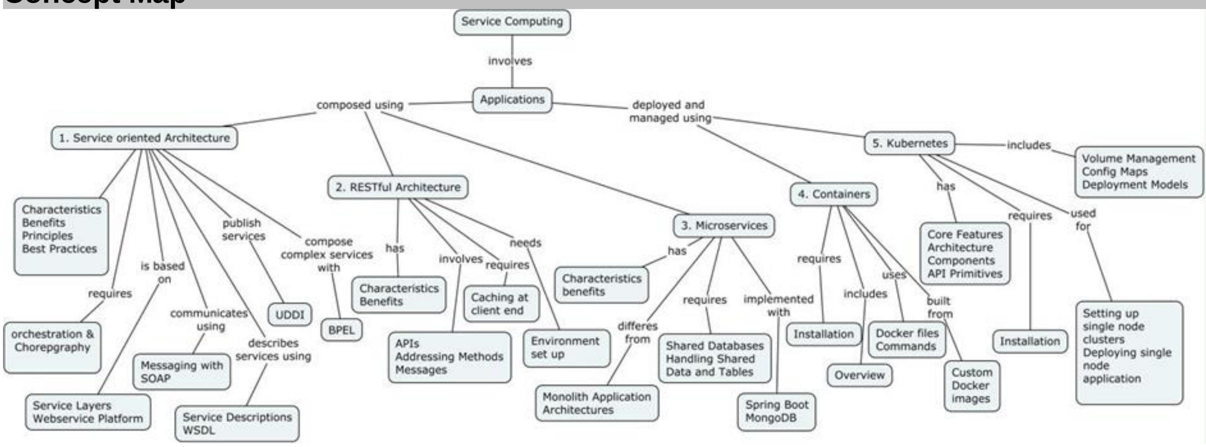
1. Consider a resource at /students containing student details. Build the RESTful API so that it can be accessed using GET, PUT and DELETE methods
2. Use Jersey framework and compose RESTful services that adds, deletes and updates course information present at the location tce.edu/courses.
3. Consider the statelessness in RESTful webservices, and predict how the shortcoming can be overcome with caching at client end.

Course Outcome 4 (CO4):
1. Enlist the best practices to create a standard URI for a web service
2. Examine the challenges you face while working Microservice Architectures
3. Construct an Arithmetic calculator application using microservice approach that includes two microservices, Addition Service and Subtraction Service

Course Outcome 5 (CO5):
1. Construct suitable Docker file for composing an image containing MySQL database on ubuntu OS
2. Show the steps for pulling a required image from docker hub and run it as a container
3. Demonstrate the process of loading dependencies for containerizing an application with appropriate commands

Course Outcome 6(CO6):
1. Use Kubernetes to manage deploying, scaling, and updating applications
2. Experiment with a multi-node cluster using Kuneadm
3. Demonstrate a Guest Book example on Kuernetes platform.

Concept Map



Syllabus

SoA - Characteristics of SOA, Benefits of SOA , Comparing SOA with Client-Server and Distributed architectures –– Principles of Service Orientation – Service layers-Web Services Platform – Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Service-Level Interaction Patterns – Orchestration and Choreography. SOA Best Practices

RESTful Architecture- Characteristics - Environment Setup- Messages- Building APIs Addressing Methods- Statelessness- Caching

Microservices – Key Characteristics- Benefits- SoA vs Microservices Architecture- Modeling Microservices from Monolith application - Shared Database - Handling Shared data and Tables - Implementation using spring boot - MongoDB connectivity - Testing - Deployment

Containers – Containerization Overview - Docker - Installation - commands- Docker Image Management-Docker files - Building custom docker images -Best Practices

Kubernetes – Kubernetes Overview-Architecture-Components- Kubernetes API Primitives-Installing Kubernets-Setting Up a Single Node Kubernetes Cluster Using Minikube - Accessing Minikube - Kubernetes Building Blocks - Services-Deploying a Stand-Alone Application - Kubernetes Volume Management - ConfigMaps and Secrets-Ingress-Hosted Solutions and Deployment Models.

Learning Resources

1. Newman, Sam. Building microservices: designing fine-grained systems. " O'Reilly Media, Inc.", 2015.
2. Thomas Erl, — Service Oriented Architecture: Concepts, Technology, and Design, Pearson Education, 2005
3. Kubernetes Basics - https://kubernetes.io/docs/tutorials/kubernetes-basics/
4. Getting Started with Kubernetes - https://kubernetes.io/docs/setup/learning-environment/minikube/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**SoA**		
1.1	Characteristics - Benefits of SOA	2	CO2
1.2	SOA vs Client-Server vs Distributed architectures – Principles of Service Orientation		CO1
1.3	Service layers -Web Services Platform		CO2
1.4	Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI	2	CO2
1.5	Service-Level Interaction Patterns – Orchestration and Choreography.	1	CO2
1.6	SoA Best Practices		
2.	**RESTful Architecture**		
2.1	Characteristics - Environment Setup	2	CO3
2.2	Using HTTP Messages	2	CO3
2.3	Building APIs - Addressing Methods	2	CO3
2.4	Statelessness- Caching	1	CO3
3.	**Microservices**		
3.1	Key Characteristics- Benefits	1	CO4
3.2	SoA vs Microservices Architecture	2	CO1
3.3	Modeling Microservices from Monolith application	2	CO4
3.4	Shared Database - Handling Shared data and Tables	1	CO4
3.5	Implementation using spring boot - MongoDB connectivity	2	CO4
3.6	Testing - Deployment	1	CO4
4.	**Containers**		
4.1	Containerization Overview	1	CO5
4.2	Docker - Installation - commands	1	CO5
4.3	Docker Image Management-Docker files	2	CO5
4.4	Building custom docker images -Best Practices	2	CO5
5	**Kubernetes**		
5.1	Kubernetes Overview-Architecture-Components	1	CO6
5.2	Kubernetes API Primitives	1	CO6
5.3	Kubernetes Installation	2	CO6
5.4	Setting Up a Single Node Kubernetes Cluster Using Minikube -Accessing Minikube	1	CO6
5.5	Kubernetes Building Blocks - Services-Deploying a	2	CO6

	Stand-Alone Application		
5.6	Kubernetes Volume Management - ConfigMaps and Secrets	1	CO6
5.7	Ingress-Hosted Solutions and Deployment Models.	1	CO6
	Total Hours	**36**	

Course Designers:

1. K. Indira kiit@tce.edu
2. S.Thiruchadai Pandeeswari eshwarimsp@tce.edu

18ITPH0	COMPUTER VISION	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

This course provides an introduction to computer vision including fundamentals of image formation, camera imaging, depth estimation, geometry, feature extraction, segmentation, motion estimation and tracking. The course also develops applications that include finding known models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment, tracking, boundary detection, and recognition.

Prerequisite

- NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain the basics of image processing and formation techniques	12
CO2	Experiment the camera depth estimation and calibration	20
CO3	Illustrate various feature extraction techniques like edge, corner, blob, affine detection for real world applications	20
CO4	Use Image Segmentation and detection for digital Images	16
CO5	Compute the optical flow and optimization for motion data.	22
CO6	Investigate the efficiency in object detection and recognition for Multi-dimensional data using open source tools.	10

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond		1.2,2.3.1,2.3.2
CO2	TPS3	Apply	Value		1.2, 2.2, 2.3.1, 2.3.2, 3.1.4, 3.1.5
CO3	TPS3	Apply	Value		1.2, 2.2, 2.3.1, 2.3.2, 3.1.4, 3.1.5
CO4	TPS3	Apply	Value		1.2, 2.3.1, 2.3.2, 2.3.3, 4.4.1, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value		1.2, 4.3.4, 4.6.1
CO6	TPS4	Analyze	Organize		1.2, 4.3.4, 4.5.3, 4.5.6, 4.6.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		L								M		
CO3	S	M	L		L			L				M	M		L
CO4	S	M	L		L			L				S	M		L
CO5	S	M	L		L			L				S	M		L
CO6	S	S	M	L	S	L	L	M	M	L		S	S	M	M

S- Strong; M-Medium; L-Low

Guidelines for the Mini-Project:

Group formation: Students are split into project groups with around 3 members in each group. A team can execute the project using appropriate Image processing and vision techniques/ algorithms and to improve the efficiency of the algorithm using any of the tools like MATLAB, OpenCV, Python etc.,

At the end of the semester, the team members have to present their project, submit their report and share their lessons learnt/best practices with other teams. Some of the activities may include: (but not limited to)

- ✓ Application identification and data set collection
- ✓ Selecting relevant Vision algorithm to extract knowledge from the data set
- ✓ Design diagram of knowledge extraction from raw data
- ✓ Results and performance analysis for the chosen technique
- ✓ Documentation

Some of the Mini-project titles may include: (but not limited to)

- Face recognition
- Voice recognition
- Gesture recognition
- Audio and signal processing
- Posture recognition
- Precision Agriculture
- Disease Identification
- Wound detection
- Cancer detection

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	-	-	-				-
Understand	20	20	20	20			20
Apply	80	80	60	80	80	80	60
Analyse	0	0	20		20	20	20
Evaluate	0	0	0				0
Create	0	0	0				0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project/Assignment/Practical Component
Perception	-
Set	-
Guided Response	-
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1):

1. Explain the steps involved in Fourier transform for the conversion of spatial image.
2. Describe the benefits of Histogram in Image processing.

3. Briefly describe the relationship between the color gamut perceivable by humans and available in a typical CRT or LCD display.

Course Outcome 2 (CO2):

1. Demonstrate how the *RANSAC algorithm* could be used to detect the orientation of the plane in the scene from the scene points.
2. Illustrate various matching strategies and error rates. Compare the results by fixing the false positive rates.
3. Experiment with subtraction of a second derivative of the image function from the original image results in the visual effect of image sharpening.

Course Outcome 3 (CO3):

1. Develop an algorithm to stitch two sample images of the mural in the geology museum which are taken by moving a handheld camera in a freeform motion. Use SIFT features and propose solution for matching and alignment.
2. Consider brightness interpolation— Compute the performance of brightness interpolation using brightness values of neighboring points in the input image than interpolating.
3. Apply suitable algorithm using Harris corner detection and describe one feature alignment technique for the two matched points captured for our TCE Dome.

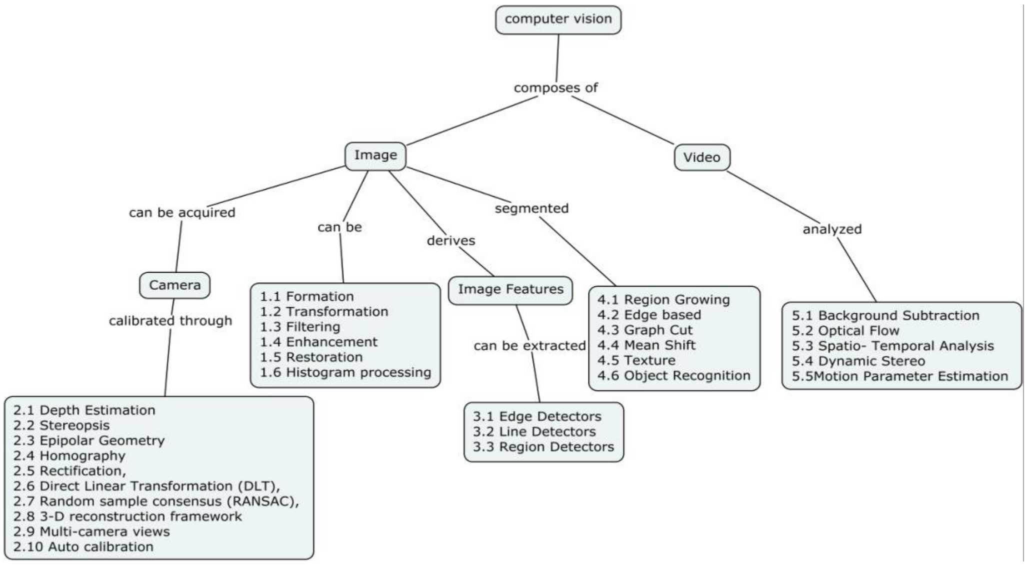
Course Outcome 4 (CO4):

1. Develop an algorithm to recognize the detected object is car or a human being when this frame is captured by a single static camera. Write the complexities for such classification for the given scenario.
2. Illustrate context based object recognition for scene understanding with an example.
3. Illustrate Graph cut algorithm to segment moving object from the static background.

Course Outcome 5 (CO5):

1. Develop a program for motion detection in the sequences you have created. If the approach is based on differential image analysis, pay special attention to automated threshold determination.
2. Develop an image tracking program using path coherence, and use it to generate object motion trajectories.
3. Develop and test a function for detection of interest points.

Concept Map



Syllabus

Digital Image Formation and low-level processing - Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Image Filtering - Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

Depth estimation and Multi-camera views - Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration, apparel.

Feature Extraction- Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

Image Segmentation- Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection, Object Recognition – scene and object, Model based recognition.

Motion Analysis - Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo; Motion parameter estimation.

Learning Resources

1. Szeliski, R. (2010). Computer vision: algorithms and applications. Springer Science & Business Media.

2. Linda G. Shapiro, George C. Stockman (2001), Computer Vision, Prentice Hall, 2001.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Digital Image Formation and low-level processing**		CO1
1.1	Overview and State-of-the-art	1	
1.2	Fundamentals of Image Formation		

1.3	Transformation	1	
1.4	Orthogonal, Euclidean, Affine, Projective, etc		
1.5	Fourier Transform		
1.6	Convolution and Filtering	1	
1.7	Image Enhancement		
1.8	Restoration		
1.9	Histogram Processing	1	
2	**Depth estimation and Multi-camera views**		CO2
2.1	Perspective	1	
2.2	Binocular Stereopsis: Camera and Epipolar Geometry	1	
2.3	Homography, Rectification	1	
2.4	DLT,	1	
2.5	RANSAC	1	
2.6	3-D reconstruction framework	1	
2.7	Auto-calibration, apparel	1	
3	**Feature Extraction**		
3.1	Edges - Canny, LOG, DOG	1	CO3
3.2	Line detectors (Hough Transform),	1	
3.3	Corners - Harris and Hessian Affine	1	
3.4	Orientation Histogram, SIFT, SURF	2	
3.5	HOG, GLOH,	1	
3.6	Scale-Space Analysis		
3.7	Image Pyramids and Gaussian derivative filters	1	
3.8	Gabor Filters and DWT.		
4	**Image Segmentation**		
4.1	Region Growing	2	CO4
4.2	Edge Based approaches to segmentation		
4.3	Graph-Cut	1	
4.4	Mean-Shift, MRFs		
4.5	Texture Segmentation	1	
4.6	Object detection	1	CO6
4.6.1	Object Recognition – scene and object	1	
4.6.2	Model based object Recognition	1	
5.	**Motion Analysis**		
5.1	Background Subtraction and Modeling	2	CO5
5.2	Optical Flow	1	
5.3	Kanade–Lucas–Tomasi (KLT) feature tracker	2	
5.4	Spatio-Temporal Analysis	1	
5.5	Dynamic Stereo	1	
5.6	Motion parameter estimation	1	
5.7	Applications	3	CO6
	Total Hours	36	

Course Designers:

1. T. Manju tmanju@tce.edu
2. E.Ramanujam erit@tce.edu

18ITPJ0	WIRELESS AND MOBILE COMMUNICATION	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

The course aims at exploring the concepts of wireless and mobile communications in Physical, MAC, Network and Transport layer level. It also explores the WLAN, GSM telecommunication system and Ad Hoc routing schemes. This course induces research practice through paper presentation in recent trends and technologies with simulation tools.

Prerequisite

- 18IT430 -Computer Networks

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Experiment with the wireless multiplexing, modulation and spread spectrum techniques for the given scenario	20
CO2	Choose the suitable wireless MAC mechanisms - SDMA, TDMA, FDMA and CDMA for solving the given problem	10
CO3	Outline the working principle of Mobile IP and Mobile TCP	15
CO4	Demonstrate the various functions of Wireless LAN and GSM telecommunication system	15
CO5	Solve the given wireless ad hoc network routing problem with suitable routing schemes	20
CO6	Analyze the performance of various wireless and mobile communication schemes through simulation tools such as NS3	10

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.3
CO2	TPS3	Apply	Value	Mechanism	1.3
CO3	TPS2	Understand	Respond	Guided Response	1.3
CO4	TPS2	Understand	Respond	Guided Response	1.3
CO5	TPS3	Apply	Value	Mechanism	1.3
CO6	TPS4	Analyse	Organise	Complex Overt Responses	1.3, 2.2, 2.4.5, 2.4.6, 2.4.7, 2.5.1, 3.1.1, 3.2

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L										M		
CO2	S	M	L										M		
CO3	M	L											L		
CO4	M	L											L		
CO5	S	M	L										M		
CO6	S	S	M	L	M			S	S	S		S	M	L	M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Paper Presentation			Terminal Examination
	1	2	3	Review 1	Review 2	Review 3	
Remember	20	30	20	30	-	-	20
Understand	60	70	40	40	20	-	40
Apply	20	-	40	30	60	50	40
Analyze	-	-	-	-	20	50	-
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-

CO6 will be assessed only through Paper Presentation.

AssessmentPattern: Psychomotor

Psychomotor Skill	Mini project/Assignment/Practical Component
Perception	-
Set	-
Guided Response	-
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):

1. Implement the slow hopping and fast hopping for the data 1010101.
2. Apply MSK for the data 1011001.
3. Experiment DSSS with the data 110011.

Course Outcome 2 (CO2):

1. Consider two senders $\mathbf{X_s}$ and $\mathbf{Y_s}$. Both senders are transmitting signal at the same time, same place with same frequency. Use the following table and apply the CDMA. Show how the two receivers $\mathbf{X_r}$ and $\mathbf{Y_r}$ received the signal and extract the data?

	$\mathbf{X_s}$	$\mathbf{Y_s}$
Digital Data	110	011
Sequence Keys	101101, 110100, 010100	111000, 101010, 000111

2. Consider the following scenario. Apply aloha. Explain with proper diagrams. Discuss your findings.
   - Assume there are three stations (X, Y and Z) using the medium for transmission
   - Assume that the transmission time for a single bit is 3 ms

	Station X	Station Y	Station Z
Digital Data	11011101	01101100	10110111
Starting time for each data transmission (ms)	0,1,4,7,8,9,12,14	1,2,5,8,10,11,13,15	0,3,4,6,10,12,17,18

3. Consider the following scenario. Apply slotted aloha. Explain with proper diagrams. Discuss your findings.
   - Assume there are two stations (X, Y) using the medium for transmission
   - Assume that the transmission time for a single bit is 3 ms
   - Assume your own time slice for slotted aloha

	Station X	Station Y
Digital Data	11011101	01101100
Starting time for each data transmission (ms)	0,1,4,7,8,9,12,14	1,2,5,8,10,11,13,15

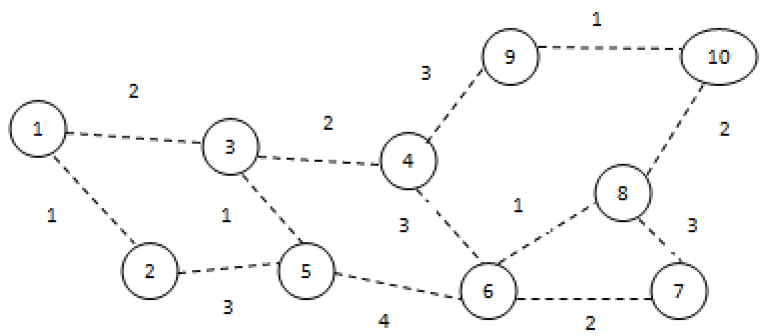
Course Outcome 3 (CO3):

1. Explain the packet forwarding in Mobile IP.
2. Discuss in detail about agent registration and reply procedure.
3. Explain the Mobile TCP functionalities.

Course Outcome 4 (CO4):

1. Explain the GSM architecture.
2. Demonstrate how the handover scheme is working in GSM.
3. Explain in detail about various MAC schemes of IEEE 802.11.

Course Outcome 5 (CO5):



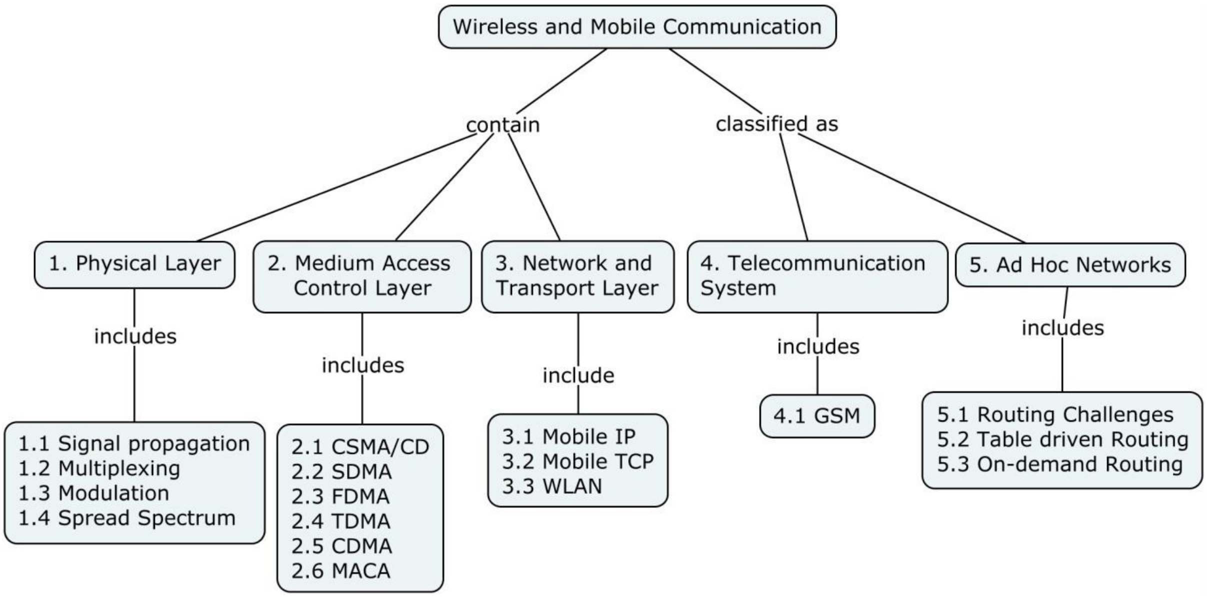
1. Consider the above graph. Find the routing path between node '1' and node '8' of the given network using WRP. Construct the routing table for the node '8' and node '9'.
2. Consider the above graph. Apply DSR for finding the path between node '2' and node '7' of the above network. Consider the node '6' is leaving the network after a data transmission between the nodes '2' and '7'. Now, demonstrate how the nodes '1' and '10' are transmitting data using DSR.
3. Consider the above graph. Build the routing table for node '4' using DSDV for the above ad hoc network

Course Outcome 6 (CO6):

Paper Presentation

- Analyse the various ad hoc routing scheme with the respect to the delay, throughput.
- Analyse the performance of various mobility scheme of wireless ad hoc networks.
- Interpret the simulated results by changing the various wireless protocols with NS3.

Concept Map



Syllabus

Physical Layer: Signal propagation - Multiplexing - SDM, TDM, FDM, CDM – Modulation – ASK, PSK, FSK, MSK - Spread spectrum – DSSS, FHSS

MAC Layer: CSMA/CD - SDMA, FDMA, TDMA – Aloha, Slotted Aloha – CDMA - MACA

Network and Transport Layer: Mobile IP – Packet Delivery, Agent Registration, Reply, Triangular Routing - Mobile TCP - Snooping TCP

Wireless LAN: Transmission Technologies – System Architecture - Physical Layer – IR, FHSS, DSSS - DFWMAC

Telecommunication Systems: GSM - Services – Architecture – Protocol Stack – Call Routing - Handover

Wireless Ad Hoc Networks – Routing: Challenges - Table driven, On-demand, Power aware Routing schemes, QoS

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcomes
1	**Physical Layer**		CO1
1.1	Signal propagation	1	
1.2	Multiplexing – SDM, TDM, FDM, CDM	2	
1.3	Modulation – ASK, PSK, FSK, MSK	2	
1.4	Spread Spectrum – DSSS, FHSS	2	
2	**Medium Access Control Layer**		CO2
2.1	CSMA/CD	1	
2.2	SDMA		
2.3	FDMA		
2.4	TDMA – Aloha, Slotted Aloha	2	
2.5	CDMA	1	
2.6	MACA		
	Paper Presentation - Review – 1	1	CO3
3	**Network and Transport Layer**		
3.1	Mobile IP – Introduction	2	
3.1.1	Packet Delivery		
3.1.2	Agent Registration, Reply, Triangular Routing	2	
3.2	Mobile TCP – Snooping TCP	1	
3.3	Wireless LAN		
3.3.1	Transmission Technologies, System Architecture	1	
3.3.2	Physical Layer – IR, FHSS, DSSS	2	
3.3.3	DFWMAC	2	
4	**Telecommunication System**		CO4
4.1	GSM – Introduction	1	
4.1.1	Services, Architecture, Protocol Stack	1	
4.1.2	Call Routing, Handover	2	
	Paper Presentation - Review – 2	1	
5	**Wireless Ad Hoc Networks**		CO5
5.1	Routing Challenges	1	
5.2	Table Driven routing schemes	3	
5.3	On-demand routing schemes	3	
	Paper Presentation - Review – 3	2	
	Total	**36**	

Learning Resources

1. T.S.Rappaport, "Wireless Communications Principles and Practices", Pearson Education, Asia, NewDelhi, 2nd Edition, 2010.
2. Jochen.H.Schiller, "Mobile Communications" Addision- Wesley, 2nd Edition 2009.
3. C.Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks- Architectures and Protocols", 2nd Edition, 2004.
4. William Stallings, "Wireless Communications and Networks", Pearson Education, 2nd Edition, 2013.
5. 2. W.C.Y.Lee., "Mobile Communication Engineering", Tata McGraw Hill, 2nd Edition, 2008.

Course Designers:

1. Dr.S.Muthuramalingam smrit@tce.edu
2. Dr.P.Karthikeyan karthikit@tce.edu

18ITPL0	CYBER PHYSICAL SYSTEMS	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

This course aims for enabling students to recognize the scope and scale of the potential impact of CPS technology and to design, develop solutions and analyzing innovative cyber physical system models for the real world problem. The syllabus emphasizes on mathematical modeling and simulation of hybrid systems.

Prerequisite

- None

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Describe the conceptual models of the Cyber Physical System process.	16
CO2	Explain the significance of hardware and software components to implement hybrid differential Cyber Physical Systems.	16
CO3	Make use of appropriate techniques to schedule the given tasks in real time systems.	20
CO4	Identify the network setup requirements for the given Cyber Physical System design.	13
CO5	Solve the issues that arise when building and validating security in CPS models.	20
CO6	Analyze the functional behavior of existing CPS such as Medical CPS, Energy CPS, Agriculture CPS etc., based on standard modeling formalisms.	15

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3, 2.1.1, 2.3.1
CO1	TPS2	Understand	Respond	Guided Response	1.3, 2.1.1, 2.3.1
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.1.5, , 2.5.1
CO4	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.1.5, , 2.5.1
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.1.5, , 2.5.1
CO6	TPS4	Analyse	Organise	Complex Overt Responses	1.3, 2.1.1, 2.1.2, 2.1.4, 2.1.5, 2.3.1, 2.4.4, 2.4.6, 3.1.1, 3.2.2, 3.2.3, 3.2.6, 4.1.1, 4.3.1, 4.4.2, 4.5.1, 4.5.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	M	L											L		
CO3	S	M	L										M		
CO4	S	M	L										M		
CO5	S	M	L										M		
CO6	S	S	M	L	M			M	M	M	L	S	M	L	M

S - Strong, M – Medium, L – Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Mini Project Presentation			Terminal Examination
	1	2	3	Review 1	Review 2	Review 3	
Remember	30	20	20	30	-	-	20
Understand	30	40	30	30	20	-	30
Apply	40	40	50	40	50	40	50
Analyze	-	-	-	-	30	60	-
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-

CO6 will be assessed through Mini Project presentation.

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Assignment/Practical Component
Perception	-
Set	-
Guided Response	-
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):

1. Discuss the Evolution of Industry 4.0 and its implications.
2. Provide representative diagram of a Mobile Cyber Physical Systems.
3. Describe the architecture of IIoT.

Course Outcome 2 (CO2):

1. Remember appropriate Drivers and Obstacles of Cyber-Physical Systems Design.
2. Infer uncertainty from any appropriate training data towards safe machine learning for CPS.
3. In many steel industry products, surface roughness is the indicator of product quality and achieving the desired surface quality is of great importance for the best functional behaviour of the product. Consider all the necessary process parameters and predict the surface roughness using SVM and related methods.

Course Outcome 3 (CO3):

1. Apply the concepts of synchronization and communication in inter task communication in order to form a parallel computer architecture.
2. In a two-level cache system, the access times of L1 and L2 caches are 1 and 8 clock cycles respectively. The miss penalty from L2 cache to main memory is 18 clock cycles. The miss rate of L1 cache is twice that of L2. The average memory access time of the cache system is 2 cycles.
   Compute the L1 and L2 cache miss rates.
3. Consider a set of two tasks and show that if they are schedulable with any fixed priority scheduling algorithm then they are also schedulable with RM Scheduling.

Course Outcome 4 (CO4):

1. Identify and demonstrate the suitable networking requirements for the modern applications like Robot and Drone coordination.
2. Implement the design principles of cyber physical networks to control of automation machinery and augmented reality applications.
3. Construct and explain the consequences of massive and/or critical wireless networking for the higher layers of communication systems.

Course Outcome 5 (CO5):

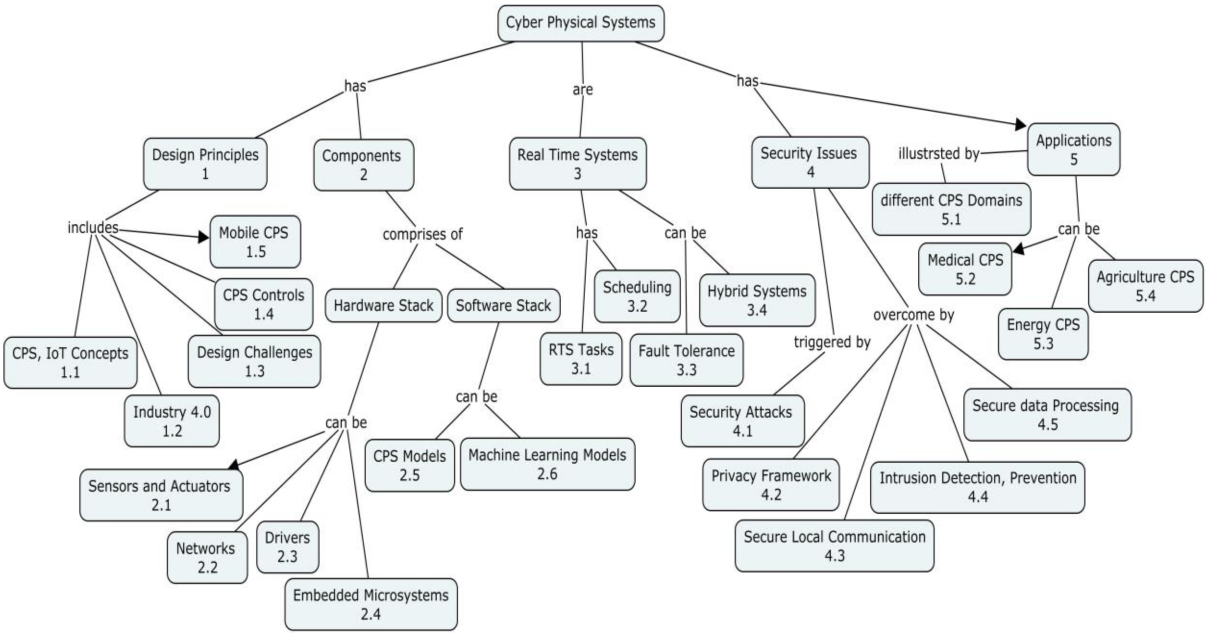
1. Draw the control theoretic model of a Cyber Physical System considering that an attacker can spoof the data sensed from plant output. Explain with suitable formulation how a threshold based detector system can detect such attacks.
2. Experiment with replay attacks, why are they considered convenient (from an attacker's point of view) in the context of feedback control systems?
3. Apply the principles of State estimation for attack detection in a cyber physical system which is subject to switching signal attacks and injection of counterfeit measurements.

Course Outcome 6 (CO6):

CO6 is attained through Mini Project demo and presentation.

1. Analyse the various existing cyber physical system models in terms of their computation and accuracy metrics
2. Analyse the functional behaviors of Medical cyber physical system with respect to performance.
3. Analyse the different functionality parameters of Energy CPS using a simulator.

Concept Map



Syllabus

Introduction and Design Principles of Cyber Physical Systems

Cyber Physical Systems Concepts – Internet of Things (IoT), Industrial IoT implications - Industry 4.0 - Design Challenges –Cyber Physical System Controls - Mobile Cyber Physical Systems – Cyber Physical System Security.

Cyber Physical System Components

Wireless Sensors and Actuators - Networks for Cyber Physical Systems - CPS Drivers - Community Sensing - Wireless Embedded Microsystems Architecture – CPS SW stack - The Application of Machine Learning in CPS.

Real Time Systems

Introduction to Real-Time Systems, RTS tasks (WCET), RTS Scheduling (Feedback Scheduling), Fault Tolerance and Robustness (RTS and Control), Hybrid Systems

Security Issues in Cyber Physical Systems

Analysis for Security Attacks in Cyber Physical Systems – Generalized Framework based on Trust with Privacy - Secure Local Communication – Internet Wide Secure Communication - Intrusion Detection, Prevention, and Privacy of Big Data for Cyber Physical Systems – Security and Privacy for Cloud-Based CPSs – Securely Processing CPS Data in the cloud – Safety Measures.

Medical, Energy and Agriculture Cyber Physical Systems

Emergence of CPS in different applications – Motivation for Medical CPS – System Description and Operational Scenarios – Key Design Drivers and Quality Attributes – Practitioners’ Implications – Motivation for Energy CPS - System Description and Operational Scenarios – Key Design Drivers and Quality Attributes – Cyber Paradigm for Sustainable SEES. Motivation for Agriculture CPS - System Description and Operational Scenarios, CPS in Aerospace, Biometric CPS, - Case studies.

Learning Resources

- Raj Rajkumar, Dionisio de Niz and Mark Klein, “Cyber Physical Systems”, 2017, Pearson Education, Inc, ISBN-13: 978-0-321-92696-8.
- Houbing Song, Gleena A. Fink and Sabina Jeschke, “Security and Privacy in Cyber-Physical Systems, Foundations, Principles, and Applications”, 2018, John Wiley, ISBN: 2017012503.
- Fei Hu, “Cyber-Physical Systems, Integrated Computing and Engineering Design”, 2013, Taylor and Francis Group, ISBN -13: 978-1-4665-7701-5.
- Gaddadevara Matt Siddesh, Ganesh Chandra Deka etal., “Cyber-Physical Systems, A computational Perspective”, 2016, Taylor and Francis Group, ISBN -13: 978-1-4822-5975-9.
- E. A. Lee and S. A. Seshia, “Introduction to Embedded Systems: A Cyber-Physical Systems Approach”, 2017, MIT Press.
- R. Alur, “Principles of Cyber-Physical Systems,” 2015, MIT Press.
- P. Tabuada, “Verification and control of hybrid systems: a symbolic approach”, 2009, Springer-Verlag.

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcome
1	**Introduction and Design Principles of Cyber Physical Systems**		
1.1	Cyber Physical Systems Concepts, Internet of Things (IoT)	1	CO1
1.2	Industrial IoT implications, Industry 4.0	1	
1.3	Design Challenges	1	
1.4	Cyber Physical System Controls	1	
1.5	Mobile Cyber Physical Systems Cyber Physical System Security	1	
2	**Cyber Physical System Components**		
2.1	Wireless Sensors and Actuators	1	CO 2
2.2	Networks for Cyber Physical Systems	2	CO 4
2.3	CPS Drivers, Community Sensing	1	CO2
2.4	Wireless Embedded Microsystems Architecture	1	
2.5	CPS Software stack	1	
2.6	The Application of Machine Learning in CPS	2	
3	**Real Time Systems**		
3.1	Introduction to Real-Time Systems, RTS tasks (WCET)	2	CO3
3.2	RTS Scheduling	2	
3.3	Fault Tolerance and Robustness	2	
3.4	Hybrid Systems	1	
4	**Security Issues in Cyber Physical Systems**		
4.1	Analysis for Security Attacks in Cyber Physical Systems	1	CO5
4.2	Generalized Framework based on Trust with Privacy	1	

4.3	Secure Local Communication, Internet Wide Secure Communication	2	CO4
4.4	Intrusion Detection, Prevention, and Privacy of Big Data for Cyber Physical Systems	2	CO5
4.5	Security and Privacy for Cloud-Based CPSs, Securely Processing CPS Data in the cloud, Safety Measures.	2	
5	**CPS Applications**		
5.1	Emergence of CPS in different applications	2	CO6
5.2	Motivation for Medical CPS: System Description and Operational Scenarios, Key Design Drivers and Quality Attributes , Practitioners' Implications	2	
5.3	Motivation for Energy CPS: System Description and Operational Scenarios, Key Design Drivers and Quality Attributes, Cyber Paradigm for Sustainable SEES	2	
5.4	Motivation for Agriculture CPS, System Description and Operational Scenarios, CPS in Aerospace, Biometric CPS Case studies	2	
	Total Lectures	36	

Course Designers:

1. Dr.S.Muthuramalingam smrit@tce.edu
2. Mr.M.Manikandakumar mmrit@tce.edu

18ITPM0	ETHICAL HACKING	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

New worms, malware, viruses, and ransomware are multiplying every day and are creating a need for ethical hacking services to safeguard the networks of businesses, government agencies or defense. The course on Ethical hacking enables the students to learn and perform hacking in a professional manner, and to prepare an analysis report highlighting the overall risk and vulnerabilities in an information system. The learners will be able to select and apply the best solution to protect against the vulnerabilities. The course provides the necessary fundamentals to earn certification in Ethical Hacking (CEH) from EC Council.

Prerequisite

- 18IT430 Computer Networks

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Explain the terminologies associated with Penetration testing, vulnerability assessment and various information security standards such as HIPAA, PCI- DSS, SOX, FISMA.	16
CO2	Use network scanning, enumeration and footprinting for gathering information about host, network and people related to an organization, search engines, web servers, DNS and social networking sites.	25
CO3	Deploy measures for protecting computer systems against password cracking, keyloggers, Spywares and Rootkits.	16
CO4	Use appropriate tools and techniques to identify various vulnerabilities in webserver and deploy counter measures.	15
CO5	Perform web application testing for prevention against OWASP application risks.	12
CO6	Provide security solutions for protection against evading of firewalls and Intrusion Detection Systems	16

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3, 2.1.1
CO2	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.2.3, 2.3.1, 2.4.1, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 4.1.1, 4.2.2, 4.5.5
CO3	TPS4	Analyze	Organize	Complex Overt Response	1.3, 2.1.1, 2.2.3, 2.3.1, 2.4.1, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 4.1.1, 4.2.2, 4.5.5
CO4	TPS4	Analyze	Organize	Complex	1.3 , 2.1.1, 2.2.3, 2.3.1, 2.4.1,

				Overt Response	2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 4.1.1, 4.2.2, 4.5.5
CO5	TPS4	Analyze	Organize	Complex Overt Response	1.3, 2.1.1, 2.2.3, 2.3.1, 2.4.1, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 4.1.1, 4.2.2, 4.5.5
CO6	TPS4	Analyze	Organize	Complex Overt Response	1.3, 2.1.1, 2.2.3, 2.3.1, 2.4.1, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 4.1.1, 4.2.2, 4.5.5

Mapping with Programme Outcomesand Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	L											M		
CO2	S	M	L		M			M	L	L		L	M	M	L
CO3	S	S	M	L	M			M	L	L		L	S	M	L
CO4	S	S	M	L	M			M	L	L		L	S	M	L
CO5	S	S	M	L	M			M	L	L		L	S	M	L
CO6	S	S	M	L	M			M	L	L		L	S	M	L

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	10	10					10
Understand	20	20					20
Apply	40	40	60	60	60	60	40
Analyse	30	30	40	40	40	40	30
Evaluate							
Create							

CAT3 is evaluated through practical test.
Assignments involve experimentation with hacking tools like NMAP, OSSEC, PFLOGSUM, DVWA, Maltego etc.,

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	
Set	
Guided Response	
Mechanism	60
Complex Overt Responses	40
Adaptation	
Origination	

Sample Questions for Course Outcome Assessment

Course Outcome1(CO1):

1. Differentiate Penetration testing and vulnerability analysis.

2. Enlist the tools to determine organization's publicly available information on the Internet such as network architecture, operating systems, applications, and users.
3. Discuss briefly about the methodologies to collect information from websites, Regional Internet Registries databases and Networks.

Course Outcome 2(CO2):
1. Explain the different types of techniques used to identify the open ports on a targetedserver or host.
2. Explain the various sources for gathering information through footprinting techniques.
3. “For attackers to build a hacking strategy, they need to gather information about the target organization's network, so that they can find the easiest way to break into theorganization's security perimeter” – Justify the requirement.

Course Outcome 3(CO3):
1. Differentiate password attack and brute force attack.
2. Demonstrate how salting of passwords can resists dictionary attack.
3. Enlist the various options to check the existence of spywares in mobile phone.

Course Outcome 4 (CO4):
1. Enlist the various ways to check whether an website has been hacked.
2. Demonstrate footprintingon a Webserver using thehttprecon tool.
3. State the differences between Denial of Service (DoS) and Distributed Denial of Service (DDos) attacks.

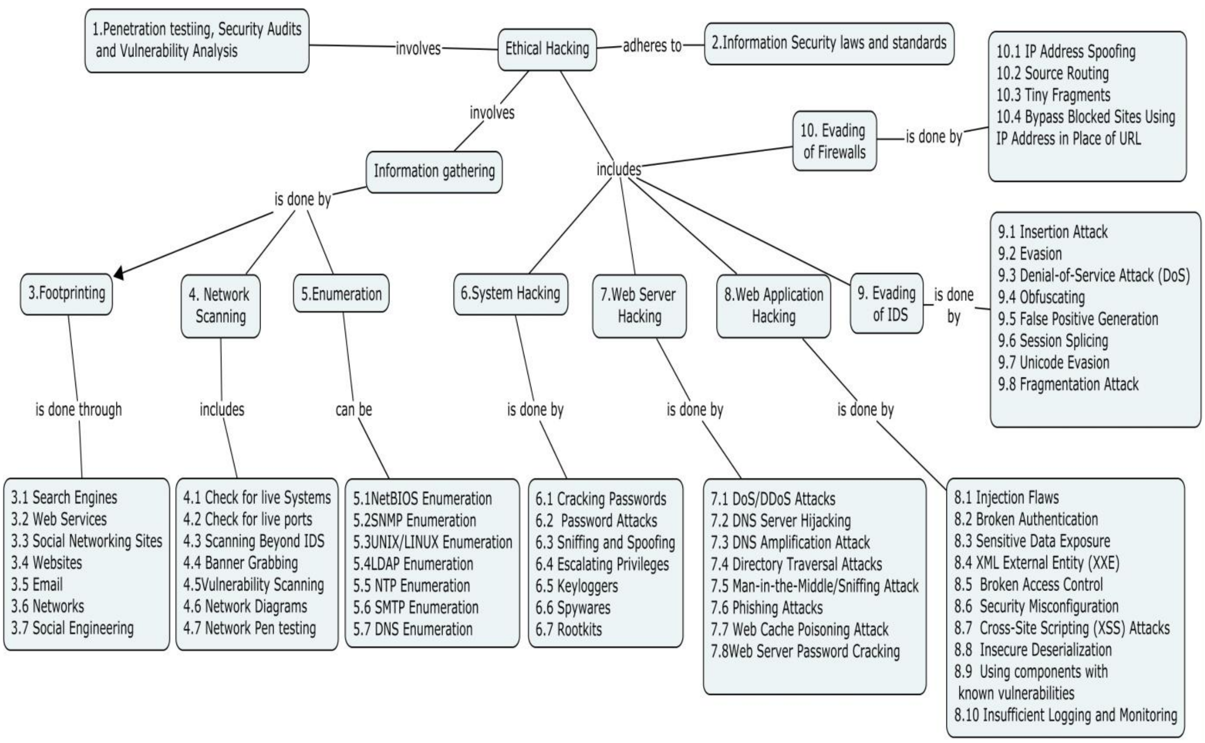
Course Outcome 5 (CO5):
1. A company’s security states that all web browsers must automatically delete their HTTP browser cookies upon terminating. What sort of security breach is this policy attempting to mitigate? Comment on the merits and demerits of the security policy.
2. Consider a University website that permits its students to view their registration status and grade information provided they login with their correct username and password. The inputs entered by the user(login credentials) are passed to the server as form parameters using HTTP POST request when the user clicks submit button as follows:Select s_ID, gpa from students where s_D = ‘14IT10’ and password =’BTECHIT’. Launch SQL injection attack to
    a. Return the tuple of the student with ID =’14IT12’.
    b. Drop table students.
    c. View all the records in the table
3. Demonstrate the steps involved in checking the vulnerability for cross site scripting.

Course Outcome6(CO6):
1. Develop rules for the following cases in a packet filtering firewall:
    a. Allow inbound mails excepting a particular external host SPIGOT.
    b. Any inside host can send mail to outside
    c. Allow IP packets where the source IP address is one of a list of designated Internal hosts and the destination TCP port number is 25.
    d. In handling ftp connections, allow
        i. Packets that originate internally.
        ii. Reply packets to a connection initiated by an internal machine.
        iii. Packets destined for a high numbered port on an internal machine.
2. A Certkiller security System Administrator is reviewing the network system log files. He notes the following:
    a. - Network log files are at 5 MB at 12:00 noon.
    b. - At 14:00 hours, the log files at 3 MB.

What should he assume has happened and what should he do about the situation?

3. List the types of intrusion detection systems and evasion techniques.

Concept Map



Syllabus

Ethical Hacking - Scope and Limitations of Ethical Hacking, Skills of an Ethical Hacker, Types of Penetration Testing, Phases of Penetration Testing, Security Testing Methodology, Comparing Security Audit, Vulnerability Assessment, and Penetration Testing, Case Studies on recent cyber security attacks -Dunkin' Donuts Reports Credential Stuffing Attack, Ransomware attack, The Phishy Wipro Breach, Privacy and security breaches in social media

Information Security Laws and Standards -Payment Card Industry Data Security Standard (PCI-DSS), ISO/IEC 27001:2013, Health Insurance Portability and Accountability Act (HIPAA), Sarbanes Oxley Act (SOX), The Digital Millennium Copyright Act (DMCA), Federal Information Security Management Act (FISMA),Cyber Law in Different Countries, State Actors and Non Sate Actors in Cyber attacks

Footprinting - Objectives of Footprinting, Footprinting through Search Engines, Footprinting through Web Services, Footprinting through Social Networking Sites, Website Footprinting, Email Footprinting, Network Footprinting, Footprinting through Social Engineering

Scanning Networks: Check for live systems, Check for live ports, Scanning beyond IDS,Banner Grabbing, Scan for vulnerability, network diagrams, Scanning Pen Testing.

Enumeration: Concepts, NetBIOS Enumeration, SNMP Enumeration, UNIX/LINUX Enumeration, LDAP Enumeration, NTP Enumeration, SMTP Enumeration, DNS Enumeration, Enumeration countermeasures

System Hacking -Cracking Passwords , Types of Password Attacks,Sniffing and Spoofing, Escalating Privileges, Executing Applications- Keyloggers, Spywares, Rootkits, Anti Keyloggers, AntiSpywares, Anti Rootkits

Web Server Hacking- Web Server Operations, IIS Web Server Architecture, Impact of Web Server Attacks, Web Server Attacks- DoS/DDoS Attacks, DNS Server Hijacking, DNS Amplification Attack, Directory Traversal Attacks, Man-in-the-Middle/Sniffing Attack, Phishing Attacks, Web Cache Poisoning Attack, Web Server Password Cracking, Web Server Penetration Testing.

Web Application Hacking - OWASP Top 10 Application Security Risks –Injection Flaws, Broken Authentication, Sensitive Data Exposure, XML External Entity (XXE),Broken Access Control, Security Misconfiguration, Cross-Site Scripting (XSS) Attacks, Insecure Deserialization, Using components with known vulnerabilities , Insufficient Logging and Monitoring

IDS Evasion Techniques - Insertion Attack, Evasion, Denial-of-Service Attack (DoS), Obfuscating, False Positive Generation, Session Splicing, Unicode Evasion, Fragmentation Attack, Overlapping Fragments, Time-To-Live Attacks, Invalid RST Packets, Urgency Flag, Polymorphic Shellcode, Protection against IDS Evasion

Firewall Evasion Techniques - IP Address Spoofing, Source Routing, Tiny Fragments, Bypass Blocked Sites Using IP Address in Place of URL, Bypass Blocked Sites Using Anonymous Website Surfing Sites, Bypass a Firewall - Proxy Server, ICMP Tunneling Method, ACK Tunneling Method, HTTP Tunneling Method, SSH Tunneling Method, Protection against Firewall Evasion

Learning Resources

1. EC-Council Certfied Ethical Hacking Review Guide, Wiley India Edition, 2012.
2. RafayBaloch , Ethical Hacking and Penetration Testing Guideǁ, CRC Press, 2015
3. Patrick Engebretson, The Basics of Hacking and Penetration Testing, Elsevier, 2013.
4. https://www.darkwiki.in/certified-ethical-hacker-v10-course-free-download/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**Ethical Hacking**		
1.1 1.2 1.3	Ethical Hacking Scope and Limitations of Ethical Hacking Skills of an Ethical Hacker	1	CO1
1.4 1.5	Types of Penetration Testing Phases of Penetration Testing	1	CO1
1.6 1.7	Security Testing Methodology Comparing Security Audit, Vulnerability Assessment, and Penetration Testing,	1	CO1

1.8	Case Studies	1	CO1
2.	**Information Security Laws and Standards**		
2.1 2.2	Payment Card Industry Data Security Standard (PCI-DSS), ISO/IEC 27001:2013,	1	CO1
2.2 2.3	Health Insurance Portability and Accountability Act (HIPAA) Sarbanes Oxley Act (SOX)	1	CO1
2.3 2.4 2.5 2.6	The Digital Millennium Copyright Act (DMCA) Federal Information Security Management Act (FISMA) Cyber Law in Different Countries State actors and Non state actors in Cyber attacks	1	CO1
3.	**Footprinting - Objectives**		
3.1 3.2 3.3	Footprinting through Search Engines Footprinting through Web Services Footprinting through Social Networking Sites	1	CO2
3.4 3.5 3.6 3.7	Website Footprinting Email Footprinting Network Footprinting Footprinting through Social Engineering	1	CO2
4.	**Scanning Networks**		CO2
4.1 4.2 4.3 4.4	Check for live systems Check for live ports Scanning beyond IDS Banner Grabbing	1 1	CO2
4.5 4.6	Scan for vulnerability Network diagrams	1	CO2
4.7	Scanning Pen Testing.	1	CO2
5.	**Enumeration**		CO2
5.1 5.2 5.3	NetBIOS Enumeration SNMP Enumeration UNIX/LINUX Enumeration	1	CO2
5.4 5.5 5.6	LDAP Enumeration NTP Enumeration SMTP Enumeration	1	CO2
5.7 5.8	DNS Enumeration Enumeration countermeasures	1	CO2
6	**System Hacking**		
6.1 6.2	Cracking Passwords Types of Password Attacks	1	CO3
6.3	Sniffing and Spoofing	1	CO3
6.4	Escalating Privileges	1	CO3
6.5	KeyloggersandAntiKeyloggers	1	CO3
6.6	Spywares and Anti Spywares	1	CO3
6.7	Rootkits and Anti Rootkits	1	CO3
7	**Web Server Hacking**		
7.0	Web Server Operations,IIS Web Server Architecture Impact of Web Server Attacks	1	CO4
7.1 7.2 7.3	DoS/DDoS Attacks DNS Server Hijacking DNS Amplification Attack	1	CO4

7.4 7.5	Directory Traversal Attacks Man-in-the-Middle/Sniffing Attack	1	CO4
7.6 7.7 7.8	Phishing Attacks Web Cache Poisoning Attack Web Server Password Cracking	1	CO4
7.9	Web Server Penetration Testing.	1	CO4
8	**Web Application Hacking**		
8.1 8.2 8.3 8.4	Injection Flaws Broken Authentication Sensitive Data Exposure XML External Entity (XXE)	1	CO5
8.5 8.6	Broken Access Control Security Misconfiguration	1	CO5
8.7	Cross-Site Scripting (XSS) Attacks	1	CO5
8.8 8.9 8.10	Insecure Deserialization Using components with known vulnerabilities Insufficient Logging and Monitoring	1	CO5
9	**IDS Evasion Techniques**		
9.1 9.2 9.3 9.4 9.5	Insertion Attack Evasion Denial-of-Service Attack (DoS) Obfuscating False Positive Generation	1	CO6
9.6 9.7 9.8	Session Splicing Unicode Evasion Fragmentation Attack	1	CO6
10	**Firewall Evasion Techniques**		CO6
10.1 10.2 10.3 10.4	IP Address Spoofing Source Routing Tiny Fragments Bypass Blocked Sites Using IP Address in Place of URL	1	CO6
10.5 10.5.1 10.5.2 10.5.3	Bypass a Firewall Using Proxy Server ICMP Tunneling Method ACK Tunneling Method	1	CO6
10.5.4 10.5.5	HTTP Tunneling Method SSH Tunneling Method	1	CO6
10.6	Protection against Firewall Evasion	1	CO6
	Total Hours	**36**	

Course Designers:

1. C.Jeyamala jeyamala@tce.edu
2. M.Thangavel mtit@tce.edu

18ITPN0	CYBER FORENSICS	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

Securing relevant evidence from computer systems and other electronic devices requires a range of skills and a deep understanding of how data is stored and organized electronically. This course serves as an introduction to the technologies relevant to cyber forensics and provides the student with hands-on experience in collecting and analyzing electronic data.

Prerequisite

- Nil.

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Describe the cyber forensics fundamentals and storage fundamentals	11%
CO2	Illustrate the knowledge required to investigate, detect and prevent cyber crimes.	14%
CO3	Apply forensic analysis tools to recover important evidence for identifying cyber crime.	14%
CO4	Observe the crime scene based on the knowledge of forensics processes and procedures	28%
CO5	Collect evidences and investigate various system forensics	17%
CO6	Use forensic tools for recovering evidences from computer and other digital storage devices	16%

CO Mapping with CDIO Curriculum Framework

CO#	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Set	1.3
CO2	TPS3	Apply	Value	Guided Response	1.3, 2.1.1, 2.4.1, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 3.2.4, 4.1.1
CO3	TPS3	Apply	Value	Guided Response	1.3, 2.1.1, 2.4.1, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 3.2.4, 4.1.1
CO4	TPS3	Apply	Value	Guided Response	1.3, 2.1.1, 2.4.1, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 3.2.4, 4.1.1
CO5	TPS3	Apply	Value	Guided Response	1.3, 2.1.1, 2.4.1, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 3.2.4, 4.1.1
CO6	TPS4	Analyze	Organize	Mechanism	1.3, 2.1.1, 2.4.1, 2.4.3, 2.4.4, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3, 3.2.4, 4.1.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	S						S						L	L	
CO 2	M	L			M				M				L	L	L
CO 3	M	L			S				M				L	L	L
CO 4	M	L											L		
CO 5	M	L											L		
CO 6	M	L			S				S			M	L	L	L

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	30	20	20	-	-	-	20
Understand	30	40	40	-	-	-	40
Apply	40	40	40	100	100	100	40
Analyse	0	0	0	-	-	-	0
Evaluate	0	0	0	-	-	-	0
Create	0	0	0	-	-	-	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini-project / Assignment/Practical Component
Perception	-
Set	30
Guided Response	70
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome1 (CO1):

1. Explain why securing the hard drive of the suspect's computer is more important than other file evidence on the hard drive.
2. How can a cyber-forensics help us reduce loss and liability?
3. What are the roles & responsibilities of cyber-forensic investigator?

Course Outcome2 (CO2):

1. Companies who recycle their computers by selling them on to someone else will aim to erase all data on their hard drive. However, this may not always be successful.
   a) Outline how formatting the disk may not in fact achieve this aim.
   b) Outline the possible effects on privacy if all of the data is not erased.
2. Explain the procedure for gathering evidence in the case of bank robbery.
3. Illustrate the tactics used in "Pulwama Attack" happened in 2019 and how to prevent these types of attacks?

Course Outcome3 (CO3):

1. Mention about the various data stored in an Apple iPhone. How these data will be analysed in a forensic laboratory.
2. Interpret the implications of "theft of information" in terms of national security.
3. An accounting company needed to review approximately 10 million pages of client internal documents in the context of an audit. The data resided in email, text documents, and file attachments. The original plan was to deploy a team of professionals at the client site for a three-month document review. How would your advanced document management services centre (DMSC) handle this document review of Computer Forensic Technology?

Course Outcome 4 (CO4):

1. Consider the case "Doctor accused of withholding treatment and erasing records", how you can prepare for this incident.
2. Discuss the methods used by criminals to hide or disguise certain files. For each method identify the countermeasures that can be taken by a computer forensic scientist.
3. Larry deposits a stolen third-party check into his account. No problems are detected during check clearance, and two days later cleared funds are available in Larry's account. Subsequently an ATM camera records Larry making cash withdrawal. The bank's forensics system analyses the video image and a match is found against the latest police records of Larry, wanted in connection with illegal drug activities. How would your forensic system continue to handle this analysis and explain it.

Course Outcome 5 (CO5):

1. A major hotel and casino needed to preserve legacy client digital linear tape (DLT) tapes and recover, extract, and host over 260 gigabytes of electronic data for attorney review. How would your computer forensics team go about preserving and recovering the electronic data?

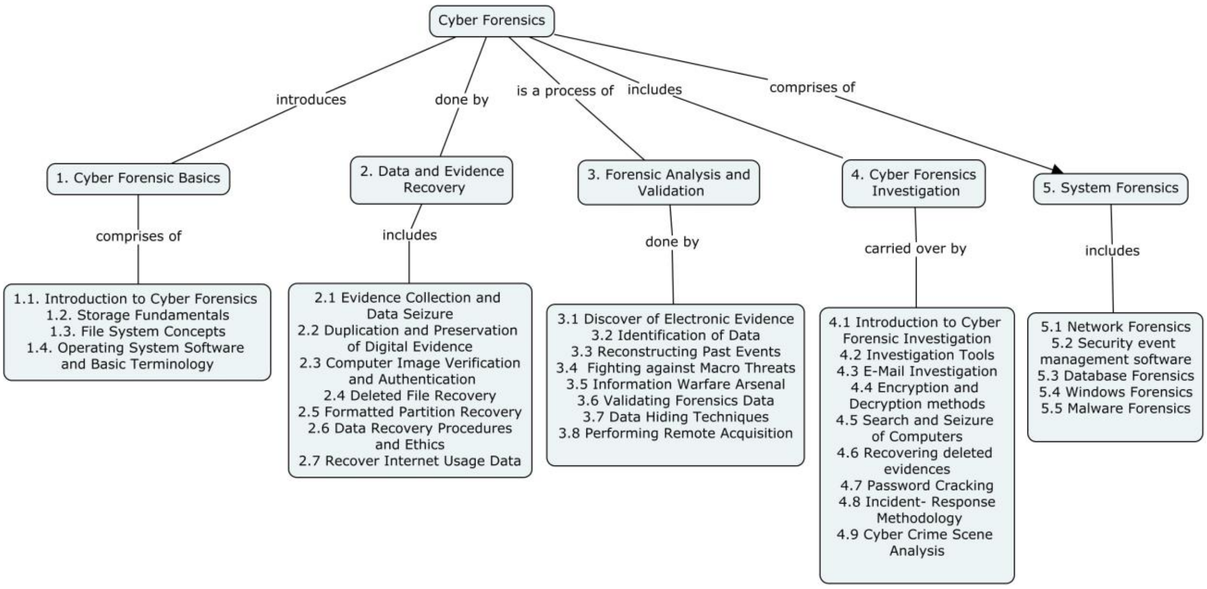
2. An accounting firm was conducting an audit of a publicly owned company when they came upon some accounting irregularities. The irregularities were serious enough to potentially necessitate a re-stating of earnings. Considering the many scandals currently blighting the corporate sector, the accounting firm wished to confirm their findings before sounding any public alarms. They retained a CFST to conduct large-scale data mining to get to the bottom of the irregularities. How would a CFST (Computer Forensics Specialist Team) go about conducting a forensics data mining operation?

3. A small landscaping company suspecting embezzlement hired a CFST to review their bookkeeper's computer. Explain how a CFST (Computer Forensics Specialist Team) would deal with this case in terms of Evidence Collection and Data Seizure.

Course Outcome 6 (CO6):

Course Outcome 6 is evaluated by exploring various cyber forensics tools and appropriate case studies through mini-project.

Concept Map



Syllabus

Cyber Forensic Basics- Introduction to Cyber Forensics- Storage Fundamentals- File System Concepts- Operating System Software and Basic Terminology.

Data and Evidence Recovery- Data Recovery- Evidence Collection and Data Seizure- Duplication and Preservation of Digital Evidence- Computer Image Verification and Authentication- Deleted File Recovery- Formatted Partition Recovery- Data Recovery Procedures and Ethics- Recover Internet Usage Data.
Case study: Introduction to Encase Forensic Edition- Forensic Tool Kit (FTK)

Forensic Analysis and Validation- Discover of Electronic Evidence-Identification of Data-Reconstructing Past Events Fighting against Macro Threats- Information Warfare Arsenal-Validating Forensics Data – Data Hiding Techniques- Erasing Hard Drives using Gutmann Algorithm– Performing Remote Acquisition.

Cyber Forensics Investigation- Introduction to Cyber Forensic Investigation- Investigation Tools- E-Mail Investigation- E-Mail Tracking- IP Tracking- E-Mail Recovery- Encryption and Decryption methods- Search and Seizure of Computers- Recovering deleted evidences-Password Cracking Incident- Response Methodology- Cyber Crime Scene Analysis.

System Forensics- Network Forensics- Firewalls- Intrusion Detection System- Security event management software-Mobile Device Forensics- Database Forensics- Web investigation- IP tracking- Server logs- Domain records-Windows Forensics- malware forensics- Google Forensics.

Learning Resources

1. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Charles River Media, Paperback Edition, 2015.
2. Nelson, Phillips, Enfinger, Steuart, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2008.
3. Michelle Moore, "Cyber security Breaches and issues surrounding online threat protection", IGI Global Publication, 2017.

4. Bernadette H Schell, Clemens Martin, “Cybercrime”, ABC – CLIO Inc, California, 2004.
5. Marjie T Britz , “Computer Forensics and Cyber Crime: An Introduction, 2/e, Pearson Education ISBN:9788131764015
6. Chad Steel, “Windows Forensics”, Wiley India, 2006.
7. Majid Yar, “Cybercrime and Society”, Sage Publications, 2006.
8. Robert M Slade, “Software Forensics”, Tata McGraw Hill, 2004.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**Cyber Forensic Basics**	1	CO1
1.1	Introduction to Cyber Forensics		
1.2	Storage Fundamentals	1	
1.3	File System Concepts	1	
1.4	Operating System Software and Basic Terminology	1	
2.	**Data and Evidence Recovery**		CO2
2.1	Data Recovery	2	
2.1.1	Evidence Collection and Data Seizure		
2.1.2	Duplication and Preservation of Digital Evidence		
2.1.3	Computer Image Verification and Authentication		
2.2	Deleted File Recovery	1	
2.3	Formatted Partition Recovery	1	
2.4	Data Recovery Procedures and Ethics	1	
2.5	Recover Internet Usage Data		
Case study: Introduction to Encase Forensic Edition- Forensic Tool Kit(FTK)		3	CO6
3.	**Forensic Analysis and Validation**		
3.1	Discover of Electronic Evidence	2	CO3
3.2	Identification of Data		
3.3	Reconstructing Past Events Fighting against Macro Threats		
3.4	Information Warfare Arsenal	1	
3.5	Validating Forensics Data	1	
3.6	Data Hiding Techniques	2	
3.7	Erasing Hard Drives		
3.8	Performing Remote Acquisition		
4.	**Cyber Forensics Investigation**		CO4
4.1	Introduction to Cyber Forensic Investigation	1	
4.2	Investigation Tools		
4.3	E-Mail Investigation	2	
4.3.1	E-Mail Tracking		
4.3.2	IP Tracking		
4.3.3	E-Mail Recovery		
4.4	Encryption and Decryption methods	1	

4.5	Search and Seizure of Computers	1	
4.6	Recovering deleted evidences	1	
4.7	Password Cracking	1	
4.8	Incident- Response Methodology	1	
4.9	Cyber Crime Scene Analysis	1	
5.	**System Forensics**	1	CO5
5.1	Network Forensics		
5.2	Security event management software		
5.3	Mobile Device Forensics	1	
5.4	Database Forensics	1	
5.5	Windows Forensics	1	
5.6	Malware Forensics	2	
Case study: Forensics Tool Exploration		3	CO6
	Total Lecture Hours	36	

Course Designers:

1. R.Parkavi rpit@tce.edu
2. S.Sujitha sujithait@tce.edu

18ITPP0	BLOCKCHAIN TECHNOLOGIES	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

Blockchain is an emerging technology platform for developing decentralized applications and data storage, over and beyond its role as the technology underlying the crypto currencies. The basic tenet of this platform is that it allows one to create a distributed and replicated ledger of events, transactions, and data generated through various IT processes with strong cryptographic guarantees of tamper resistance, immutability, and verifiability. After successful completion of this course, students can build their own application with blockchain and crypto currency concepts.

Prerequisite

- 18IT520 Information Security

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Demonstrate the need and usage of cryptographic algorithms in blockchain technology.	11
CO2	Explain the significance of blocks, proof-of-work, and consensus building in blockchain technology	27
CO3	Explain the functional/operational aspects of trading and mining using crypto currencies.	12
CO4	Demonstrate verifiability and correctness of smart contracts in Blockchain.	16
CO5	Develop blockchain applications and write smart contracts in Hyperledger platform.	14
CO6	Analyze the impact and challenges of Blockchain implementation in various domains like finance, Health care etc.	20

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.2.3, 2.3.1, 2.4.1, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3
CO2	TPS2	Understand	Respond	Guided Response	1.3
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.2.3, 2.3.1, 2.4.1, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3
CO4	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.2.3, 2.3.1, 2.4.1, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.2.3, 2.3.1, 2.4.1, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3
CO6	TPS4	Analyze	Organize	Complex Overt Response	1.3, 2.1.1, 2.2.3, 2.3.1, 2.4.1, 2.5.1, 2.5.2, 3.1.1, 3.1.2, 3.2.3

Mapping with Programme Outcomesand Programme Specific Outcomes

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	S	M	L										M		
CO2	M	L											L		
CO3	S	M	L										M		
CO4	S	M	L		S				M			M	M	S	M
CO5	S	M	L		S				M			M	M	S	M
CO6	S	S	M	L					M				S		

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	ContinuousAssessmentTests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	**10**				10
Understand	40	40	20				30
Apply	40	40	40	100	100	60	40
Analyse			30			40	20
Evaluate							
Create							

Assignment 3 involves case study on applications of blockhain technology in various domains

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	
Set	
Guided Response	30
Mechanism	40
Complex Overt Responses	30
Adaptation	
Origination	

Sample Questions for Course Outcome Assessment

Course Outcome1(CO1):

1. Enumerate four points of the elliptic curve $Y^2 = X^3 + 9X + 5$ over F_{13}.
2. Differentiate strong and weak collision resistance.
3. Find two distinct inputs such that the corresponding SHA-256 hash function outputs coincide in the initial 28 bits.

Course Outcome2(CO2):

1. What are Merkle trees? How important are Merkle trees in Blockchains?
2. The Merkle Patricia trie corresponding to the key-value pairs { 646f : 'verb', 646f67 : 'puppy', 646f6765 : 'coin', 686f727365 : 'stallion' } is given below. Suppose the last key-value pair (corresponding to the value 'stallion') is deleted from the trie. Write down the modified trie.
    - rootHash [<16>, hashA]
    - hashA [<>, <>, <>, <>, hashB, <>, <>, <>, hashC, <>, <>, <>, <>, <>, <>, <>, <>]

- hashC [<20 6f 72 73 65>, ’stallion’]
- hashB [<00 6f>, hashD]
- hashD [<>, <>, <>, <>, <>, <>, hashE, <>, <>, <>, <>, <>, <>, <>, <>, <>, ’verb’]
- hashE [<17>, hashF]
- hashF [<>, <>, <>, <>, <>, <>, hashG, <>, <>, <>, <>, <>, <>, <>, <>, <>, ’puppy’]
- hashG [<35>, ’coin’].

3. Explain PoW (Proof of Work) in blockchain.

Course Outcome3(CO3):

1. Alice wants to buy a book from Bob. He emails his Bitcoin P2PKH address to Alice. But a single character is missing from the address. Bob made a mistake while typing it. How can Alice find the location and value of the missing character in the address without contacting Bob?
2. The merchant Bob wants to create a vanity P2PKH address to share with this customers. He wants it to start with the characters 1bob.... How can he generate such an address?
3. Suppose a merchant waits for six confirmations on a Bitcoin payment before transferring some goods to a customer. Describe how a 51% attacker can execute a double spend attack on such a merchant.

Course Outcome 4 (CO4):

1. Explain transaction malleability in smart contracts.
2. Write the procedure with reference to micropayments contracts:
   Creating refund transaction
   Getting paid for first page edits
3. Write pseudocodes for smart contract creation and currency allocation.

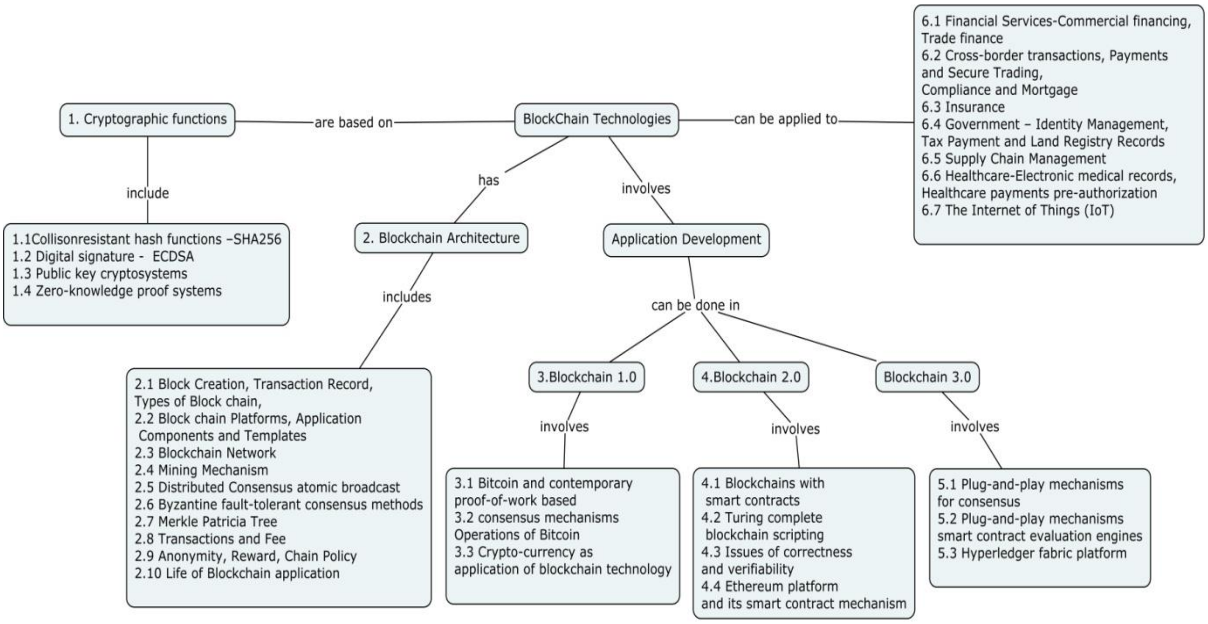
Course Outcome 5 (CO5):

1. Suppose a Hyperledger Fabric network requires an application to get three endorsements before a transaction proposed by it is added to the blockchain. Explain the steps involved starting from the transaction proposal by the application to the addition of the transaction in the blockchain. Assume there are four peers P1, P2, P3, P4 connected by the same channel who can endorse a transaction.
2. Explain the salient features of Hyperledger fabric.
3. Describe the process of ensuring multitenancy in Hyperledger.

Course Outcome6(CO6):

1. Analyze the impact of blockchain technologies other than cryptocurrency.
2. Explain how blockchain technology can be applied in manufacturing industry.
3. Present a detailed report on the application of blockchain technology in electronic records of patients in healthcare industry

Concept Map



Syllabus

Cryptographic primitives in Blockchain

Applications of Collison-resistant hash functions – SHA 256, Digital signature -ECDSA, public key cryptosystems, zero-knowledge proof systems

Blockchain – Architecture

Block Creation, Transaction Record, Types of Block chain, Block chain Platforms, Application Components and Templates, Blockchain Network, Distributed Consensus atomic broadcast, Byzantine fault-tolerant consensus methods, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Mining Mechanism – Energy efficiency, Reward, Chain Policy, Life of Blockchain application, Limitations of Blockchain Technology

Blockchain 1.0

Bitcoin and contemporary proof-of-work based consensus mechanisms, operations of Bitcoin, Crypto-currency as application of blockchain technology

Blockchain 2.0

Blockchains with smart contracts and Turing complete blockchain scripting – issues of correctness and verifiability, Ethereum platform and its smart contract mechanism

Blockchain 3.0 – Plug-and-play mechanisms for consensus and smart contract evaluation engines, Hyperledger fabric platform

Blockchain – Use cases

Financial Services-Commercial financing, Trade finance, Cross-border transactions, Payments and Secure Trading, Compliance and Mortgage, Insurance, Government – Identity Management, Tax Payment and Land Registry Records, Supply Chain

Management, Healthcare-Electronic medical records, Healthcare payments pre-authorization, The Internet of Things (IoT)

Learning Resources

- Melanie Swa, "Blockchain – Blueprint for New Economy", O'Reilly,First Edition 2015
- Andreas Antonopoulos , "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly, Second Edition, 2018.
- S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.
- Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
- Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html
- https://swayam.gov.in/nd1_noc19_cs63/
- Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
- https://www.packtpub.com/big-data-and-business-intelligence/hands-blockchain-hyperledger
- Public github repository with code samples: https://github.com/HyperledgerHandsOn/trade-finance-logistics
- https://www.ee.iitb.ac.in/~sarva/courses/EE465/Autumn2019.html

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**Cryptographic primitives in Blockchain**		CO1
1.1	Collison-resistant hash functions –SHA256	1	CO1
1.2	Digital signature - ECDSA	1	CO1
1.3	Public key cryptosystems	1	CO1
1.4	Zero-knowledge proof systems	1	CO1
2	**Block Chain – Architecture**		CO2
2.1	Block Creation, Transaction Record, Types of Block chain,	1	CO2
2.2	Block chain Platforms, Application Components and Templates	1	CO2
2.3	Blockchain Network	1	CO2
2.4	Mining Mechanism	2	CO2
2.5	Distributed Consensusatomic broadcast	1	CO2
2.6	Byzantine fault-tolerant consensus methods	1	CO2
2.7	Merkle Patricia Tree	2	CO2
2.8	Transactions and Fee	1	CO2
2.9	Anonymity, Reward, Chain Policy	1	

2.10	Life of Blockchain application	1	CO2
3	**Blockchain 1.0**		CO3
3.1	Bitcoin and contemporary proof-of-work based consensus mechanisms	1	CO3
3.2	Operations of Bitcoin	2	CO3
3.3	Crypto-currency as application of blockchain technology	1	CO3
4	**Blockchain 2.0**		CO4
4.1	Blockchains with smart contracts	1	CO4
4.2	Turing complete blockchain scripting	2	CO4
4.3	Issues of correctness and verifiability	1	CO4
4.4	Ethereum platform and its smart contract mechanism	2	CO4
5	**Blockchain 3.0**		CO5
5.1	Plug-and-play mechanisms for consensus	1	CO5
5.2	Plug-and-play mechanisms smart contract evaluation engines	1	CO5
5.3	Hyperledger fabric platform	2	CO5
6	**Blockchain – Use cases**		CO6
6.1	Financial Services-Commercial financing, Trade finance	1	CO6
6.2 6.3	Cross-border transactions, Payments and Secure Trading, Compliance and Mortgage Insurance	1	CO6 CO6
6.4	Government – Identity Management, Tax Payment and Land Registry Records	1	CO6
6.5	Supply Chain Management	1	CO6
6.6	Healthcare-Electronic medical records, Healthcare payments pre-authorization	1	CO6
6.7	The Internet of Things (IoT)	1	CO6
	Total Lecture Hours	36	

Course Designers:

1. C.Jeyamala jeyamala@tce.edu
2. R.Parkavi parkaviravi@gmail.com

18ITPQ0	SOFTWARE TESTING

Category	L	T	P	Credit
PE	3	0	0	3

Preamble

The course presents a comprehensive study of software testing concepts, principles, methodologies, management strategies. The purpose of this course is to build the skills necessary to perform software testing at the function, class and application level.

Prerequisite

- Basic knowledge in Software Engineering

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Describe test management activities like strategies development, planning and progress monitoring	19%
CO2	Demonstrate agile testing practices in the project team	20%
CO3	Develop test cases and test scripts using appropriate testing tools and techniques	22%
CO4	Determine test adequacy state for test enhancement	14%
CO5	Practice defect management process using suitable tools	11%
CO6	Use software testing tools for performing application testing	14%

CO Mapping with CDIO Curriculum Framework

CO#	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3, 2.4.1, 2.4.7, 2.5.1, 2.5.2, 3.2
CO2	TPS3	Apply	Value	Mechanism	1.3, 2.4.3, 2.4.4, 2.4.7, 2.5, 3.1, 3.2
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.4.3, 2.4.4, 2.4.7, 3.2, 4.5.4, 4.5.5,
CO4	TPS3	Apply	Value	Mechanism	1.3, 2.4.3, 2.4.4, 2.4.7, 3.2, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.4.6, 3.2, 4.5.5,
CO6	TPS3	Apply	Value	Mechanism	1.3, 2.4.3, 2.4.4, 2.4.6, 2.4.7, 3.1.2, 3.2,

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	M	L						S			M		L		L
CO 2	S	M	L		S			S	S	S		M	M	M	M
CO	S	M	L		S			S				S	M	M	L

3															
CO 4	S	M	L					S				M	M		L
CO 5	S	M	L		S			S					M	M	L
CO 6	S	M	L		S			S	S	S	S	M	M	M	S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	30	20	20	-	-	-	20
Understand	30	40	40	40	-	-	40
Apply	40	40	40	60	100	100	40
Analyse	0	0	0	-	-	-	0
Evaluate	0	0	0	-	-	-	0
Create	0	0	0	-	-	-	0

AssessmentPattern: Psychomotor

Psychomotor Skill	Mini-project / Assignment/Practical Component
Perception	-
Set	-
Guided Response	30
Mechanism	70
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome1 (CO1):

1. List and explain the different types of test reports that are generated in test progress monitoring and control.
2. Outline the Software Testing Principles.
3. Rewrite the benefits of detecting defects earlier in SDLC.

Course Outcome2 (CO2):

1. Agile and Scrum methodologies are used to complete a project at earliest. Implementing agile principles results in customer satisfaction where as scrum is known for its flexible feature as per the requirements. How will you choose the number of resources required to your scrum team? Justify your answer.
2. As a tester what should be your approach when requirements change continuously? How can you implement scrum in an easy way to your project?
3. For the following requirements of a simple String calculator with a method int Add(string numbers), check whether the input is ok: "1\n2,3" will produce result as 6. Also check the program using Test Driven Development if the method can take 0, 1 or 2 numbers,

and will return their sum, for an empty string it will return 0, for example "" or "1" or "1,2". Allow the Add method to handle an unknown amount of numbers. Allow the Add method to handle new lines between numbers instead of commas.

Course Outcome3 (CO3):

1. Airbnb, founded in 2008, is now well known around the world. The online market place allows people to rent their homes (or private and shared rooms) to travellers, who can book them. It has recently expanded to also offer bookable "Experiences" – for example, a coffee shop tour in a city with a local who knows the best spots. In addition, it offers guides to major cities and lists events available in some of them. For the given scenario what kind of Testing to be done in the Airbnb website and justify your answer.
2. A 70kb page would not take more than 15 seconds to load for the worst connection of 28.8kbps modem (latency=1000 milliseconds), while the page of the same size would appear within 5 seconds for the average connection of 256kbps DSL (latency=100 milliseconds).A 1.5mbps T1 connection (latency=50 milliseconds) would have the performance benchmark set as 1 second to achieve this target. Performance/Load/Stress Testing which will be preferred and why?
3. The following example illustrates the definition of (valid and invalid) equivalence classes and the corresponding test case values. The software module in question calculates entrance ticket prices for the Golden Splash Swimming Centre. The Centre's ticket price depends on four variables: day (weekday, weekend), visitor's status (OT = one time, M = member), entry hour (6.00–19.00,19.01–24.00) and visitor's age (up to 16, 16.01–60, 60.01–120).Identify the valid and invalid EC's for the above.

Course Outcome 4 (CO4):

1. Outline the Test Enhancement Procedure used in assessing the test adequacy with neat diagram.
2. Consider the following function foo that is required to return the sum of two integers.

int foo(int x, y)
{return (x-y);}

Create different mutants and detect the errors in the given piece of code.

3. Consider the program to find the roots of quadratic equation and assess the test adequacy using Statement Coverage and Block Coverage using your own test data.

Course Outcome 5 (CO5):

1. Consider the following scenarios,s

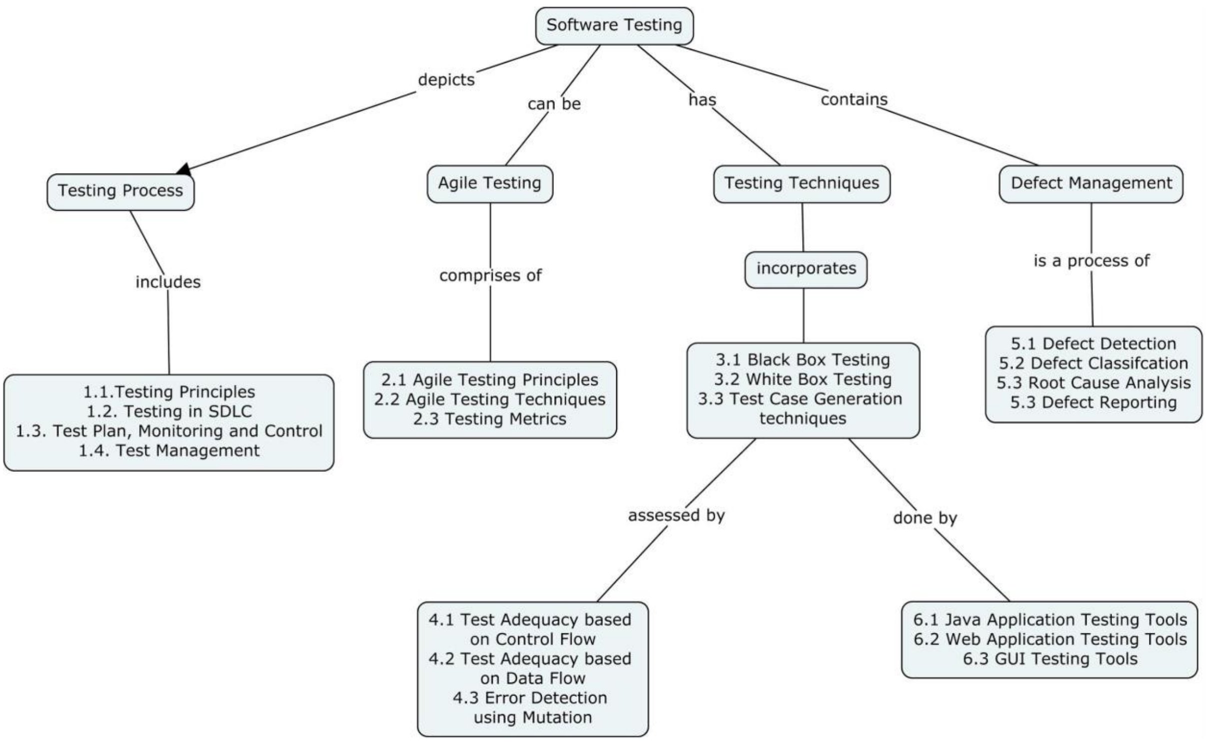
- If the user tries to do online shopping and the application does not load or server unavailable message pops up.
- The user performs adding an item to the cart, the number of quantities added is incorrect/wrong product gets added.
- The user makes the payment and after the payment, the order stays in the cart as reserved instead confirmed.
- The system accepts the order but finally, cancels the order after half an hour due to any issues.
- The system accepts the "Add to Cart" on double click only instead on a single click.
- The Add To Cart button is spelt as Add To Cart.

Identify the Defect Priority and Severity Levels of each scenario.

2. In the email service provider like Yahoo or Gmail, after typing the correct Username and the password, instead of logging in, the system crashes or throws the error message; this defect is classified as critical as this defect makes the whole application unusable. Develop the Defect Report.

3. Construct Fish Bone Diagram and derive test cases from it through decision table for the following specifications.
User must input the string length (upto 80) and the character to search for. If the string length is out-of-range, an error message will appear. If the character appears in the string, its position will be reported. If the character is not in the string, error message “Not found” will be the output.

Concept Map



Syllabus

Testing Process

Principles of Software Testing **-** Testing in Software Development Life Cycle –Test Planning, Monitoring and Control- Test Analysis- Test Design- Test Implementation- Test Execution- Evaluating exit criteria and Reporting- Test Closure Activities - Test Analyst’s task

Agile Testing

Agile Testing Lifecycle – Testing skills – Role of testers - Testing Methods – Test Driven Development – Acceptance Test-Driven Development – Behaviour-driven Development —

Agile Testing Practices and Techniques – Agile Testing Quadrants – Agile Testing in SCRUM - Work products – Testing Metrics

Testing Techniques and Tests Generation
Black Box testing – White Box testing - Regression Testing – Specification-based techniques Equivalence Partitioning- Boundary Value Analysis- Decision Tables- Cause Effect Graph- Use case testing- State Transition Testing- Combinatorial Testing- User Story Testing- Domain Analysis- Applying techniques to Requirements – Defect-based Techniques- Experience-based techniques

Test Adequacy Assessment and Enhancement – Basics- Adequacy criteria based on Control Flow- Adequacy criteria based on data flow- Mutation and Mutants- Fault Detection using Mutation

Defect Management
Defect detection - Defect Classification - Root Cause Analysis - Defect Reporting
Case Study- NASA Metrics DATA SET for Defect Prediction

Testing tools
Testing tools - Test Automation – Java Application Testing tools like JUnit, JMeter, Maven - Web Application Testing tools like Selenium – GUI testing tools

Learning Resources

1. Dorothy Graham, Rex Black, Erik Van, “Foundations of Software Testing”, Cengage Learning EMEA; 4th edition edition (August 9, 2019)
2. Lisa Crispin, Janet Gregory, “Agile Testing: A Practical Guide for Testers”, Addison-Wesley Professional, 2009
3. Srinivasan Desikan ,Gopalasamy Ramesh, ”Software Testing – principles and practices”, Pearson Education , First Edition, 2009
4. AdityaP.Mathur “Foundations of Software Testing “, Pearson education, First Edition, 2008.
5. Rex Black, “Advanced Software Testing”, Cengage Learning EMEA, 2nd edition, a Guide to ISTQB Certification course, Dec 2015.
6. Lisa Crispin, Janet Gregory, ”Agile Testing Condensed”, Library and Archives Canada, 2019.
7. Krishna Rungta, “Selenium Learn in one day”, published on Amazon digital services, 2017.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**Testing Process**	1	CO1
1.1	Principles of Software Testing		
1.2	Testing in Software Development Life Cycle	1	
1.3	Test Planning, Monitoring and Control	1	
1.4	Test Analysis	1	
1.5	Test Design		

1.6	Test Implementation	1	
1.7	Test Execution		
1.8	Evaluating exit criteria and Reporting	1	
1.9	Test Closure Activities		
1.10	Test Analyst's task	1	
2.	**Agile Testing**	1	CO2
2.1	Agile Testing Lifecycle		
2.2	Testing skills , Role of testers		
2.3	Testing Methods	2	
2.3.1	Test Driven Development		
2.3.2	Acceptance Test-Driven Development		
2.3.3	Behaviour-driven Development	1	
2.3.4	Agile Testing in SCRUM	2	
2.4	Agile Testing Practices and Techniques	1	
2.5	Agile Testing Quadrants , Work products, Testing Metrics		
Case Study: Test Automation		2	CO6
3.	**Testing Techniques and Tests Generation**	1	CO3
3.1	Black Box testing		
3.2	White Box testing	1	
3.3	Regression Testing		
3.4	Specification-based techniques	2	
3.4.1	Equivalence Partitioning		
3.4.2	Boundary Value Analysis		
3.4.3	Decision Tables		
3.4.4	Cause Effect Graph		
3.5	Use case testing	2	
3.6	State Transition Testing		
3.7	Combinatorial Testing		
3.8	User Story Testing	2	
3.9	Domain Analysis		
3.10	Defect-based Techniques		
3.11	Experience-based techniques		
Case Study: Web Application Testing Tools, Java Application Testing Tools, GUI Testing Tools		3	CO6
4.	**Test Adequacy Assessment and Enhancement**	1	CO4
4.1	Basics		
4.2	Adequacy criteria based on Control Flow	1	
4.3	Adequacy criteria based on data flow	1	
4.4	Mutation and Mutants	2	
4.5	Fault Detection using Mutation		
5.	**Defect Management**	1	
5.1	Defect Detection		

5.2	Defect Classification	1	CO5
5.3	Root Cause Analysis	1	
5.4	Defect Reporting	1	
Case Study: NASA Metrics Dataset			
	Total Lecture Hours	36	

Course Designers:

1. A.M. Abirami abiramiam@tce.edu
2. S.Sujitha sujithait@tce.edu

18ITPR0	C# AND .NET FRAMEWORK

Category	L	T	P	Credit
PE	3	0	0	3

Preamble

This subject will enable students to understand the .Net Framework as a whole and technologies that constitute the framework. The student will gain programming skills in C# both in basic and advanced levels. It will help them to develop applications (windows based application, web based application and web services) using C#.

Prerequisite

- 18IT320-Object Oriented Programming

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain the .Net framework components of CLR, CTS and JIT	17
CO2	Implement the basic concepts of OOP and delegates-events using C# programming language and apply Framework Base Classes for different applications	22
CO3	Develop a components in assemblies and implement the reflection class in any applications	13
CO4	Construct the different types of applications like windows based application, web based applications and able to retrieve data using ADO.Net	22
CO5	Make use of Windows Communication Foundation, Windows Presentation Foundation, Windows Workflow Foundation	13
CO6	Examine a simple project that incorporates all important features of NET Framework.	13

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS1	Understand	Respond	Guided Response	1.2,2.3.1,2.3.2
CO2	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO4	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO6	TPS3	Analyse	Organise	Complex Overt Responses	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 3.1, 3.2, 4.1, 4.5.3

Mapping with Programme Outcomesand Programme Specific Outcomes

Cos	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	M	L											L	L	
CO2	S	M	L		S	S	L	L				c	M	S	L
CO3	S	M	L		S	S	L	L				S	M	S	L
CO4	S	M	L		S	S	L	L				S	M	S	L
CO5	S	M	L		S	S	L	L				S	M	S	L
CO6	S	S	M	L	S	S	L	S	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	0	0	0	-	-	-	0
Understand	30	10	30	10	10	10	30
Apply	60	80	60				60
Analyse	10	10	10				10
Evaluate	0	0	0				0
Create	0	0	0	-	-	-	0

CAT 2 is evaluated by Lab exams and Assignment 1,2,3 is also evaluated by Lab experiment.

CO2, CO3, CO4 and CO6 are evaluated by laboratory sessions/assignments

Attainment of course outcome 6 is evaluated through mini project which involves design and development of simple applications in .NET framework.

Assignments are evaluated through rubrics. Some of the assignment problems include: (but not limited to)

1. Implement delegates and events to solve the complex programming areas.
2. Create a DLL component that may be used by another application
3. Implement crystal report in any application
4. Include different database for your application
5. Prepare the best Desktop framework for any application

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	-
Guided Response	20
Mechanism	60
Complex Overt Responses	20
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

** (2 to 3 at the cognitive level of course outcome)

Course Outcome1 (CO1):

1. List .Net framework components like a CLR, CTS, and CLS.
2. Recall the features of Managed Code.
3. List any of different types of compilation.
4. Retrieve the use of delegates and events
5. List the types of assemblies.
6. Describe the namespace in which .Net have the data functionality classes.
7. Describe are the two fundamental objects in ADO.NET.
8. List difference between dataset and data reader.
9. Recall the major difference between classic ADO and ADO.NET

Course Outcome2 (CO2):

1. Summarize .Net framework with core components.
2. Summarize various Base classes in the .Net Framework.
3. Explain jagged array and its use with simple example.
4. Explain the Lambda Expression with examples.
5. Explain various types of Assemblies with necessary examples.
6. How will you handle the Language Integrated Query for Relational Data in the applications?
7. Classify the Basic components of ADO.NET environment for different data providers.
8. How do you access the different web service from various web applications?
9. Interpret the need of windows workflow foundation in the application.

Course Outcome3 (CO3):

1. Implement a program for System.IO namespace.
2. Implement a program to connect the database using System.Data.OleDb.
3. Carryout C# program to implement the string manipulation.
4. Implement a C# program for the following concepts.

a. Delegates
b. Event handling

5. Implement the LIQRD operation for the following

a. Select
b. Count
c. Min, Max
d. Distinct
e. Intersect

6. Implement a window based application for Employee payroll management.
7. Using C# implement the following assemblies:

a) Private
b) Shared
c) Single file
d) Multi file.

Course Outcome4 (CO4):

1. Compare and contrast the characteristic of the following Namespace
    - System.Data
    - System.Collection
    - System.Drawing
    - System.Text
2. Explain the difference between an ADO.NET Dataset and an ADO Record set? If a table contains 20000 records in a page at each time 100 records to be displayed.

What is the steps you will take to improve performance? Will you use dataset or data reader?
3. Compare the different ways to get the assembly (System.Reflection.Assembly.) for a given type in .Net4. Compare the different types of assemblies and justify usage.
4. Compare and contract LINQ to SQL attribute-based approach to mapping a LINQ to SQL object model to a SQL Server database.

Course Outcome 5 (CO5):

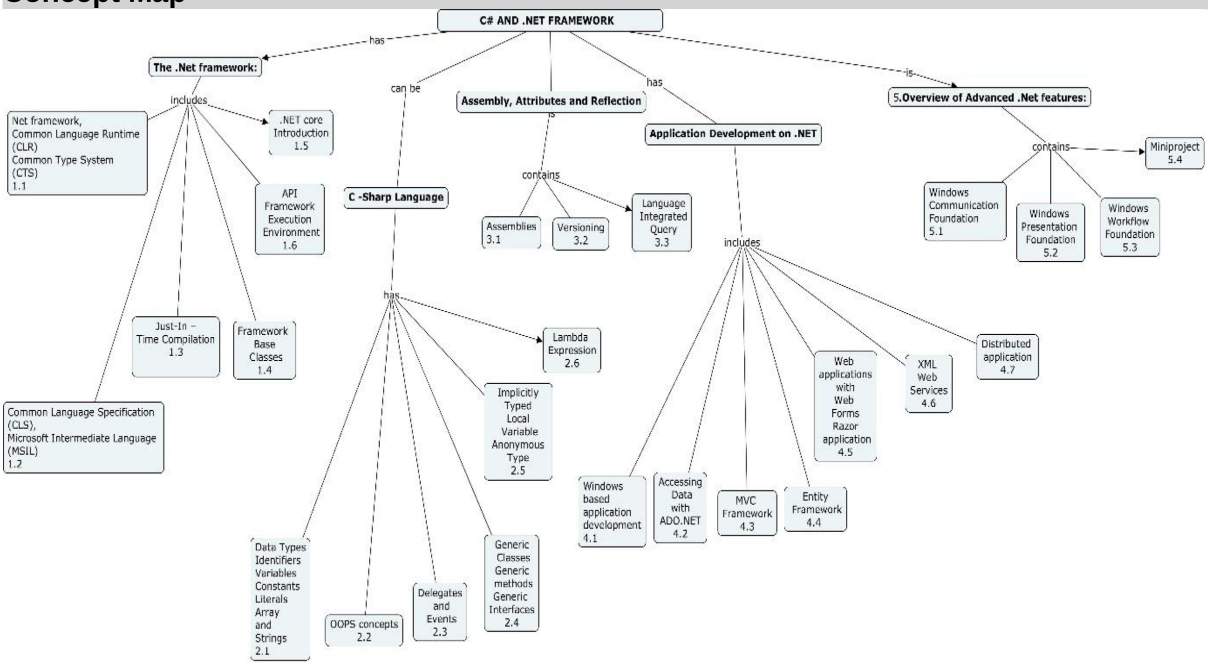
1.Create WCF application to implement any webservice..

2. Create a Windows Workflow foundation for flight booking system which includes the following condition1.Ask for passenger name.2.Ask for city from where passenger wants to fly.3.Ask for destination city.4.Project will have list of cities in a dictionary. It will search city names in same.5.If it finds both cities in dictionary, it will display 'Booking confirmed'. (Assuming there is unlimited space in airplane and everyone can get a window seat!)6. Otherwise, apologize with passenger

Course Outcome 6 (CO6):

1. Design and implement a C# Program for making Student mark list using Delegates and event
2. Design and implement a C# Program for Online Bus Reservation system using Generic classes, methods and interfaces.
3. Design a service oriented architecture to provide weather services. Implement the same using C#
4. Design and implement a C# program using ADO.NET to perform operations of a library
5. Design a calculator web-service. Test this program using a client program.
6. Create a program structure that can connect with multiple databases seamlessly to display the details of student table in a data grid control

Concept Map



Syllabus

The .Net framework: Introduction, .Net framework, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS),Microsoft Intermediate Language (MSIL), Just-In –Time Compilation, Framework Base Classes.**.NET core:** Introduction-API-Framework-Execution Environment.

C -Sharp Language: Introduction-Data Types, Identifiers, Variables, Constants, Literals, Array and Strings,-**OOPS** concepts-Delegates and Events- -Generic Classes-Generic methods-Generic Interface-Implicitly Typed Local Variable-Anonymous Type-Lambda Expression.

Assembly, Attributes and Reflection: Assemblies- Versioning- Attributes-Reflection. Language Integrated Query (Language Integrated Query for Relational Data

Application Development on .NET: Windows based Applications, **-** Accessing Data with ADO.NET, MVC Framework, and Entity Framework -Web applications with Web Forms-Razor application-XML Web Services- Distributed application- Implementing .NET Remoting-Develop peer-to-peer applications.

Overview of Advanced .Net features: Windows Communication Foundation-Windows Presentation Foundation-Windows Workflow Foundation.-Case study Synchronous and Asynchronous Programming

Learning Resources

1. Andrew Troelsen, ―Pro C#5 and the .NET 4.5 Framework‖, AndrewTroelsen, Apress, Sixth Edition 2012
2.Herbert Schildt, ―C# 4.0 The Complete Reference‖, McGraw-Hill, 2010.
3. Karli Watson, Christian Nagel, etal, Professional C# 4.0 and .NET 4, Wrox, 2010
4. https://msdn.microsoft.com

Course Contents and Lecture Schedule

Module No	Topic	Number of Lecturers	Course outcome
1	**The .Net framework**:		
1.1	Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS)	2	**CO1**
1.2	Common Language Specification (CLS),Microsoft Intermediate Language (MSIL)	1	
1.3	Just-In –Time Compilation	1	
1.4	Framework Base Classes	1	
1.5	**.NET core:** Introduction-	1	
1.6	API-Framework-Execution Environment.	1	
2	**C –Sharp Language**		
2.1	Introduction – Data Types, Identifiers, Variables, Constants, Literals, Array and Strings	2	**CO2**

2.2	OOP concepts	1	
2.3	Delegates and Events	1	
2.4	Generic Classes – Generic methods – Generic Interface	1	
2.5	Implicitly Typed Local Variable- Anonymous Type	2	
2.6	Lambda Expression	1	
3	**Assembly, Attributes and Reflection**		**CO3**
3.1	Assemblies-Reflection	2	
3.2	Versioning	1	
3.3	Language Integrated Query (Language Integrated Query for Relational Data).	2	
4	**Application Development on .NET**		**CO4**
4.1	Windows based application development	1	
4.2	Accessing Data with ADO.NET	1	
4.3	MVC Framework	1	
4.4	Entity Framework	1	
4.5	Web applications with Web Forms-Razor application	2	
4.6	XML Web Services	1	
4.7	Distributed application	1	
5	**Overview of Advanced .Net features**		
5.1	Windows Communication Foundation	2	**CO5**
5.2	Windows Presentation Foundation	2	
5.3	Windows Workflow Foundation	1	
5.4	Case study Synchronous and Asynchronous Programming-Mini project	5	**CO6**
	Total Lectures	**36**	

Course Designers:

1. K.Indira kiit@tce.edu
2. C.V Nisha Angeline cvnait@tce.edu

18ITPS0	THEORY OF COMPUTATION	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

This course introduces the theory of computation through a set of abstract machines that serve as models for computation - finite automata, pushdown automata, and Turing machines – and examines the relationship between these automata and formal languages. Additional topics beyond the automata classes themselves include deterministic and nondeterministic machines, regular expressions, context free grammars, undecidability, and the P = NP question

Prerequisite

18IT310 Discrete Mathematics

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Describe the formal relationship among machines, languages and grammars	15
CO2	Explain finite state machines and the equivalent regular expressions	20
CO3	Construct Push down automata by using context free grammars	20
CO4	Formalize an informal decidable problem into a formal language and design a Turing machine to decide the language	20
CO5	Compare and design Finite automata, Push down automata, Turing machine, Formal languages and grammars	7
CO6	Describe the formal relationship among recursive and recursively enumerable languages	18

CO Mapping with CDIO Curriculum Framework

COs	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2,2.3.1,2.3.2
CO2	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,3.1.4, 3.1.5
CO3	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,3.2.3, 4.4.1, 4.4.2
CO4	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,4.4.1, 4.4.2 4.5.5
CO5	TPS2	Understand	Respond	Guided Response	1.2,4.3.4
CO6	TPS2	Understand	Respond	Guided Response	1.2,4.3.4, 4.5.3, 4.5.6

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M											S	L		L
CO2	S	M		L						L		S	M		M
CO3	S	M	L	M	M			L				S	S	L	L
CO4	S	M	M	L	M			L				S	M	L	L
CO5	M	L										S	L		L
CO6	M	L										S			L

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	30	30	20				20
Understand	30	30	30				30
Apply	40	40	50	80	90	70	50
Analyse	0	0	0	20	10	20	0
Evaluate	0	0	0			10	0
Create	0	0	0				0

AssessmentPattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	-
Guided Response	50
Mechanism	50
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1):

1. Identify the needs for Automate
2. Differentiate the grammar and its machines
3. Explain the Chomsky hierarchy of grammar

Course Outcome 2 (CO2):

1. Differentiate between NFA and DFA
2. Recall the regular expression for all strings over {a,b} with three consecutive b’s.
3. State pumping lemma for regular languages.

Course Outcome 3 (CO3):

1. Define Instantaneous description of Push down automata.
2. Find a CFG without ∈ -production equivalent to the grammar defined by

S-> BabC, C-> b | ∈ , B-> a| ∈

3. Construct an NPDA that accept the language generated by the grammar S->aSbb | aab.

Course Outcome 4 (CO4):

1. Convert the grammar S->AB | aB, A->aab | €, B-> bbA into CNF
2. Design a Turing machine for zero function f:N->N f(x)=0
3. Prove that the set of CFL is not closed under Intersection.

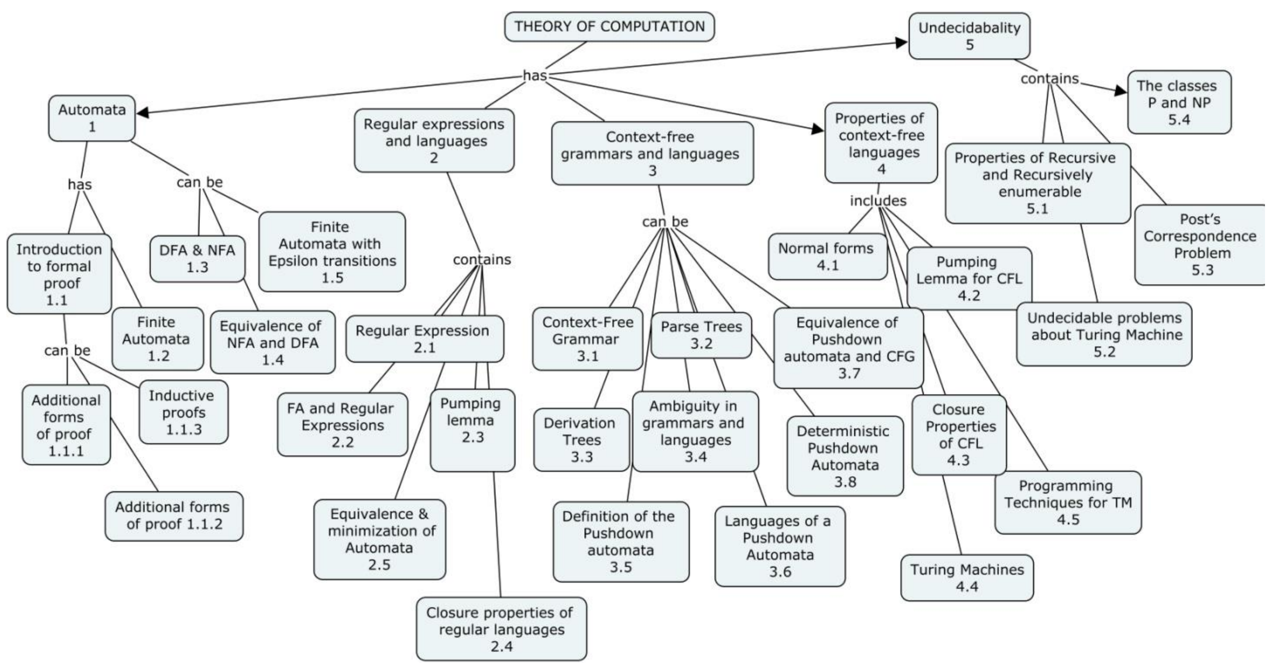
Course Outcome 5 (CO5):

1. Compare and analyze DFA and DPDA
2. Design a Turing machine and Push down automata for $a^n b^n$ | n>=1
3. Design UTM and show that the Universal Turing machine as an undecidable problem

Course Outcome 6 (CO6):

1. Prove that Lu is recursively enumerable
2. Prove the theorem: "If L1 and L2 are two recursive languages then L1∪ L2 is also recursive language
3. State Post correspondence problem with an example.

Concept Map



Syllabus

Automata - Introduction to formal proof – Additional forms of proof – Inductive proofs- Finite Automata (FA) - Deterministic Finite Automata (DFA)– Non-deterministic Finite Automata (NFA) - Equivalence of NFA and DFA - Finite Automata with Epsilon transitions

Regular expressions and languages - Regular Expression - FA and Regular Expressions - Pumping lemma - Proving languages not to be regular - Closure properties of regular languages - Equivalence and minimization of Automata.

Context-free grammars and languages - Context-Free Grammar - Parse Trees- Derivation Trees- Ambiguity in grammars and languages - Definition of the Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG - Deterministic Pushdown Automata.

Properties of context-free languages - Normal forms for CFG – CNF, GNF - Pumping Lemma for CFL - Closure Properties of CFL - Turing Machines - Programming Techniques for TM

Undecidabality – Unsolvable Problems and Computable Functions- Primitive recursive functions- Properties of Recursive and Recursively enumerable - Undecidable problems about Turing Machine - Post's Correspondence Problem - The classes P and NP.

Applications & Tools: Timed automata, Uppaal tool

Learning Resources

1. J.E. Hopcroft, R. Motwani and J.D. Ullman. Introduction to Automata Theory, Languages and Computations, Second Edition, Pearson Education, 2007.
2. J. Martin. Introduction to Languages and the Theory of computation, Tata McGraw Hill, Third Edition, 2007.
3. https://nptel.ac.in/courses/106104028/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Automata**		
1.1	Introduction to formal proof Additional forms of proof Inductive proofs	1	CO1
1.2	Finite Automata (FA)	1	CO2
1.3	Deterministic Finite Automata (DFA) Non-deterministic Finite Automata (NFA)	2	CO2
1.4	Equivalence of NFA and DFA	2	CO2
1.5	Finite Automata with Epsilon transitions.	2	CO2
2	**Regular expressions and languages**		
2.1	Regular Expression	2	CO2
2.2	FA and Regular Expressions		CO1
2.3	Pumping lemma - Proving languages not to be regular	1	CO1
2.4	Closure properties of regular languages	3	CO1
2.5	Equivalence and minimization of Automata.		CO5
3	**Context-free grammars and languages**		
3.1	Context-Free Grammar	1	CO3
3.2	Parse Trees	1	CO3
3.3	Derivation Trees	**1**	CO3

3.4	Ambiguity in grammars and languages	1	CO3
3.5	Definition of the Pushdown automata	1	CO3
3.6	Languages of a Pushdown Automata	1	CO3
3.7	Equivalence of Pushdown automata and CFG	1	CO5
3.8	Deterministic Pushdown Automata.	1	CO3
4	**Properties of context-free languages**		
4.1	Normal forms for CFG – CNF, GNF	2	CO5
4.2	Pumping Lemma for CFL	1	CO4
4.3	Closure Properties of CFL	1	CO4
4.4	Turing Machines	2	CO4
4.5	Programming Techniques for TM	2	CO4
5.	**Undecidabality**		
5.1	Unsolvable Problems and Computable Functions-Primitive recursive functions- Properties of Recursive and Recursively enumerable	3	CO6
5.2	Undecidable problems about Turing Machine	1	CO6
5.3	Post's Correspondence Problem	1	CO5
5.4	The classes P and NP.	1	CO6
	Total Hours	**36**	

Course Designers:

1. R.Suganya rsuganya@tce.edu
2. S.Karthiga skait@tce.edu

18ITPT0	PRINCIPLES OF COMPILER DESIGN	Category	L	T	P	Credit
		PE	3	0	0	3

Preamble

This course introduces the fundamental concepts in compiler design. The topic includes scanner, parser designs and its implementation, program shape analysis, intermediate code generation, and back-end optimizations such as instruction selection and scheduling. The goal is to familiarize students with basic structure of a typical compiler, compiler phases and implementation consequences of the choices made in programming language design.

Prerequisite

- 18IT310 Discrete Mathematics

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Describe the compiler architecture with its phases	14
CO2	Draw Finite Automata for the token recognition	17
CO3	Compute the formal and practical properties of different approaches to parsing	20
CO4	Practise various techniques to parse the source code to Intermediate representation	11
CO5	Dramatize code generator with optimization on Intermediate representation	25
CO6	Implement a basic complier for any programming language	13

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond		1.2,2.3.1,2.3.2
CO2	TPS3	Apply	Value		1.2, 2.2, 2.3.1, 2.3.2, 3.1.4, 3.1.5
CO3	TPS3	Apply	Value		1.2, 2.2, 2.3.1, 2.3.2, 3.1.4, 3.1.5
CO4	TPS3	Apply	Value		1.2, 2.3.1, 2.3.2, 2.3.3, 4.4.1, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value		1.2, 4.3.4, 4.6.1
CO6	TPS4	Analyze	Organize		1.2, 4.3.4, 4.5.3, 4.5.6, 4.6.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L										M		
CO3	S	M	L										M		
CO4	S	M	L										M		
CO5	S	M	L										M		
CO6	S	S	M	L	M			L		M		M	S	L	L

S- Strong; M-Medium; L-Low
*CO6 Assessed through Mini Project / Assignment

Guidelines for the Mini-Project:

Group formation: Students are split into project groups with around 2 members in each group. A team can design and implement a significant portion of a compiler for any programming languages using any modern real time tools like lex, yacc, bison etc.

At the end of the semester, the team members have to present their project, submit their report and share their lessons learnt/best practices with other teams. Some of the activities may include: (but not limited to)

- ✓ Module identification and compiler tool selection.
- ✓ Relevant parser to analyse the tokens given in the code
- ✓ Intermediate Code generation process and its flow
- ✓ Documentation

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	10				10
Understand	60	40	30	20			30
Apply	20	40	40	80	80	80	40
Analyse	0	0	20		20	20	20
Evaluate	0	0	0				0
Create	0	0	0				0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project/Assignment/Practical Component
Perception	-
Set	-
Guided Response	30
Mechanism	50
Complex Overt Responses	20
Adaptation	-
Origination	-

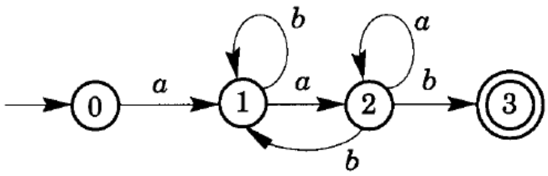
Sample Questions for Course Outcome Assessment****

Course Outcome 1 (CO1):

1. Define Compiler. State the phases of the Compiler with a neat diagram.
2. State the Compiler Construction Tools and explain its specifications in detail.
3. Explain any two cousins of compiler.

Course Outcome 2 (CO2):

1. Construct NFA, DFA for the expression aa* ¦ bb*
2. Convert the given NFA to a DFA using suitable algorithm



3. Convert the regular expression **(a|b)*abb(a|b)*** to deterministic Finite Automata with the explanation of suitable algorithm

Course Outcome 3 (CO3):

1. Discuss SLR parsing and construct SLR parsing table for the grammar.
   E - >E+T/T
   T->T*F/F
   F->(E)/id
2. Construct the predictive parser for the following grammar.
   S- >a|↑|(T) T-
   >T,S|S
   Apply the necessary algorithms and define FIRST and FOLLOW. Show the behaviour of the parser in the sentences:
   (i)(a,(a,a))
   (ii)(((a,a),↑,(a),a).
3. Illustrate the operator precedence parse technique for the input id + id * id.

Course Outcome 4 (CO4):

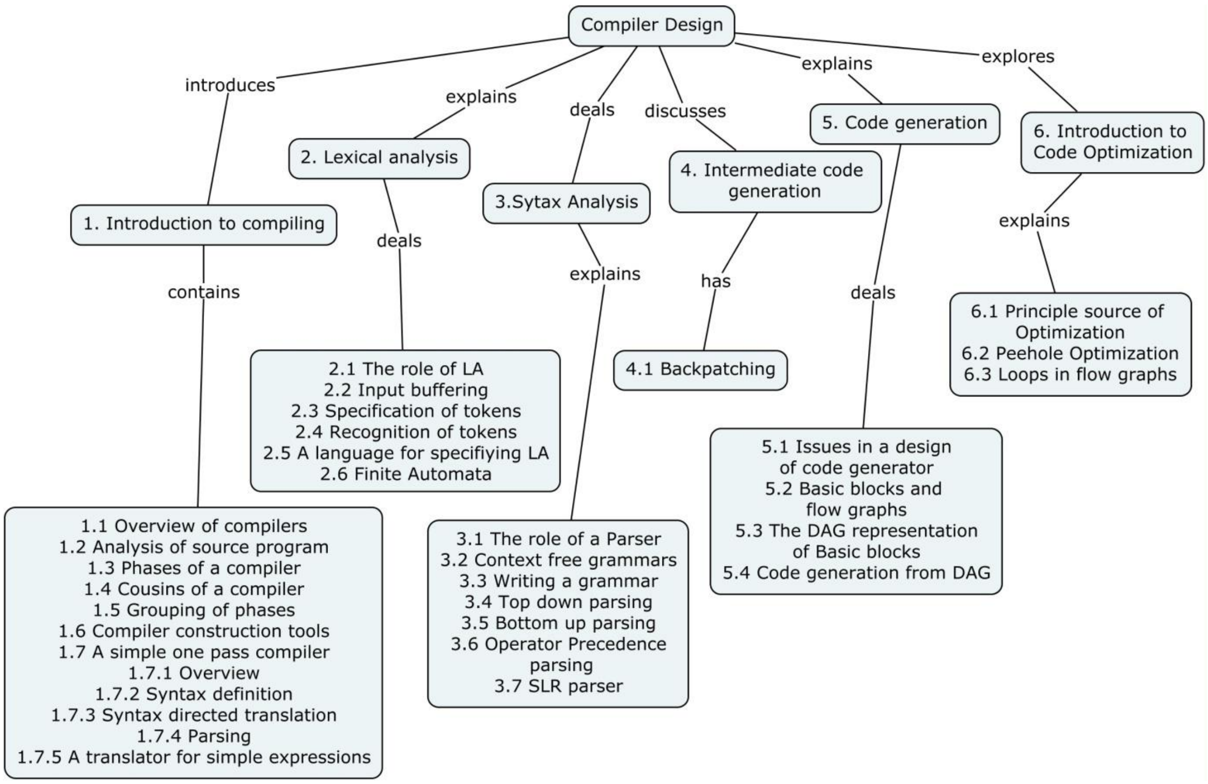
1. Calculate the regular expression to generate identifiers by giving examples.
2. Construct the generation of intermediate code with control-flow analysis, dataflow analysis.
3. Translate infix to prefix expression using syntax directed translation with an example

Course Outcome 5 (CO5):

1. For the Syntax Directed Definition give annotated parse trees for the following expressions (3+4)*(5+6) and 1*2*3*(4+5)
2. Generate code using code generation algorithm for the sum of prime numbers from 1 to N.
3. Apply different techniques in peephole optimization to the intermediate code representation for the following.

```
if a>b then
        while c<d do
                x=x-y
else
        do
                r=r+q
        while e<=f
```

Concept Map



Syllabus

Introduction to compiling: Compilers-Analysis of the source program-Phases of compiler-Cousins of a compiler-Grouping of Phases- Compiler construction tools- A Simple one pass Compiler-Overview-syntax definition-syntax-directed translation- Parsing- A translator for simple expressions.

Lexical Analysis-Role of the lexical analyser-Input buffering-Specification of tokens- Recognition of tokens-A language for specifying lexical analysers- Finite Automata – case study

Syntax Analysis - The role of parser- Context-free grammars- Writing a grammar-Top- down Parsing-Bottom-up parsing-Operator-precedence parsing-SLR parser – case study

Intermediate Code Generation- Back patching – case study

Code Generation-Issues in the design of a code generator- basic blocks and flow graphs- The DAG representation of basic blocks-Code generation from DAG case study

Introduction to Code Optimization- The principal sources of optimization-Peephole Optimization- Loops in flow graphs – Tool – LMVM, GCC, case study

Learning Resources

1. Alfred V. Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, " Compilers: Principles, Techniques, and Tools ",Pearson New International, 2013.
2. Steven S. Muchnick: Advanced Compiler Design & Implementation Harcourt Asia, Morgan Kaufmann,Second Edition, 2001.
3. J. P. Bennet: Introduction to Compiling Techniques, Tata McGraw-Hill Publishing- Second Edition, 2002.
4. NPTEL Online course on Compiler Design – IIT Kharagpur - https://nptel.ac.in/courses/106105190/
5. Standford online Course on Compilers - https://online.stanford.edu/courses/soe-ycscs1-compilers

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Introduction to Compiling**		
1.1	Overview of Compilers	1	CO1
1.2	Analysis of the source program		
1.3	Phases of a compiler	1	CO1
1.4	Cousins of a compiler		
1.5	Grouping of Phases	1	CO1
1.6	Compiler construction tools		
1.7	A Simple one pass compiler	1	CO1
1.7.1	Overview		CO1
1.7.2	syntax definition		
1.7.3	Syntax directed translation		
1.7.4	Parsing	1	CO1
1.7.5	A translator for simple expressions		
2.	**Lexical Analysis**		
2.1	The role of the lexical analyzer	1	CO2
2.2	Input buffering	2	CO2
2.3	Specification of tokens		
2.4	Recognition of tokens		
2.5	A language for specifying lexical analyzers		
2.6	Finite Automata	3	CO2
2.7	Case study	1	CO6
3.	**Syntax Analysis**		
3.1	The role of a parser	2	CO3
3.2	Context-free grammars		
3.3	Writing a grammar		CO3
3.4	Top-down Parsing	1	CO3
3.5	Bottom-up parsing		CO3
3.6 3.7	Operator-precedence parsing SLR parser	4	CO3
3.8	Case study	1	CO6
4.	**Intermediate Code Generation**		
4.1	Backpatching	4	CO4
4.2	Case study	1	CO6
5.	**Code Generation**		
5.1	Issues in the design of a code generator	2	CO5
5.2	Basic blocks and flow graphs		CO5
5.3	The DAG representation of Basic Block	2	CO5
5.4	Code generation from DAG		CO5
5.5	Case study	1	CO6
6	**Introduction to Code Optimisation**		
6.1	The principal sources of optimization	1	CO5
6.2	Peephole Optimisation	2	CO5
6.3	Loops in flow graphs	2	CO5
6.4	Case study	1	CO6
	Total Lectures	36	

Course Designers:

1. R.Suganya rsuganya@tce.edu
2. E.Ramanujam erit@tce.edu

BOARD OF STUDIES MEETING

B.Tech Degree (Information Technology) Program

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001-2000 certified
Autonomous Institution affiliated to Anna University)

MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41
Fax: 0452 2483427
Web: www.tce.edu

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech DEGREE (INFORMATION TECHNOLOGY) PROGRAM

ONE CREDIT AND TWO CREDIT COURSES

FOR THE STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001-2000 certified
Autonomous Institution affiliated to Anna University)

MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41
Fax: 0452 2483427
Web: www.tce.edu

LIST OF ONE AND TWO CREDIT COURSES

.

COURSE CODE	COURSE NAME
18IT2A0	MULTIPLATFORM MOBILE APPLICATION DEVELOPMENT
18IT2B0	PENETRATION TESTING METHODOLOGIES
18IT2C0	EDGE AND MOBILITY NETWORK SECURITY SOLUTIONS
18IT2D0	DATA SCIENCE AND AI APPLICATONS
18CS1C0	CONTAINERIZATION TECHNOLOGIES(Common to IT and CSE)

18IT2A0	MULTIPLATFORM MOBILE APPLICATION DEVELOPMENT

Category	L	T	P	Credit
PE	2	0	0	2

Preamble

Multiplatform Mobile Application Development explores Javascript based mobile application development in the React library with various aspects of React UI components. This course offers knowledge and skill on mobile application development in Multiplatform environment.

Prerequisite

- None

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Illustrate basic React Native components like Icons, Fonts and Buttons to develop hybrid mobile apps	15
CO2	Demonstrate Forms and Modals for specific mobile application domain	30
CO3	Adapt appropriate techniques to build a standalone apps.	35
CO4	Solve a real world problem by adapting capabilities of Devices in the native environment.	20

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO2	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO4	TPS4	Analyze	Organize	Complex Overt Responses	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 3.1, 3.2, 4.1, 4.5.3

Mapping with Programme Outcomesand Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		M			L	L	L		L	M	L	L
CO2	S	M	L		M			L	L	L		L	M	L	L
CO3	S	M	L		M			L	L	L		L	M	L	L
CO4	S	S	M	L	S	S	L	S	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests	Terminal Examination
Remember	0	20
Understand	30	40
Apply	40	40
Analyze	30	0
Evaluate	0	0
Create	0	0

CO4 will be assessed only through Mini Project.

AssessmentPattern: Psychomotor

Psychomotor Skill	Mini project/Assignment/Practical Component
Perception	-
Set	10
Guided Response	30
Mechanism	60
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):

1. Use JSX syntax to represent objects
2. Apply lifecycle methods to illustrate it with a class.
3. Use Props to show a notification in React.
4. Demonstrate Rendering and Extraction of Components in React.

Course Outcome 2 (CO2):

1. Use EventHandling to identify the focus on various components in the application
2. Apply conditional operators to differentiate signed up and new users in an application
3. Demonstrate the use of Inline if
4. Experiment with Keys and Lists in React

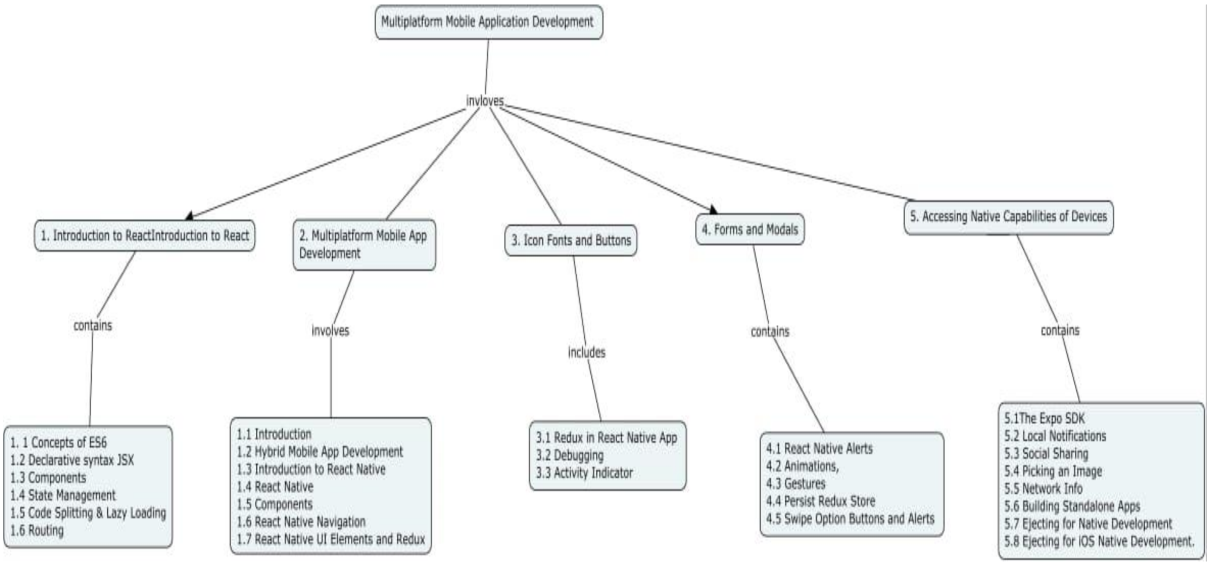
Course Outcome 3 (CO3):

1. Prepare a static version of your app in react
2. Produce a Form for Registration of a Job Fair
3. Relate if inheritance is needed with any application of your choice.
4. Relate various APIs that can be involved in building a commercial app.

Course Outcome 4 (CO4):

- CO4 is evaluated through mini project

Concept Map



Syllabus

Introduction to React - Concepts of ES6 - Declarative syntax JSX – Components – State Management - Code Splitting & Lazy Loading – Routing.

Multiplatform Mobile App Development with React Native: An Introduction –Hybrid Mobile App Development - Introduction to React Native - React Native - Components – React Native Navigation - React Native UI Elements and Redux.

Icon Fonts and Buttons - Redux in React Native App – Debugging - Activity Indicator.

Forms and Modals- React Native Alerts -Animations - Gestures- Persist Redux Store – Swipe Option Buttons and Alerts.

Accessing Native Capabilities of Devices: The Expo SDK - Local Notifications – Social Sharing - Picking an Image – Network Info - Building Standalone Apps -Ejecting for Native Development – Ejecting for iOS Native Development.

Learning Resources

1. Emilio Rodriguez Martinez,"React: Cross-Platform Application Development with React Native" Build 4 real-world apps with React Native, Packt Publishing (March 13, 2018)
2. Devin Abbott, Houssein Djirdeh, Anthony Accomazzo , Sophia Shoemaker,"Fullstack React Native: Create beautiful mobile apps with JavaScript and React Native", Independently published (January 11, 2019).
3. Dan Ward,"React Native Cookbook: Recipes for solving common React Native development problems, Packt Publishing; 2nd edition(January 31, 2019).
4. Bonnie Eisenman Learning React Native: Building Native Mobile Apps with JavaScript O'Reilly Media; 2 edition (November 12, 2017)

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcome
1	**Introduction to React**		
1.1	Concepts of ES6	1	CO1
1.2	Declarative syntax JSX	1	
1.3	Components	1	
1.4	State Management	1	
1.5	Code Splitting & Lazy Loading	1	
1.6	Routing.	1	
2	**Multiplatform Mobile App Development with React Native:**		
2.1	An Introduction –Hybrid Mobile App Development	2	CO1
2.2	Introduction to React Native		
2.3	React Native - Components	2	
2.4	React Native Navigation	1	
2.5	React Native UI Elements and Redux	1	
3	**Icon Fonts and Buttons**		
3.1	Redux in React Native App	1	CO1
3.2	Debugging	1	
3.3	Activity Indicator	1	
4	**Forms and Modals**		
4.1	React Native Alerts	1	CO2
4.2	Animations	1	
4.3	Gestures	1	
4.4	Persist Redux Store	1	
4.5	Swipe Option Buttons and Alerts	1	
5	**Accessing Native Capabilities of Devices**		
5.1	The Expo SDK	1	CO3
5.2	Local Notifications	1	
5.3	Social Sharing	1	
5.4	Picking an Image	1	
5.5	Network Info	1	
5.6	Building Standalone Apps	1	CO4
5.7	Ejecting for Native Development	1	
5.8	Ejecting for iOS Native Development	1	
	Total Hours	**28**	

Course Designers:

1. **Industry Expert**: Mr.Manimaran Chellaperumal, Mobile Team Leader, Great Innovus Solutions, Madurai.
2. S.Karthiga skait@tce.edu
3. Mrs.K.Indira kiit@tce.edu
4. Mrs.C.V.Nisha Angeline cvnait@gmail.com

18IT2B0	PENETRATION TESTING METHODOLOGIES

Category	L	T	P	Credit
PE	2	0	0	2

Preamble

Penetration testing methodologies use offensive security tools available with the Kali Linux distribution. The course provides an ability to be presented with an unknown network, enumerate the targets within their scope, exploit them, and clearly document their results in a penetration test report.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Demonstrate the tools and techniques used to perform penetration testing in Kali Linux.	30%
CO2	Examine the given web application to perform attacks using Web application Hacking methodologies.	40%
CO3	Utilize the appropriate tools to perform Exploit analysis.	15%
CO4	Make use of appropriate tools to perform and detect Hardware based attacks.	15%

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 3.1.1, 3.2.2, 3.2.3, 3.2.6, 4.1.1, 4.3.1, 4.4.2, 4.5.1, 4.5.3, 4.5.5
CO2	TPS4	Analyse	Organise	Complex Overt Responses	1.3, 2.1.1, 2.1.2, 2.1.4, 2.1.5, 2.3.1, 2.4.4, 2.4.6, 3.1.1, 3.2.2, 3.2.3, 3.2.6, 4.1.1, 4.3.1, 4.4.2, 4.5.1, 4.5.3, 4.5.5
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 3.1.1, 3.2.2, 3.2.3, 3.2.6, 4.1.1, 4.3.1, 4.4.2, 4.5.1, 4.5.2, 4.5.3, 4.5.5
CO4	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 3.1.1, 3.2.2, 3.2.3, 3.2.6, 4.1.1, 4.3.1, 4.4.2, 4.5.1, 4.5.2, 4.5.3, 4.5.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L	L	S	L	M	M	M	M		M	S	S	M
CO2	S	S	M	M	S	L	M	M	M	M	M	S	S	S	S
CO3	S	M	L	L	S	L	M	M	M	M		M	S	S	M
CO4	S	M	L	L	S	L	M	M	M	M		M	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests	Assignment	Terminal Examination
Remember	20	-	20
Understand	40	-	40
Apply	40	40	40
Analyse		60	
Evaluate		-	
Create		-	

Attainment of CO2 is assessed through Practical Assignments.

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Assignment/Practical Component
Perception	-
Set	10
Guided Response	20
Mechanism	40
Complex Overt Responses	30
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1 (CO1):

1. Organize the procedures to install, configure and updating system and network services in Kali Linux.
2. Experiment with Windows 7 System to perform Target Scoping, Information gathering, and Target discovery as part of penetration testing phases.
3. Interview the outcome of Kali Linux Penetration testing phases.

Course Outcome 2 (CO2):

1. Examine the Ticket Booking web application against Handling User Access, Handling User Input, and Handling Attackers defensive measures.
2. Analyze the Banking web application against Client-Side Controls, Authentication Mechanism, and Session Management Mechanism.
3. Inspect Educational Attendance and Mark web application against Access Controls, Input-Based Vulnerabilities, Function-Specific Input Vulnerabilities and Logic Flaws.

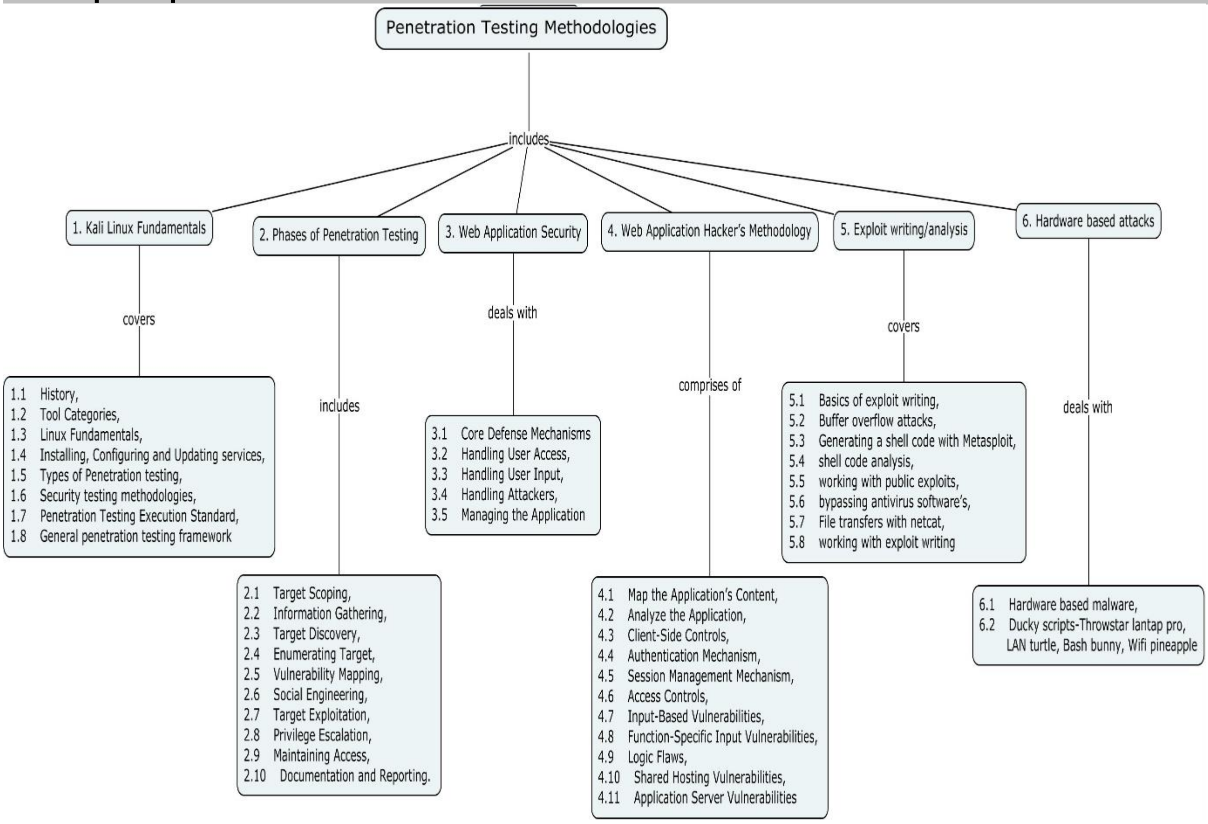
Course Outcome 3 (CO3):

1. Identify the path to access Windows 7 system in a network indirectly by generating a shell code with Metasploit.
2. Experiment with Windows 7 system exploits to bypass antivirus software's and File transfers.
3. Interview the Linux system exploits to bypass security features and File transfers.

Course Outcome 4 (CO4):

1. Utilize the appropriate tools to identify the Hardware based malware in i7 processor system.
2. Make use of appropriate tools to perform simple Hardware based malware in i7 processor system.
3. Interview the possible ways to perform and identify Hardware based malware in any process system.

Concept Map



Syllabus

Kali Linux Fundamentals: History, Tool Categories, Linux Fundamentals, Installing, Configuring and Updating services, Types of Penetration testing, Security testing methodologies, Penetration Testing Execution Standard, General penetration testing framework

Phases of Penetration Testing: Target Scoping, Information Gathering, Target Discovery, Enumerating Target, Vulnerability Mapping, Social Engineering, Target Exploitation, Privilege Escalation, Maintaining Access, Documentation and Reporting, Enumeration Techniques.

Web Application Security: Core Defense Mechanisms - Handling User Access, Handling User Input, Handling Attackers, Managing the Application.

Web Application Hacker's Methodology: Map the Application's Content, Analyze the Application, Client-Side Controls, Authentication Mechanism, Session Management Mechanism, Access Controls, Input-Based Vulnerabilities, Function-Specific Input Vulnerabilities, Logic Flaws, Shared Hosting Vulnerabilities, Application Server Vulnerabilities.

Exploit writing/analysis: Basics of exploit writing, Buffer overflow attacks, Generating a shell code with Metasploit, shell code analysis, working with public exploits, bypassing antivirus software's, File transfers with netcat, working with exploit writing.

Hardware based attacks: Hardware based malware, Ducky scripts-Throwstar lantap pro, LAN turtle, Bash bunny, Wifi pineapple.

Tools essential:

Website Copier, The Harvester, Google-fu, Whois, SET, netcat, ncat, Wireshark, Tcpdump, Email harvesting, DNS, SMTP, SNMP, SMB, Metasploit, Shodan, Exploit-db, Nmap, Nikto, Password attacks.

Learning Resources

1. Raphaël Hertzog, Jim O'Gorman, Mati Aharoni, "Kali Linux Revealed - Mastering the Penetration Testing Distribution", OFFSEC Press, 1st Editon, 2017.
2. Lee Allen, Tedi Heriyanto, Shakeel Ali, " Kali Linux – Assuring Security by Penetration Testing", PACT Publishers, Second Edition, 2014.
3. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress; 2 edition, 2013
4. Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", Wiley, Second edition, 2011.
5. Owasp top 10, Url:https://www.owasp.org/index.php/Top_10_2017-Top_10
6. Exploit database, Url: https://www.exploit-db.com/
7. SecurityFocus, Url: http://www.securityfocus.com/
8. Packetstormsecurity, Url:https://packetstormsecurity.com/
9. Basic Linux Privilege Escalation, Url: http://blog.g0tmi1k.com/2011/08/basic-linux-privilege-escalation/
10. Windows Privilege Escalation Fundamentals, Url: http://www.fuzzysecurity.com/tutorials/16.html
11. Capture the flag, Url: https://ctftime.org/

Course Contents and Lecture Schedule

<table>
<tr><th>Module No.</th><th>Topic</th><th>No. of Lectures</th><th>Course Outcome</th></tr>
<tr><td>1</td><td colspan="2">Kali Linux Fundamentals</td><td rowspan="9">CO1</td></tr>
<tr><td>1.1</td><td>History,</td><td rowspan="5">1</td></tr>
<tr><td>1.2</td><td>Tool Categories,</td></tr>
<tr><td>1.3</td><td>Linux Fundamentals,</td></tr>
<tr><td>1.4</td><td>Installing, Configuring and Updating services,</td></tr>
<tr><td>1.5</td><td>Types of Penetration testing,</td></tr>
<tr><td>1.6</td><td>Security testing methodologies,</td><td rowspan="3">1</td></tr>
<tr><td>1.7</td><td>Penetration Testing Execution Standard,</td></tr>
<tr><td>1.8</td><td>General penetration testing framework</td></tr>
<tr><td>2</td><td colspan="2">Phases of Penetration Testing</td><td rowspan="11">CO1</td></tr>
<tr><td>2.1</td><td>Target Scoping,</td><td rowspan="4">1</td></tr>
<tr><td>2.2</td><td>Information Gathering,</td></tr>
<tr><td>2.3</td><td>Target Discovery,</td></tr>
<tr><td>2.4</td><td>Enumerating Target,</td></tr>
<tr><td>2.5</td><td>Vulnerability Mapping,</td><td rowspan="2">1</td></tr>
<tr><td>2.6</td><td>Social Engineering,</td></tr>
<tr><td>2.7</td><td>Target Exploitation,</td><td rowspan="2">1</td></tr>
<tr><td>2.8</td><td>Privilege Escalation,</td></tr>
<tr><td>2.9</td><td>Maintaining Access,</td><td rowspan="2">1</td></tr>
<tr><td>2.10</td><td>Documentation and Reporting & Enumeration Techniques</td></tr>
<tr><td>3</td><td colspan="2">Web Application Security</td><td rowspan="6">CO2</td></tr>
<tr><td>3.1</td><td>Core Defense Mechanisms</td><td rowspan="2">1</td></tr>
<tr><td>3.2</td><td>Handling User Access,</td></tr>
<tr><td>3.3</td><td>Handling User Input,</td><td>1</td></tr>
<tr><td>3.4</td><td>Handling Attackers,</td><td>1</td></tr>
<tr><td>3.5</td><td>Managing the Application</td><td>1</td></tr>
<tr><td>4</td><td colspan="2">Web Application Hacker's Methodology</td><td rowspan="4">CO2</td></tr>
<tr><td>4.1</td><td>Map the Application's Content,</td><td>1</td></tr>
<tr><td>4.2</td><td>Analyze the Application,</td><td>1</td></tr>
<tr><td>4.3</td><td>Client-Side Controls,</td><td>1</td></tr>
</table>

4.4	Authentication Mechanism,	1	CO2
4.5	Session Management Mechanism,	1	
5	**Exploit writing/analysis**		CO3
5.1	Basics of exploit writing,	1	
5.2	Buffer overflow attacks,		
5.3	Generating a shell code with Metasploit,	1	
5.4	shell code analysis,		
5.5	working with public exploits,	1	
5.6	bypassing antivirus software's,		
5.7	File transfers with netcat,	1	
5.8	working with exploit writing		
6	**Hardware based attacks**		CO4
6.1	Hardware based malware,.	2	
6.2	Ducky scripts-Throwstar lantap pro, LAN turtle, Bash bunny, Wifi pineapple	2	
	Total Lectures	**28**	

Course Designers:

1. Mr..J.Reegun Richard — reegunj@outlook.com
Industry : Symantec Corporation, India
Area of Interests : Vulnerability researching in windows and web application penetration testing, analysing targeted attacks like exploit kits, Dynamic& static analysis of malware, Network traffic analysis, Adding rules to malicious network traffic, detailed analysis on malicious network traffic to get the URI patterns for exploit kits and targeted attacks, Expertise in removing malwares/rootkits manually.

2. Mr.M.Thangavel — mtit@tce.edu

18IT2C0	EDGE AND MOBILITY NETWORK SECURITY SOLUTIONS

Category	L	T	P	Credit
PE	2	0	0	2

Preamble

Edge and Mobility Network Security Solutions course provide the knowledge of a network security engineer to configure and implement security on network perimeter edge devices such as a switch, router, and ASA firewall. It also provides knowledge of a network security engineer on the variety of Intrusion Prevention Systems (IPS) and Virtual Private Network (VPN) solutions on the ASA firewall.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Outline the vulnerabilities, attacks, risks, countermeasures and threats of the given Network.	30%
CO2	Configure the Firewall to implement security on network perimeter edge and mobility devices.	15%
CO3	Configure the IPS and VPN for securing communications with the network perimeter edge and mobility devices.	20%
CO4	Examine the given network to identify the possible attacks and appropriate configuration of network edge and mobility devices.	35%

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3, 2.1.1, 2.3.1
CO2	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 3.1.1, 3.2.2, 3.2.3, 3.2.6, 4.1.1, 4.3.1, 4.4.2, 4.5.1, 4.5.3, 4.5.5
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 3.1.1, 3.2.2, 3.2.3, 3.2.6, 4.1.1, 4.3.1, 4.4.2, 4.5.1, 4.5.3, 4.5.5
CO4	TPS4	Analyse	Organise	Complex Overt Responses	1.3, 2.1.1, 2.1.2, 2.1.4, 2.1.5, 2.3.1, 2.4.4, 2.4.6, 3.1.1, 3.2.2, 3.2.3, 3.2.6, 4.1.1, 4.3.1, 4.4.2, 4.5.1, 4.5.3, 4.5.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L			S							L	L		L
CO2	S	M	L	L	S	L	M	M	M	M		M	S	M	S
CO3	S	M	L	L	S	L	M	M	M	M		M	S	M	S
CO4	S	S	M	M	S	L	M	M	M	M	M	S	S	M	S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests	Assignment	Terminal Examination
Remember	20	-	20
Understand	40	-	40
Apply	40	40	40
Analyse		60	
Evaluate		-	
Create		-	

Attainment of CO4 is assessed through Practical Assignments.

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Assignment/Practical Component
Perception	-
Set	10
Guided Response	20
Mechanism	40
Complex Overt Responses	30
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1):

1. Relate VLANs and VTP.
2. Compare the features of NAT and PAT.
3. Outline the security issues in TCP/IP, DNS and Routing.

Course Outcome 2 (CO2):

1. Identify the procedure to implement the Firewall ASA with application filtering, protocol inspection, and security contexts.
2. Experiment with Packet tracer, Packet capture and Syslog to monitor the Firewall.
3. Build an Firewall with three or more interfaces (inside, outside and DMZ) for an Educational institution with 8 departments connecting 1500 systems in the network.

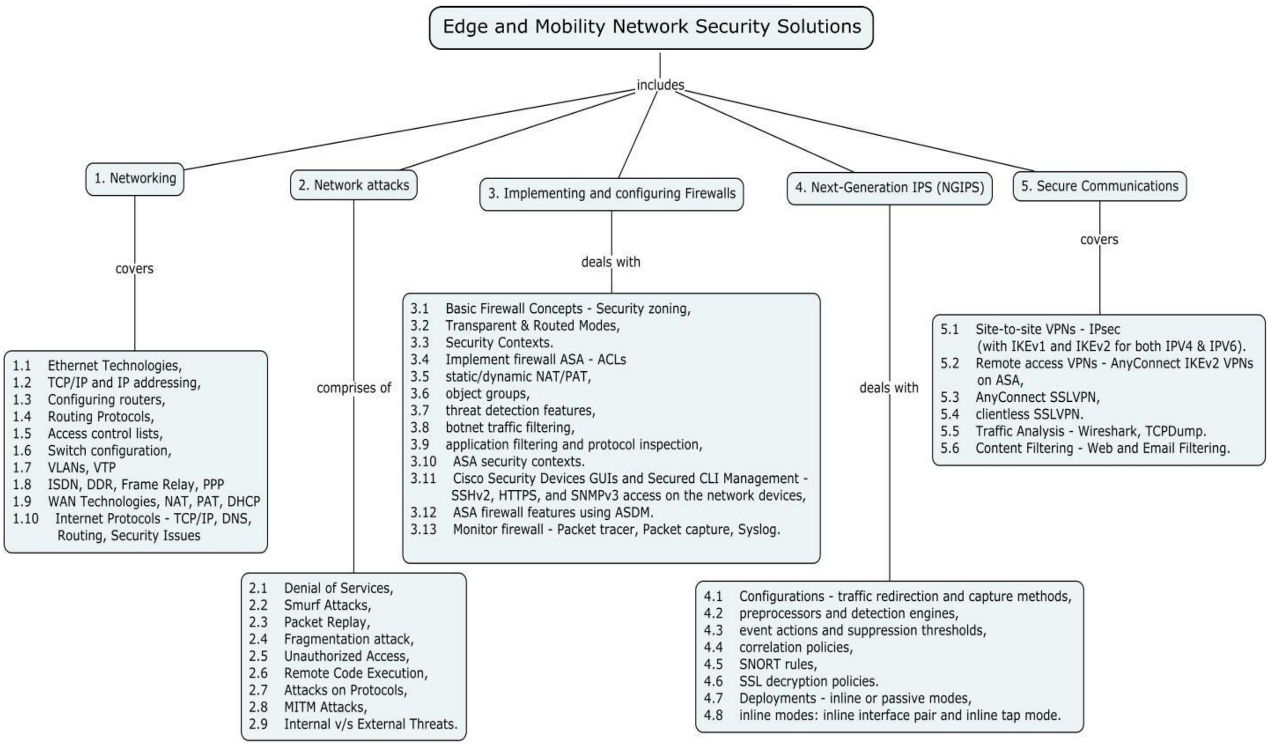
Course Outcome 3 (CO3):

1. Build an IPS signatures with appropriate attributes, type, file, micro, triggers and action to stop incoming malicious traffic in an educational institution network.
2. Construct an secure network with appropriate symmetric cryptosystem, asymmetric cryptosystem, key management, public key infrastructure and certificate authorities for remotely connected examination system
3. Interview the feasibility of implementing Site-to-site and Remote access VPN in an Educational organization.

Course Outcome 4 (CO4):

1. Examine the GUIs and CLI Management to access the network devices with firewall.
2. Analyze the strength of IPS against event actions and suppression thresholds, correlation policies, SNORT rules, SSL decryption policies.
3. Compare the concept of Traffic analysis and content filtering with the appropriate tools result.

Concept Map



Syllabus

Networking: Ethernet Technologies, TCP/IP and IP addressing, Configuring routers, Routing Protocols, Access control lists, Switch configuration, VLANs, VTP, ISDN, DDR, Frame Relay, PPP, WAN Technologies, NAT, PAT, DHCP, Internet Protocols - TCP/IP, DNS, Routing, Security Issues.

Network attacks: Denial of Services, Smurf Attacks, Packet Replay, Fragmentation attack, Unauthorized Access, Remote Code Execution, Attacks on Protocols, MITM Attacks, Internal v/s External Threats.

Implementing and configuring Firewalls: Basic Firewall Concepts - Security zoning, Transparent & Routed Modes, Security Contexts. Implement firewall ASA - ACLs, static/dynamic NAT/PAT, object groups, threat detection features, botnet traffic filtering, application filtering and protocol inspection, ASA security contexts. Cisco Security Devices GUIs and Secured CLI Management - SSHv2, HTTPS, and SNMPv3 access on the network devices, ASA firewall features using ASDM. Monitor firewall - Packet tracer, Packet capture, Syslog.

Next-Generation IPS (NGIPS): Configurations - traffic redirection and capture methods, preprocessors and detection engines, event actions and suppression thresholds, correlation policies, SNORT rules, SSL decryption policies. Deployments - inline or passive modes, inline modes: inline interface pair and inline tap mode.

Secure Communications: Site-to-site VPNs - IPsec (with IKEv1 and IKEv2 for both IPV4 & IPV6). Remote access VPNs - AnyConnect IKEv2 VPNs on ASA, AnyConnect SSLVPN, clientless SSLVPN. Traffic Analysis - Wireshark, TCPDump. Content Filtering - Web and Email Filtering.

Learning Resources

1. Catherine Paquet, "Implementing Cisco Threat Control Solutions (SITCS) Foundation Learning Guide: (CCNP Security 300-207)", Cisco Press, 2015
2. Mark Bernard, David Burns, " CCNP Security SENSS 300-206 Official Cert Guide (Certification Guide)", Cisco Press, 2015
3. Natalie Timms, " CCNP Security SIMOS 300-209 Official Cert Guide (Certification Guide)", Cisco Press, 2015
4. William Stallings, “Network Security Essentials Applications and Standards”, Pearson Education, Fourth Edition, 2011
5. John R. Vacca, " Network and System Security", Syngress Media,U.S., 2010.
6. “VPN Security”, The Government of the Hong Kong Special Administrative Region 2008.
7. Douglas R. Stinson, “Cryptography Theory and Practice”, Third Edition, Chapman & Hall/CRC, 2006
8. Joseph Migga Kizza, “Computer Network Security”, Springer, 2005.
9. Jan L. Harrington, " Network Security: A Practical Approach", Morgan Kaufmann, 2005

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**Networking**		CO1
1.1	Ethernet Technologies,	1	
1.2	TCP/IP and IP addressing,		
1.3	Configuring routers,	1	
1.4	Routing Protocols,		
1.5	Access control lists,	1	
1.6	Switch configuration,		
1.7	VLANs, VTP		
1.8	ISDN, DDR, Frame Relay, PPP	1	
1.9	WAN Technologies, NAT, PAT, DHCP	1	
1.10	Internet Protocols - TCP/IP, DNS, Routing, Security Issues	1	
2.	**Network attacks**		CO1
2.1	Denial of Services,	1	
2.2	Smurf Attacks,	1	
2.3	Packet Replay,		
2.4	Fragmentation attack,		
2.5	Unauthorized Access,	1	
2.6	Remote Code Execution,		
2.7	Attacks on Protocols,	1	
2.8	MITM Attacks,		
2.9	Internal v/s External Threats.		
3.	**Implementing and configuring Firewalls**		CO2 & CO4
3.1	Basic Firewall Concepts - Security zoning,	1	
3.2	Transparent & Routed Modes,	1	
3.3	Security Contexts.		
3.4	Implement firewall ASA - ACLs	1	
3.5	static/dynamic NAT/PAT,		
3.6	object groups,		
3.7	threat detection features,	1	
3.8	botnet traffic filtering,		
3.9	application filtering and protocol inspection,		
3.10	ASA security contexts.	1	

Module No.	Topic	No. of Hours	Course Outcome
3.11	Cisco Security Devices GUIs and Secured CLI Management - SSHv2, HTTPS, and SNMPv3 access on the network devices,	1	CO2 & CO4
3.12	ASA firewall features using ASDM.	1	
3.13	Monitor firewall - Packet tracer, Packet capture, Syslog.	1	
4.	**Next-Generation IPS (NGIPS)**		CO3 & CO4
4.1	Configurations - traffic redirection and capture methods,	1	
4.2	preprocessors and detection engines,		
4.3	event actions and suppression thresholds,	1	
4.4	correlation policies,		
4.5	SNORT rules,	1	
4.6	SSL decryption policies.		
4.7	Deployments - inline or passive modes,	1	
4.8	inline modes: inline interface pair and inline tap mode.		
5.	**Secure Communications**		CO3 & CO4
5.1	Site-to-site VPNs - IPsec (with IKEv1 and IKEv2 for both IPV4 & IPV6).	1	
5.2	Remote access VPNs - AnyConnect IKEv2 VPNs on ASA,	1	
5.3	AnyConnect SSLVPN,	1	
5.4	clientless SSLVPN.	1	
5.5	Traffic Analysis - Wireshark, TCPDump.	1	
5.6	Content Filtering - Web and Email Filtering.	1	
	Total Lectures	**28**	

Course Designers:

1. Manigandan Sellamuthu — sendmanigandan@gmail.com
   Industry : Symantec Corporation, India
   Profile : His professional background includes more than 14 years of experience as Network & Information Security Engineer with extensive technical and project management skills. He currently Holding various vendor certification such
   SANS - (GCIA,GCIH,GSSEC),
   Checkpoint - (CCSA,CCSE),
   Cisco -(CCSP,CCIE-Written), Sourcefire -(SFCP).

2. Mr.M.Thangavel — mtit@tce.edu

18IT2D0	DATA SCIENCE AND AI APPLICATONS

Category	L	T	P	Credit
PE	2	0	0	2

Preamble

The course aims to provide theoretical and practical foundations on Data Science and Artificial Intelligence techniques. It focuses on handling different use cases and solving them using Python packages and libraries.

Prerequisite

Basic Programming Knowledge in Python and familiarity with Machine Learning Algorithms

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Use suitable machine learning techniques like Naïve Bayes, and SVM for language identification in text analytics	15%
CO2	Use suitable deep learning techniques like CRF, LSTM for automation in text analytics	15%
CO3	Select suitable machine learning techniques like SVM, Decision trees and Neural network for automating the solution	20%
CO4	Apply regression modelling techniques to solve appropriate real time manufacturing machines level problems	20%
CO5	Use suitable machine learning algorithms with modification for the given problem and imbalanced dataset	15%
CO6	Compare performance of different machine learning algorithms for the given problem and dataset	15%

CO Mapping with CDIO Curriculum Framework

CO#	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO2	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO3	TPS4	Analyze	Organize	Complex Overt Responses	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO4	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 4.1, 4.5.3
CO6	TPS4	Analyze	Organize	Complex Overt Responses	1.3, 2.1.1, 2.1.2, 2.4.5, 2.4.6, 2.5, 3.1, 3.2, 4.1, 4.5.3

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO1	PSO2	PSO3
CO1	S	M	L		S	S	L	L				S	M	S	L
CO2	S	M	L		S	S	L	L				S	M	S	L
CO3	S	S	M	L	S	S	L	L				S	S	S	L
CO4	S	M	L		S	S	L	L				S	M	S	L
CO5	S	M	L		S	S	L	L				S	M	S	L
CO6	S	S	M	L	S	S	L	S	S	S	S	S	S	S	S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests	Terminal Examination
Remember	0	20
Understand	30	40
Apply	40	40
Analyze	30	0
Evaluate	0	0
Create	0	0

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini-project/Assignment/Practical Component
Perception	-
Set	10
Guided Response	30
Mechanism	60
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome1 (CO1):
1. Explain language identification problem in NLP
2. Use Naïve Bayes classifier for text analytics
3. Use SVM classifier for text analytics

Course Outcome2 (CO2):
1. Explain sequence classification problem
2. Discuss the principle of LSTM technique
3. Use CRF and LSTM techniques for the given product or service reviews or customer reviews.

Course Outcome3 (CO3):
1. Explain the approach how machine learning algorithm can be automated
2. Apply different machine learning algorithms for the given problem and dataset
3. Explain how does machine learning tools help in automation

Course Outcome 4 (CO4):

1. Use linear regression algorithm for the prediction of machine failure data set
2. Use multiple linear regression algorithm for the prediction of machine failure data set
3. Explain basis functions in machine learning.

Course Outcome 5(CO5):

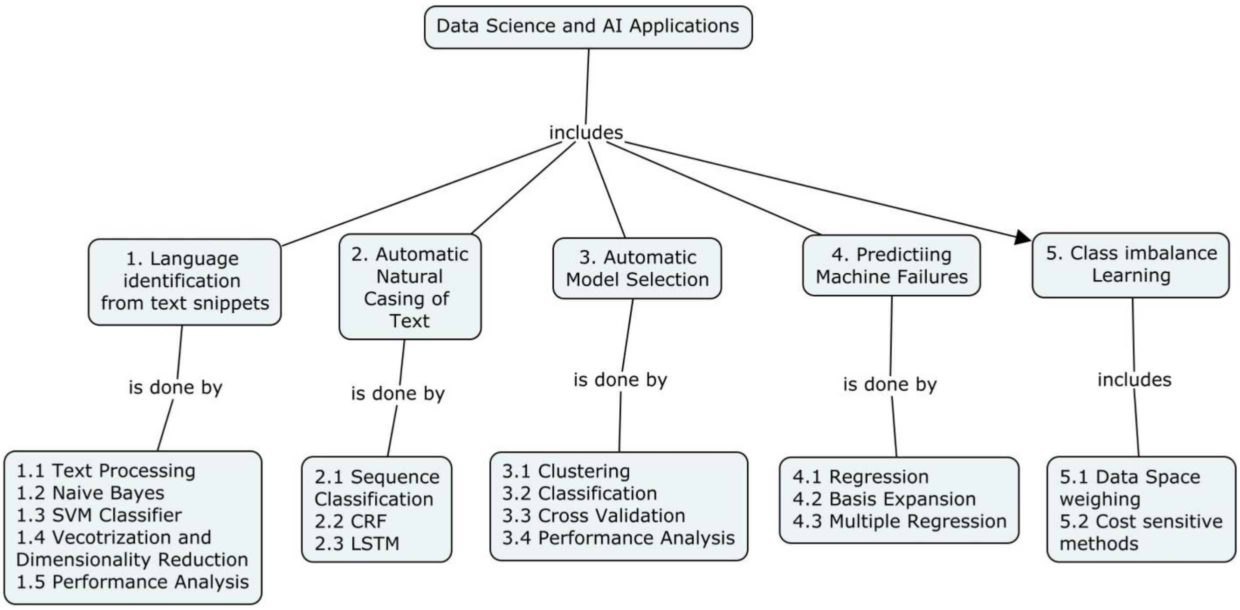
1. Explain the need for imbalanced classes use in machine learning techniques
2. Differentiate data space weighing and cost sensitive methods
3. Use suitable machine learning techniques for the given imbalanced data set

Course Outcome 6(CO6):

CO6 is evaluated through mini project

(Mini-project using dataset from Kaggle / UCI repository and Python packages/libraries)

Concept Map



Syllabus

Use case UC1 Language Identification from Text Snippets – Text Processing, Naïve Bayes, SVM Classifiers, Vectorization and Dimensionality Reduction – Performance Analysis

Use case UC2 Automatic Natural Casing of Text - Sequence classification, Conditional Random Field (CRF), Long Short Term Memory (LSTM) techniques

Use case UC3 Automatic Model Selection - Clustering, Classification, Cross-validation – Performance Analysis

Use case UC4 Predicting Machine Failures from manufacturing data - Regression, Basis Expansion and Multiple Regressions

Use case UC5 Class Imbalance Learning - Data space weighting, Cost-sensitive methods.

Project Implementation

Learning Resources

1. Sebastian Raschka and Vahid Mirjalili, "Python Machine Learning: Machine Learning and Deep Learning with Python, scikit-learn, and Tensor Flow", 3rd Edition, Packt Publishers, 2020.
2. AurélienGéron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 2nd Edition, O'Reilly, 2020.
3. Web Reference - https://towardsdatascience.com/
4. Dataset : https://www.kaggle.com/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1	**Language Identification from Text Snippets**	5	CO1
1.1	Text Processing		
1.2	Naïve Bayes Classifier		
1.3	SVM Classifier		
1.4	Vectorization and Dimensionality Reduction		
1.5	Performance Analysis		
2	**Automatic Natural Casing of Text**	5	CO2
2.1	Sequence Classification Problem		
2.2	Conditional Random Field (CRF)		
2.3	Long Short Term Memory (LSTM)		
3	**Automatic Model Selection**	5	CO3
3.1	Clustering technique		
3.2	Classification techniques		
3.3	Cross-validation		
3.3	Performance Analysis		
4	**Predicting Machine Failures from manufacturing data**	5	CO4
4.1	Regression Technique		
4.2	Basis Expansion		
4.3	Multiple Regression Techniques		
5	**Class Imbalance Learning**	5	CO5
5.1	Data space weighting		
5.2	Cost-sensitive methods.		
6	**Project Implementation**	3	CO6
	Total Hours	**28**	

Course Designers:

1. Mr. Sudarsun Santhiappan sudar@buddi.ai
   Industry : Chief Scientist @ BUDDI.AI, India
2. Dr.R. Suganya rsuganya@tce.edu
3. Dr.A.M. Abirami abiramiam.@tce.edu
4. Dr.A.Sheik Abdullah asait@tce.edu

OUTCOME BASED EDUCATION

CURRICULUM AND DETAILED SYLLABI

FOR

B.Tech. INFORMATION TECHNOLOGY DEGREE PROGRAMME

GENERAL ELECTIVES COURSES

FOR THE STUDENTS ADMITTED IN THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
(A Government Aided ISO 9001:2008 certified Autonomous Institution affiliated to Anna University)
MADURAI – 625 015, TAMILNADU

Phone: 0452 – 2482240, 41
Fax: 0452 2483427
Web: www.tce.edu

LIST OF GENERAL ELECTIVES COURSES

S. No.	COURSE CODE	COURSE NAME
1.	18ITGA0	Database Management System
2.	18ITGB0	Python for Data science
3.	18ITGC0	Object Oriented Programming with Java
4.	18ITGD0	Software Engineering
5.	18ITGE0	Cloud Technologies
6.	18ITGF0	Assistive Technology

18ITGA0	DATABASE MANAGEMENT SYSTEM

Category	L	T	P	Credit
GE	3	0	0	3

Preamble

This course is intended for enabling students to understand the various functionalities of Database management systemand develop solutions for the real world problem. It emphasizes the need for design of database systems and provides an in depth coverage of various principles of database systems.

Prerequisite

- None

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain structured, unstructured data and Data Base Management Systems.	19%
CO2	Apply DDL and DML Commands to solve the simple SQL query.	19%
CO3	Illustrate the use of complex query languages to populate, update and retrieve the data from database.	14%
CO4	Use PL/SQL to perform various Query operations for a given database.	22%
CO5	Apply normalization techniques to design a database for a givenapplication.	14%
CO6	Explain transaction, concurrency control mechanism.	5%
CO7	Develop an application by incorporating database concepts with Database connectivity.	7%

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3,2.3.2,2.3.3
CO2	TPS3	Apply	Value	Mechanism	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO3	TPS3	Apply	Value	Mechanism	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO4	TPS3	Apply	Value	Mechanism	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO5	TPS3	Apply	Value	Mechanism	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO6	TPS2	Understand	Respond	Guided Response	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO7	TPS3	Apply	Value	Mechanism	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	S	M	L		S			S	S	M		L	M	M	M
CO3	S	M	L		S			S	S	M		L	M	M	M
CO4	S	M	L		S			S	S	M		L	M	M	M
CO5	S	M	L										M		
CO6	M	L											L		
CO7	S	M	L		S			S	S	M		L	M	M	M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	ContinuousAssessmentTests			Assignment			Terminal Examination
	1	2 (Practical)	3	1	2	3	
Remember	20	0	20	-	-	-	20
Understand	30	0	30	-	-	-	20
Apply	50	100	50	100	100	100	60
Analyse	0	0	0	-	-	-	-
Evaluate	0	0	0	-	-	-	-
Create	0	0	0	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Assignment/Practical Component
Perception	-
Set	20
Guided Response	20
Mechanism	60
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

** (2 to 3 at the cognitive level of course outcome)

Course Outcome 1 (CO1):

1. Discuss the main categories of data models. What are the basic differences between the relational model, the object model, and the XML model?
2. Describe the three-schema architecture. Why do we need mappings between schema levels? How do different schema definition languages support this architecture?
3. Construct the Entity Relationship (ER) diagram for the " Airline Reservation System".

Course Outcome 2 (CO2):

1. Consider the following relations:
Employee (empID, FirstName, LastName, address, DOB,sex,position,deptNo),
Department(dtptNo,deptName,mgr,empID),
Project(projNo,projName,deptNo),
Workon(empID,projNo,hoursworked).

Writethe SQL statements for the following:
a. List the name and addresses of all employees who work for the IT department.
b. List the total hours worked by each employee, arranged in order of department number and within department, alphabetically by employee surname.
c. List the total number of employees in each department for those departments with more than 10 employees.
d. List the project number, project name and the number of employees who work on that project.
2. Consider the following relational schema:
Suppliers(sid:integer, sname:string, city:string, street:string)
Parts(pid:integer, pname:string, color:string)
Catalog(sid:integer, pid:integer, cost:real)

(A) Find the names of all suppliers who have supplied a non-blue part.
(B) Find the names of all suppliers who have not supplied a non-blue part.
(C) Find the names of all suppliers who have supplied only blue parts.
(D) Find the names of all suppliers who have not supplied only blue parts.
(E) Find the number of supplier who live in Madurai

3. Consider the following relations:
Student(snum: integer , sname: string , major: string , level: string ,age: integer)
Class(name: string , meets at: string, room: string , fid: integer)
Enrolled(snum: integer, cname: string)
Faculty(fid : integer , fname: string , deptid: integer)
The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class.
Major means Subjects like history, data structures.etc. Level means Junior (JR) or Senior (SR).
Write the following queries in SQL. No duplicates should be printed in any of the answers.

a) Find the names of faculty members who teach in every room in which some class is taught.
b) Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.
c) For each level, print the level and the average age of students for that level.
d) For all levels except JR, print the level and the average age of students for that level.
e) For each faculty member that has taught classes only in room R128, print the faculty member's name and the total number of classes she or he has taught.
f) Find the names of students enrolled in the maximum number of classes.
g) Find the names of students not enrolled in any class.

Course Outcome 3 (CO3):

1.Specify the following views in SQL on the COMPANY database schema

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date

DEPT_LOCATIONS

Dnumber	Dlocation

PROJECT

Pname	Pnumber	Plocation	Dnum

WORKS_ON

Essn	Pno	Hours

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship

a. A view that has the department name, manager name, and manager salary for every department
b. A view that has the employee name, supervisor name, and employee salary for each employee who works in the 'Research' department.
c. A view that has the project name, controlling department name, number of employees, and total hours worked per week on the project for each project.
d. A view that has the project name, controlling department name, number of employees, and total hours worked per week on the project for each project *with more than one employee working on it*.

2. In SQL, specify the following queries on the database in Question No. 1 using the concept of nested queries and concepts.

a. Retrieve the names of all employees who work in the department that has the employee with the highest salary among all employees.
b. Retrieve the names of all employees whose supervisor's supervisor has '888665555' for Ssn.
c. Retrieve the names of employees who make at least $10,000 more than the employee who is paid the least in the company.

3. Perform Natural Join, Left Join, Right Join operation for the relations

Suppliers (sid:integer, sname:string, city:string, street:string)
Parts (pid:integer, pname:string, color:string)

Course Outcome 4 (CO4):

1. Write a PL/SQL Function to find square root and cube root of a given number
2. Consider the Employee Database

Employee(Employee_name,street,city)
Works (Employee_name, company_name, salary)

Company(Company_name,city)
Manages (Employee_name,Manager_name)

Write PL/SQL procedure to display the employee name and salary

3.Consider the following relations.

SUPPLIER(Sno, Sname)
PART(Pno, Pname)
PROJECT(Jno, Jname)
SUPPLY(Sno, Pno, Jno)

a) Create one system defined exception and one user defined exception for any of the relation given above.
b) Write a PL/SQL procedure to find the minimum number among 3 given numbers.

Course Outcome 5 (CO5):

1. Consider the following relational schema:
   Suppliers(sid:integer, sname:string, city:string, street:string)
   Parts(pid:integer, pname:string, color:string)
   Catalog(sid:integer, pid:integer, cost:real)

   Assume that, in the suppliers relation above, each supplier and each street within a city has a unique name, and (sname, city) forms a candidate key. No other functional dependencies are implied other than those implied by primary and candidate keys. Apply all possible Normalization techniques in the above relations and display the table before and after normalization.

2. Suppose that we have the following requirements for a university database that is used to keep track of students' transcripts:
   a. The university keeps track of each student's name (SNAME); student number (SNUM); social security number (SSN); current address (SCADDR) and phone (SCPHONE); permanent address (SPADDR) and phone (SPPHONE); birth date (BDATE);sex(SEX);class (CLASS) (freshman, sophomore, ..., graduate); major department(MAJORCODE); minor department (MINORCODE) (if any); and degree program (PROG) (B.A., B.S., ..., PH.D.). Both SSSN and student number have unique values for each student.

   b. Each department is described by a name (DNAME), department code (DCODE), office
   number (DOFFICE), office phone (DPHONE), and college (DCOLLEGE). Both name andcode have unique values for each department.
   c. Each course has a course name (CNAME), description (CDESC), course number (CNUM), number of semester hours (CREDIT), level (LEVEL), and offering department(CDEPT). The course number is unique for each course.
   d. Each section has an instructor (INAME), semester (SEMESTER), year (YEAR), course(SECCOURSE), and section number (SECNUM). The section number distinguishesdifferent sections of the same course that are taught during the same semester/yearits
   values are 1, 2, 3, .up to the total number of sections taught during each semester.
   e. A grade record refers to a student (SSN), a particular section, and a grade (GRADE).
   Prepare a relational database schema for this database application. First show all the functional dependencies that should hold among the attributes. Then design relation schemas for the database that are each in 3NF or BCNF. Specify the key attributes of each relation.

3.Convert the following table that that no cyclic dependencies exist.

propertyNo	itemDescription	supplierNo
PG4	Bed	S1
PG4	Chair	S2
PG16	Bed	S2
PG4	Bed	S2

Course Outcome 6 (CO6):

1. List the different types of Transaction failures.
2. Describe ACID properties.
3. Explain Two phase locking protocol.

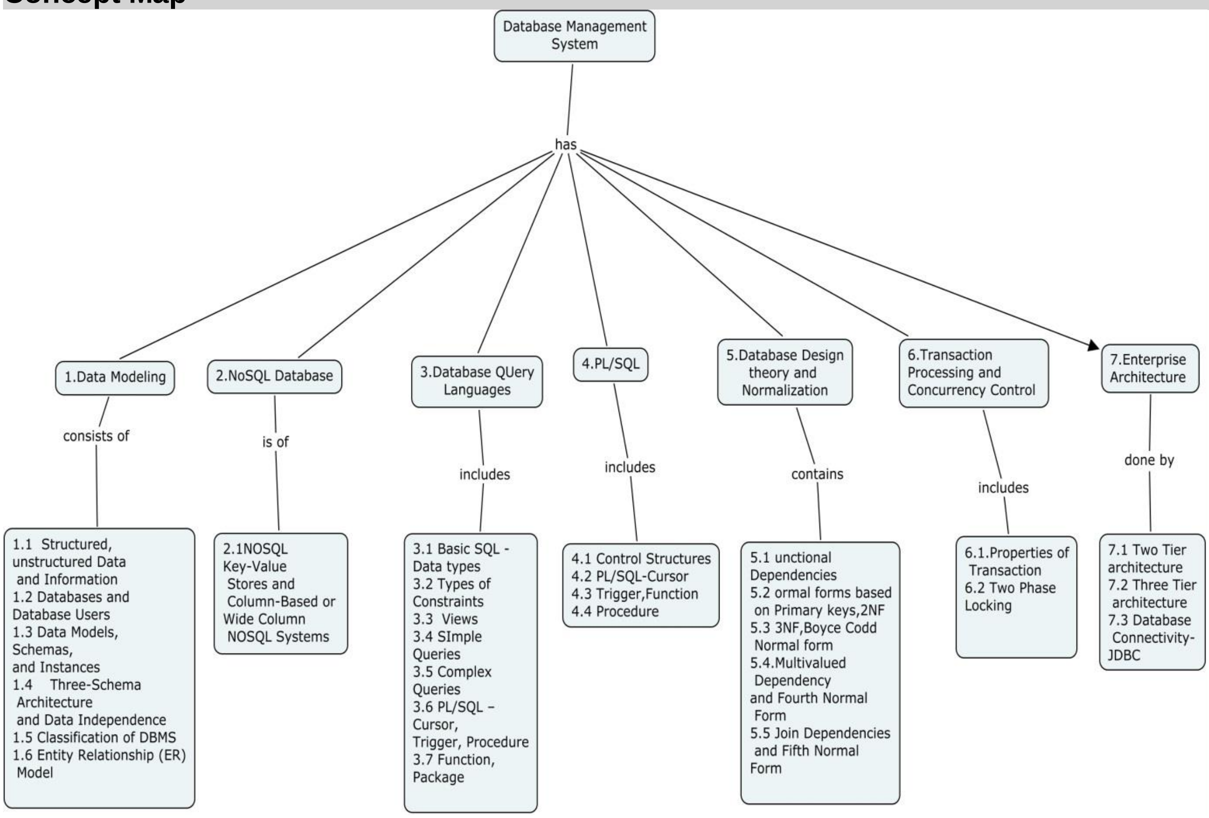
Course Outcome 7 (CO7):

1.Write a JDBC program to connect the Employee database and perform insertion, updation and deletion.

2. Consider student database system .Calculate the number of students in individual department by using Java Program.

3.Consider the following relational schema:
Suppliers (sid:integer, sname:string, city:string, street:string)
Parts (pid:integer, pname:string, color:string)
Catalog (sid:integer, pid:integer, cost:real)
Write a Java program to get the user preference and retrieve the Suppliers details from the database.

Concept Map



Syllabus

Database Systems Concepts: Structured data, unstructured data and Information, Databases and Database Users. Data models and its Types, Schemas and Instances, Three Schema Architecture, Classification of DBMS.**Data Modeling:** Entity Relationship (ER) Model .**NOSQL database**- NOSQL Key-Value Stores- Column-Based or Wide Column NOSQL Systems.

Database query language: Basic SQL- Data types –Types of Constraints, Views, Simple and Complex Queries.

Programming Language Extension to SQL (PL/SQL)– Fundamentals, Control Structures, PL/SQL –Cursor, Trigger, Procedure, and Function.

Database Design Theory and Normalization: Functional Dependencies-Normal forms based on Primary keys-2NF-3NF-Boyce Codd Normal form-Multivalued dependence and Fourth Normal form-Join dependencies and Fifth Normal Form.

Transaction: Properties of Transaction**. Concurrency Control** –Two Phase Locking

Enterprise Architecture – Two tier architecture, Three tier architecture, Database Connectivity,JDBC.

Learning Resources

1. RamezElmasri, Shamkant B. Navathe,"Fundamentals of Database Systems", Pearson, Seventh Edition, 2016
2. Nilesh Shah, "Database Systems using Oracle", 2nd edition, Prentice Hall of India Pvt Ltd, 2007
3. C.J Date, A.Kannan, S.Swamynathan , "An Introduction to database systems",Pearson Education, Eighth Edition, 2006.
4. Abraham Silberschatz, Henry F.Korth and Sudarshan, "Database System Concepts", Tata Mcgraw-Hill, Sixth edition, 2010
5. Raghu Ramakrishnan, Johannes Gehrke, ―Database Management Systems‖, McGraw Hill ,Fourth Edition, 2010
6. Pramod J. Sadalage,Martin Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence,Pearson,2013
7. Web Reference :http://nptel.ac.in/courses/106106093/ Course Name:Database Design.

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcome
1	**Database Systems Concepts and Data Modeling**		
1.1	Structured data, unstructured data and Information	1	CO1
1.2	Databases and Database Users		
1.3	Data models and its Types, Schemas and Instances	1	
1.4	Three Schema Architecture	1	
1.5	Classification of DBMS	1	
1.6	Entity Relationship (ER) Model	1	
2	**NOSQL Database**		
2.1	NOSQL Key-Value Stores- Column-Based or Wide Column NOSQL Systems.	2	
3	**Database query language**		
3.1	Basic SQL- Data types	2	CO2
3.2	Types of Constraints	1	
3.3	Views	1	
3.4	Simple Queries	3	
3.5	Complex Queries	5	CO3
4	**Programming Language Extension to SQL (PL/SQL)**		
4.1	Control Structures	2	CO4
4.2	PL/SQL - Cursor	2	
4.3	Trigger, Function	2	
4.4	Procedure	2	
5	**Database Design Theory and Normalization:** Functional Dependencies- -		
5.1	Functional Dependencies	1	CO5
5.2	Normal forms based on Primary keys, 2NF	1	
5.3	3NF, Boyce Codd Normal form	1	
5.4	Multivalued dependence and Fourth Normal form	1	
5.5	Join dependencies and Fifth Normal Form	1	
6	**Transaction,Concurrency Control, and Enterprise Architecture**		
6.1	Properties of Transaction	1	CO6
6.2	Two Phase Locking	1	
6.3	Two tier architecture, Three Tier Architecture	1	CO7
6.4	Database Connectivity, JDBC	1	
	Total Lectures	**36**	

Course Designers:

1. K.V.UMA kvuit@tce.edu
2 .S. SRIDEVI sridevi@tce.edu

18ITGB0	DATA SCIENCE

Category	L	T	P	Credit
GE	3	0	0	3

Preamble

Data Science is used in organizations for making better business decisions and is used in sciences to verify or disprove existing models or theories. This course will provide an overview of the wide area of data science, with a particular focus on to the tools required to store, clean, manipulate, visualize, model, and ultimately extract information from large amounts of data.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain Data Science life cycle process.	11%
CO2	Explain different Data sampling techniques.	15%
CO3	Demonstrate Exploratory data analysis for the given dataset.	15%
CO4	Apply Data Visualisation technique for the given dataset.	5%
CO5	Demonstrate Supervised learning technique such as Decision tree,Regression .	22%
CO6	Demonstrate Unsupervised learning technique such as K Means ,Kmedoids clustering.	16%
CO7	Develop data models for any real time applications by following Data science life cycle process using Python.	16%

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3,2.3.2,2.3.3
CO2	TPS2	Understand	Respond	Guided Response	1.3,2.3.2,2.3.3
CO3	TPS3	Apply	Value	Mechanism	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO4	TPS3	Apply	Value	Mechanism	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO5	TPS3	Apply	Value	Mechanism	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO6	TPS3	Apply	Value	Mechanism	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4
CO7	TPS3	Apply	Value	Mechanism	1.3,2.1,2.2.3,4.3.1,4.3.2,4.3.3,4.4

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	M	L											L		
CO3	S	M	L		S			S	S	M			M	M	M
CO4	S	M	L		S			S	S	M			M	M	M
CO5	S	M	L		S			S	S	M			M	M	M
CO6	S	M	L		S			S	S	M			M	M	M
CO7	S	M	L		S			S	S	M		L	M	M	M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	ContinuousAssessmentTests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	20	-	-	-	20
Understand	30	30	30	-	-	-	30
Apply	50	50	50	100	100	100	50
Analyse	0	0	0	-	-	-	-
Evaluate	0	0	0	-	-	-	-
Create	0	0	0	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Assignment/Practical Component
Perception	-
Set	20
Guided Response	30
Mechanism	50
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1):

1. Describe the standard life cycle phases of the data science project.
2. Explain Descriptive statistics.
3. Explain the different types of data.

Course Outcome 2 (CO2):

1. Relate sampling techniques with and without replacement.
2. Explain the different Data collection methods.
3. Explain Stratified sampling with an example.

Course Outcome 3 (CO3):

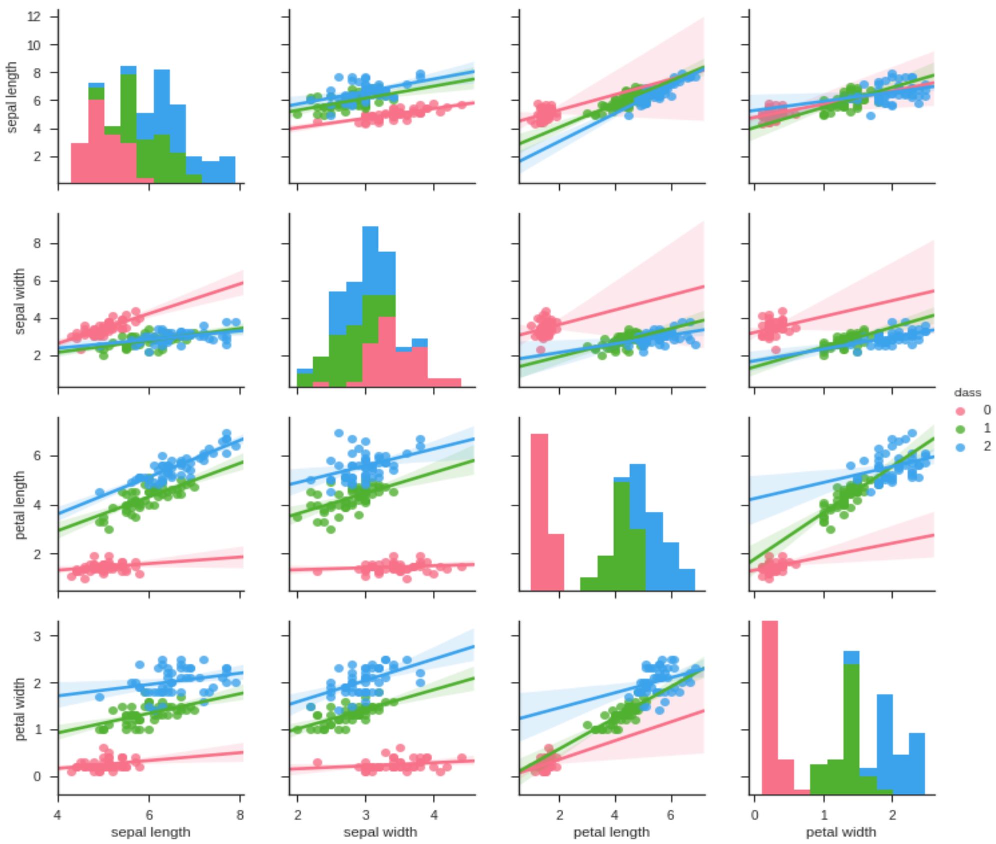
1. Consider the following data for the attribute *age*: 13, 15,16, 16, 19, 20, 20, 21, 22, 22, 25, 25, 25, 25, 30, 33, 33, 35, 35, 35, 35, 36, 40, 45, 46,52, 70.
   Use min-max normalization to transform the value 35 for *age* onto the range [0.0, 1.0].And, apply z-score normalization to transform the value 35 for *age*, where the standard deviation of *age* is 12.94 years.
2. Determine the use of Outlier data present in a dataset.
3. Suppose that the data for analysis includes the attribute age. The age values for the data tuples are 75, 63, 55, 47, 77, 48, 63, 54, 60, 38, and 54.
   a. Find the mean, median and mid-range of the data.
   b. Can you find (roughly) the first quartile (Q1) and the third quartile (Q3) of the data?
   c. Comment on the data's modality (i.e., bimodal, trimodal, etc.).

Course Outcome 4 (CO4):

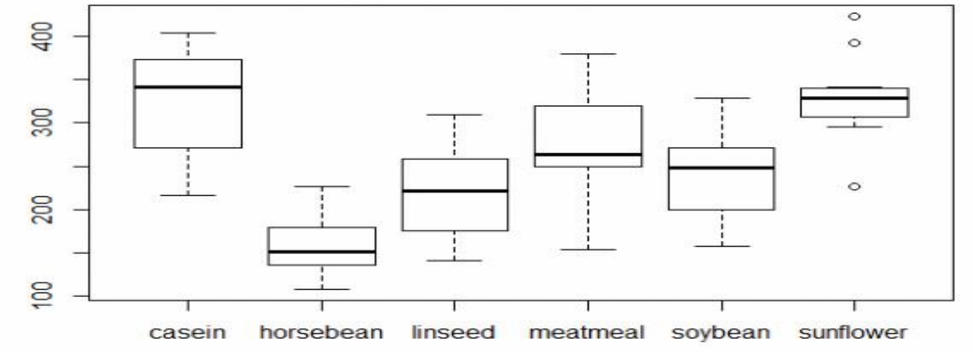
1. Use scatter plot for the following hospital data and mention the relationship between the age and fat.

age	23	23	27	27	39	41	47	49	50
%fat	9.5	26.5	7.8	17.8	31.4	25.9	27.4	27.2	31.2
age	52	54	54	56	57	58	58	60	61
%fat	34.6	42.5	28.8	33.4	30.2	34.1	32.9	41.2	35.7

2. Interpret the following Pairplot of Iris dataset.



3. Interpret the distribution of each species given in the following Box plot.



Course Outcome 5 (CO5):

1. Consider the following Loan Repayment dataset that contains the whether the borrower is default or not. Classify by Decision tree algorithm.
(Hint: Discretize the Annual Income (60K to 100K as “medium” and >100K as “high”)

Tid	Home Owner	Marital Status	Annual Income	Defaulted Borrower
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

2. Compute the value of ‘Profit’ attribute for the following test tuple using Naïve bayes Classification. X = (Age = Middle-aged, Competition = Yes, Type = Hardware, Profit = ?)

Age	Competition	Type	Profit
Senior	Yes	Software	Down
Senior	No	Software	Down
Senior	No	Hardware	Down
Middle-aged	Yes	Software	Down
Middle-aged	Yes	Hardware	Down
Middle-aged	No	Hardware	Up
Middle-aged	No	Software	Up
Youth	Yes	Software	Up

Youth	No	Hardware	Up

3. Depict a predictive model using multiclass classification techniques for any real-time application.

Course Outcome 6 (CO6):

1. Cluster the following flower data set into 3 clusters. The distance function is Euclidean distance. Use K-Means algorithm to show the final three clusters

Flower No	Sepal Length	Sepal Width	Petal Length	Petal Width
1.	5.1	3.5	1.3	0.2
2.	4.6	3.1	1.4	0.2
3.	4.5	2.3	1.5	0.2
4.	7.0	3.2	1.7	0.4
5.	5.2	2.7	1.4	0.1
6.	5.7	2.8	1.5	0.3
7.	6.5	3.0	1.7	0.2
8.	6.9	3.1	1.4	0.3

2. Use ML technique which is used to determine the optimal value of K to perform the K-Means Clustering Algorithm.
3. Consider the Iris data given above.Use K-Medoid algorithm to show the final two clusters.

Course Outcome 7(CO7):

*CO6 will be assessed through Mini Project / Assignment

Guidelines for the Mini-Project:

Group formation: Students are split into project groups with around 3 members in each group. A team can execute the project using appropriate data mining algorithms and improve the efficiency of the algorithm by pre-processing methods using any of the data mining software like R tool, Rapid Miner and python etc.

At the end of the semester, the team members have to present their project, submit their report and share their lessons learnt/best practices with other teams. Some of the activities may include: (but not limited to)

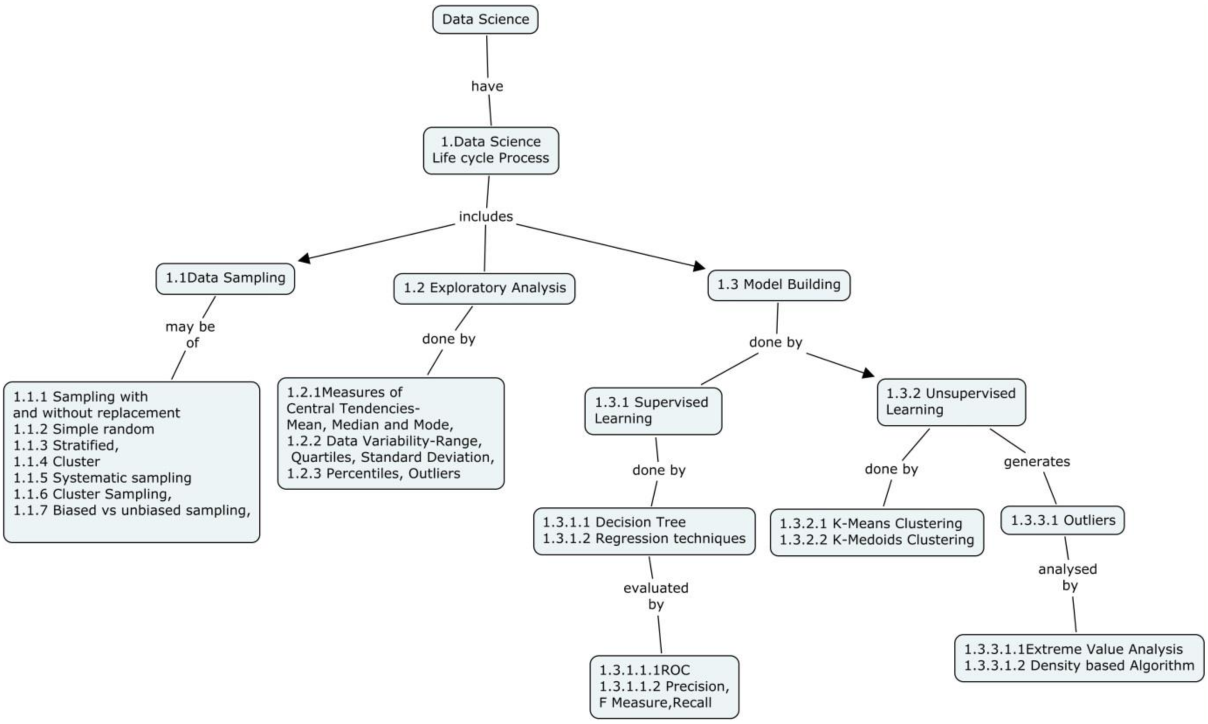
✓Application identification and data set collection
✓Selecting relevant data mining algorithm to extract knowledge from the data set
✓Design diagram / Data Modeling
✓Results and performance analysis for the chosen data mining technique
✓Documentation

Some of the Mini-project titles may include: (but not limited to)

- Financial Data Analysis
- Retail Industry

- Telecommunication Industry
- Biological Data Analysis
- Intrusion Detection
- Healthcare data Analysis
- Market Basket Analysis

Concept Map



Syllabus

Data Science: Data Science life cycle process. Applied statistics in business- Descriptive Statistics, Inferential Statistics. Type of Data - Quantitative vs Qualitative Data
Data Sampling: Sampling with and without replacement, Simple random, Stratified, Cluster, Systematic sampling, Cluster Sampling, Biased vs unbiased sampling, Sampling Error. Data Collection methods.
Exploratory Analysis: Measures of Central Tendencies, Mean, Median and Mode, Data Variability: Range, Quartiles, Standard Deviation, Calculating Standard Deviation-Score/Standard Score, CalculatingPercentiles, Outliers
Data visualization: Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot.
Supervised Learning: Decision Tree, Regression- Linear, Multiple, Logistic regression ,Naïve Bayes Classification.Receiver Operating Characteristics RoC – Metrics Precision, Recall, F Measure, Accuracy – Cross validation.
Unsupervised Learning: K-means clustering, K-Medoids Clustering.
Outlier Analysis: Extreme Value Analysis, Density based algorithm
Case Study: Churn Prediction and Air quality prediction using Python Machine learning libraries

Learning Resources

1.Bart Baesens, "Analytics in a Big Data World", The Essential Guide to Data Science and its Applications, , Wiley, First edition,2014.
2. Samir Madhavan," Mastering python for data science", Ingram short title,2010

3. Douglas Montgomery ,"Applied statistics and probability for engineers" Wiley; Sixth edition,2016.
4. Web Reference: https:// https://swayam.gov.in/nd1_noc19_cs59/preview Course Name: Python for Data Science

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course Outcome
1	**Data Science**		
1.1	Data Science life cycle Process	2	**CO1**
1.2	Applied statistics in business- Descriptive Statistics, Inferential Statistics.	1	
1.3	Type of Data - Quantitative vs Qualitative Data	1	
2.	**Data Sampling**		
2.1	Sampling with and without replacement	1	**CO2**
2.2	Simple random, Stratified, Cluster, Systematic sampling, Cluster Sampling	1	
2.3	Biased vs unbiased sampling	1	
2.4	Sampling Error	1	
2.5	Data Collection methods.	1	
3.	**Exploratory Analysis**		
3.1	Measures of Central Tendencies, Mean, Median and Mode	1	**CO3**
3.2	Data Variability: Range, Quartiles, Standard Deviation, Calculating Standard Deviation-Score/Standard Score,	2	
3.3	Calculating Percentiles, Outliers	2	
4	**Data visualization**		
4.1	Scatter plot, Line plot, Bar plot, Histogram, Box plot, Pair plot.	2	**CO4**
5.	**Supervised Learning**		
5.1	Decision Tree	2	**CO5**
5.2	Regression- Linear, Multiple, Logistic regression	3	
5.3	Naïve Bayes Classification	1	
5.4	Receiver Operating Characteristics RoC – Metrics Precision, Recall, F Measure, Accuracy – Cross validation	2	
6	**Unsupervised Learning**		
6.1	K-means clustering	2	**CO6**
6.2	K-Medoids Clustering.	2	
7.	**Outlier Analysis**		
7.1	Extreme Value Analysis, Density based algorithm	2	
8	**Case Study**		

8.1	Python Machine learning libraries	3	**CO7**
8.2	Churn Prediction and Air quality prediction	3	
Total		**36**	

Course Designers:

1. K.V.UMA kvuit@tce.edu
2 .S. KARTHIGAskait@tce.edu

18ITGC0	Object Oriented Programming with Java	Category	L	T	P	Credit
		GE	3	0	0	3

Preamble

This course aims to provide students with broad theoretical and practical skills in inobject oriented programming. This course focus on various OOP concepts like Class, Object, Encapsulation, Inheritance and Polymorphism. It also focuses on various libraries & Swing for programming an interactive real world application.

Prerequisite

- None

Course Outcomes

On successful completion of the course, students will be able to

Course Outcomes		Weightage*** in %
CO1	Use programming constructs like Data types, Control structures, looping statements	16
CO2	Construct object-oriented programs for the given scenario using object oriented concepts like abstraction, encapsulation, polymorphism and inheritance.	17
CO3	Apply JAR, package, and exception handling mechanism for the given problem.	17
CO4	Implement various libraries like String, I/O, Collection classes and JDBC	16
CO5	Develop interactive, user friendly software for real world applications using swing and Event Handling	17
CO6	Construct Java based solutions for various domain areas.	17

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2,2.1.5
CO2	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2,2.1.5
CO3	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2,2.1.5
CO4	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2,2.1.5
CO5	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2,2.1.5
CO6	TPS3	Apply	Value	Mechanism	1.2, 2.1.1, 2.1.2,2.1.5,2.4.3, ,2.4.6, 2.5.1,3.1.1,3.2.1-3.2.6, 4.4.1,4.5.1

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L	L		L			M				M	L	L	
CO2	M	L	L		L			M				M	L	L	
CO3	M	L	L		L			M				M	L	L	
CO4	S	M	L		S			M				M	S	S	M
CO5	S	M	L		S			S	S	S		S	S	S	M
CO6	S	M	L		S			S	S	S		S	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	20	20	-	-	-	20
Understand	30	30	20	-	-	-	20
Apply	50	50	60	100	100	100	60
Analyze	0	0	0	-	-	-	-
Evaluate	0	0	0	-	-	-	-
Create	0	0	0	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Assignment/Practical Component
Perception	-
Set	-
Guided Response	-
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

CO6 is assessed through Mini Project

Mini Project Details:

1. Group formation: Students are split into project groups
2. Identify a suitable problem from various domain areas.
3. Select suitable java concepts
4. Identify appropriate library classes.
5. Implement and submit the results and findings.

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Explain about the benefits of Object oriented Programming.
2. Write a Java program to create 2 two-dimensional arrays which hold numbers. Write a method which takes the arrays as arguments to perform matrix multiplication.

Course Outcome 2 (CO2):

1. Write a Java Program to implement multilevel inheritance for the following classes: Project, Task and Module. Assume the data members and methods used.
3. Write a java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.
4. Illustrate compile time and runtime polymorphism for employee management system using a java program.
5. Discuss the ways of implementing interface with example program.

Course Outcome 3 (CO3):

1. Illustrate the following exceptions with a sample program and handle it using try with multiple catch.
   - Number Format Exception
   - Array Index Out of Bounds Exception
   - Arithmetic Exception
2. Differentiate checked exception from unchecked exception.
3. Write a Java program to create a package which has classes and methods to read Student Admission details.

Course Outcome 4 (CO4):

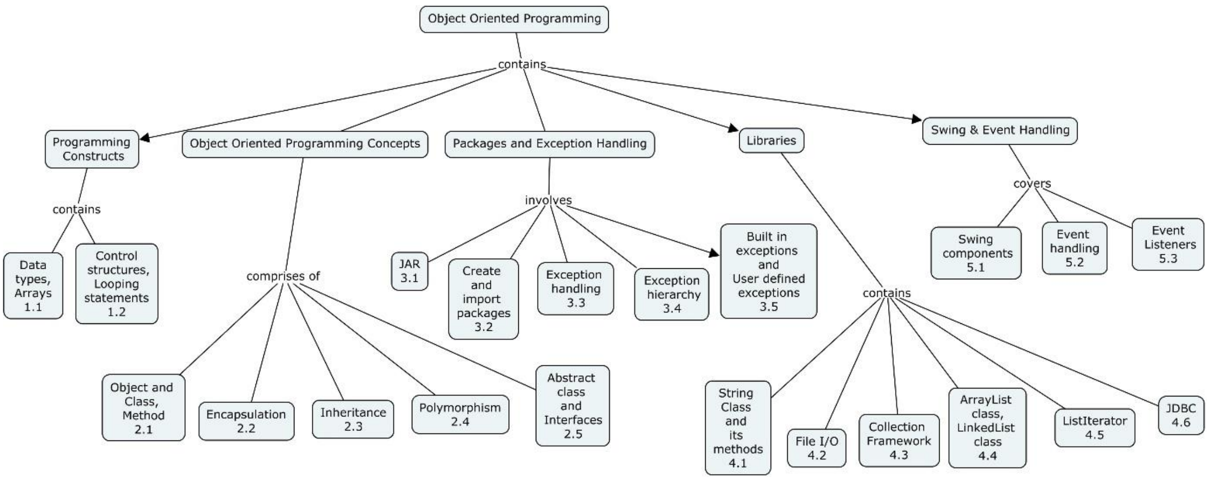
1. Create any 3 collections for different types of books. Find the name of the book based on the given id. Generate the bill for the purchased books.
2. List out various Collection Interfaces.
3. Write a Java Program to Copy the file contents from one to another.
4. Identify the suitable collection for storing the student name (inclusive of duplicates) in the random order. Perform the following operations.
   Display the student name without duplicate
   Arrange the name in ascending order
   Count the number of students with duplicate

Remove the student whose index is at '5'
Identify any three levels of logs for electrical billing application. Write a program to generate it and store it in a file.

Course Outcome 5 (CO5):

1. Design and develop an application for bill calculation of a book shop using swing with events.
2. Write an applet to perform the 4 basic arithmetic operations as buttons in a form accepting two integers in text boxes and display their result.
3. List out any four Listener Interfaces in Event Handling.
4. Recall the syntax of different layouts in swing handling.
5. Write a java program that simulates a traffic signal. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "stop" or "ready" or "go" should appear above the buttons in a selected color. Initially there is no message shown.

Concept Map



Syllabus

Programming Constructs: Data types, Arrays, Control structures, Looping statements,

Object Oriented Programming Concepts: Object and Class, Method, Encapsulation,Inheritance, Polymorphism, Abstract class and Interfaces

Packages and Exception Handling:JAR,Create and import packages,Exception handling, Exception hierarchy, Built in exceptions and User defined exceptions

Libraries: String Class and its methods, File I/O, Collection Framework-ArrayListclass,LinkedListclass,ListIterator,JDBC

Swing & Event Handling: Swing components, Eventhandling, Event Listeners

Text Books

- Herbert Schildt, "Java : The Complete Reference", McGraw-Hill. Ninth Edition, 2014.

References

- Paul Deitel and Harvey Deitel, "Java How to Program (Early Objects)", Pearson, Eleventh Edition, 2017.
- E.Balagurusamy, "Programming with Java" , McGraw-Hill, Fifth Edition, 2014.
- Kathy Sierra, "Head First Java", Shroff publications, Second edition, 2005.
- Cay S. Horstmann and Gary Cornell, "Core Java, Volume I - Fundamentals", Prentice Hall, Ninth Edition, 2013.
- Cay S. Horstmann and Gary Cornell, "Core Java, Volume II – Advanced Features : 2", Prentice Hall, Eleventh Edition, 2018.

Course Contents and Lecture Schedule

Module No	Topic	No. of Lecture Hours	Course outcome
1	**Programming Constructs**		
1.1	Data types, Arrays	2	CO1
1.2	Control structures, Looping statements	2	
2	**Object Oriented Programming Concepts**		
2.1	Object and Class, Method	2	CO2
2.2	Encapsulation	2	
2.3	Inheritance	2	
2.4	Polymorphism	2	
2.5	Abstract class and Interfaces	2	
3	**Packages and Exception Handling**		
3.1	JAR	2	CO3
3.2	Create and import packages	2	
3.3	Exception handling	2	
3.4	Exception hierarchy	1	
3.5	Built in exceptions and User defined exceptions	2	
4	**Libraries**		
4.1	String Class and its methods	1	CO4
4.2	File I/O	1	
4.3	Collection Framework	2	
4.4	ArrayListclass,LinkedList class	2	
4.5	ListIterator	1	
4.6	JDBC	2	
5	**Swing & Event Handling**		
5.1	Swing components	1	CO5
5.2	Event handling	2	
5.3	Event Listeners	1	
	Total Lectures	**36**	

Course Designers

1. Ms.C.V.Nisha Angeline cvnait@tce.edu
2. Mr.M.Manikandakumar mmrit@tce.edu

18ITGDO	SOFTWARE ENGINEERING	Category	L	T	P	Credit
		GE	3	0	0	3

Preamble

The course highlights the application of systematic, disciplined, quantifiable approach to the development, operation and maintenance of software. Aims to impart knowledge on the basic principles, concepts and standard practices of software lifecycle process. The course also enables the students to acquire team building and managerial skills through team project activities using agile practices

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Compare various software process models and Devops practices.	16
CO2	Identify functional and non-functional requirements for any given problem and document it systematically.	16
CO3	Prepare design documents with standards for any given user requirements.	25
CO4	Build optimal test cases using appropriate testing techniques.	22
CO5	Illustrate the benefits upon usage of version controlling and tracking mechanisms in software development	11
CO6	Develop an application using software engineering best practices and standards.	10

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.2,2.3.1,2.3.2
CO2	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,3.1.4, 3.1.5
CO3	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,3.2.3, 4.4.1, 4.4.2
CO4	TPS3	Apply	Value	Mechanism	1.2,2.3.1,2.3.2,2.3.3,2.3.4,4.4.1, 4.4.2 4.5.5
CO5	TPS2	Understand	Respond	Guided Response	1.2,4.3.4
CO6	TPS3	Apply	Value	Mechanism	1.2,2.1.1,2.1.4,3.1,4.5.1

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L				M		L	S	S			L	L	M
CO2	S	M	L		M				S	S			M	L	M
CO3	S	M	L		S								M	L	
CO4	S	M	L										M		
CO5	M	L											L		
CO6	S	M	L						S	S	S	M	M		S

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	**2**	**3**	1	2	3	
Remember	20	20	20	-	-	-	10
Understand	40	30	30	-	-	-	30
Apply	40	50	50	100	100	100	60
Analyse	-	-	-	-	-	-	-
Evaluate	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Assignment/Practical Component
Perception	-
Set	-
Guided Response	-
Mechanism	100
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

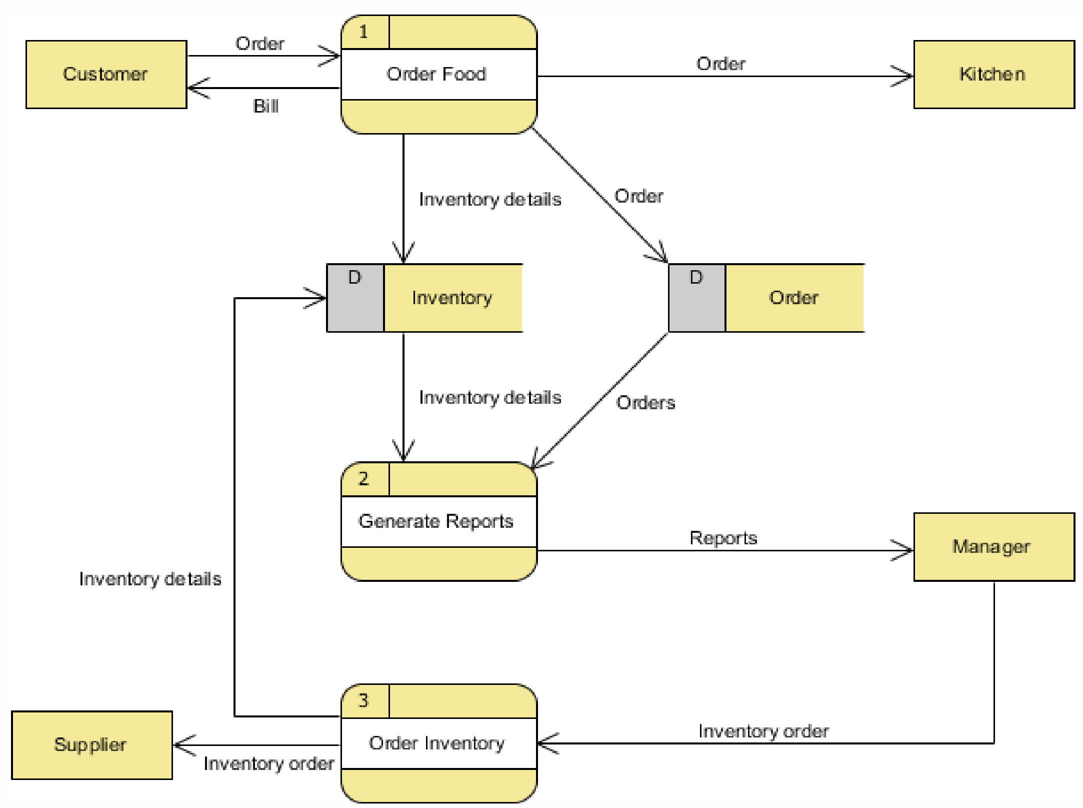
Course Outcome 1(CO1):
1. Define Software Engineering.
2. Explain the pros and cons of Waterfall model and spiral model with diagram.
3. Discuss Kanban- agile software development methodology in detail.

Course Outcome 2(CO2):
Scenario:1 With the advancement of technology, Company ABC has agreed to develop the Web portal for the Hospital XYZ. Mutual agreement has been drawn to address the following requirements: Software has to maintain and manage all patient records. It needs to give results for patient and physician queries like past treatment undergone, lab reports, medical prescription, etc. using patient identification number. Patient can make appointments with his physicians or doctors online. And also the system should send reminder to the patients for periodic check-ups. Hospital makes billing for patient and it can be settled through Medi-claim policy issued by insurance company PQRS.

Considering the above scenario,
1. Prepare a FR and NFR document for the system.
2. Draw Use case diagram with appropriate notations.
3. Identify features and sequence of activities required and depict them using User story map

Course Outcome 3(CO3):
1. Draw the following Data Flow Diagrams for the **Scenario 1**
   - Level 0 DFD
   - Level 1 DFD
   - Level 2 DFD

2. Describe the given Data Flow Diagram w.r.t its notations, entities, processes and data flow



3. For the given **Scenario 1**, draw class diagram, activity and sequence diagrams

Course Outcome 4 (CO4):

1. Explain the various types of black-box testing methods.
2. A program specs state the following for an input field: The program shall accept an input value of 4 digit integer equal or greater than 2000 and less than or equal 8000.Determine the test cases using
   (i) Equivalence class partitioning.
   (ii) Boundary Value Analysis.
3. Show the proper pseudo-code and generate test cases for simple subtraction.

Course Outcome 5 (CO5):

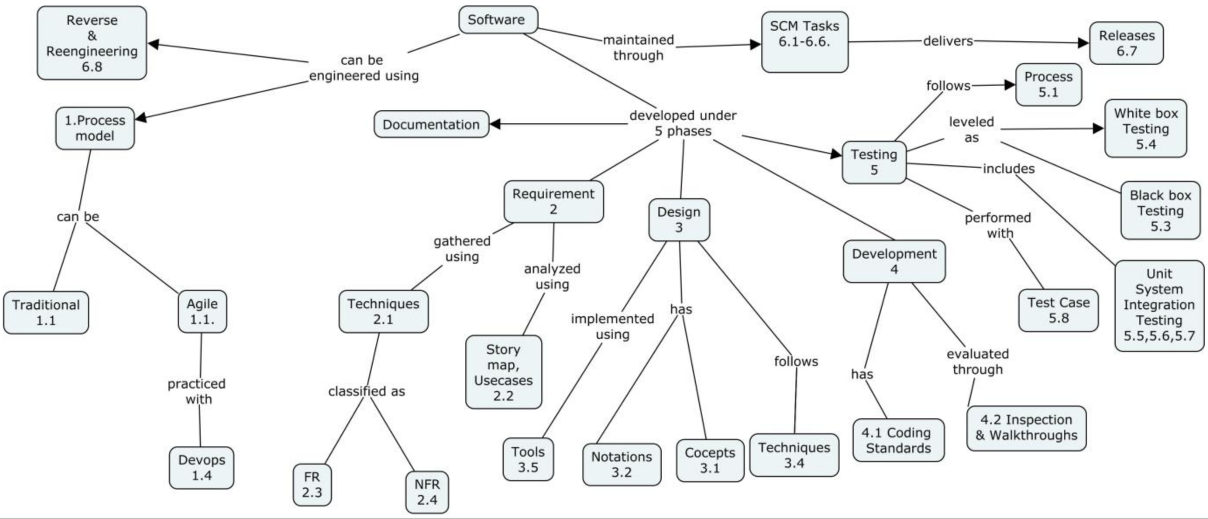
1. Describe the tasks involved in Software Configuration management
2. Define version control
3. Differentiate reverse engineering and reengineering concepts

Course Outcome 6(CO6):

CO6 would be evaluated through Mini-project that may include but not limited to the following topics

1. Health Monitoring System
2. Smart City Applications
3. Farmer support system
4. Vehicle Tracking System

Concept Map



Syllabus

Software Process: Traditional Process Models Vs Agile Process model, Software Quality Attributes, Roles and responsibilities of software project manager, Devops-lifecycle process, principles and practices.
Software Requirements Analysis: Requirement Gathering techniques – User story map - Functional Requirements - Non-functional Requirements, Use Cases –Documentation.
Software Design: Design concepts, Design notations, Design techniques-UML diagrams, Data Flow Diagrams, Design guidelines, Design Tools, Documentation.
Software Development: Coding standards, code inspection, reviews and walkthroughs.
Software Testing: Testing process, Testing levels- Black box testing, White box testing, Unit testing, Integration testing, System testing, Test case generation.
Software Configuration and maintenance Management: Tasks- version control- tracking-VC tools-Git, CVS, Monotone, Bazaar- software release and maintenance, reverse engineering and reengineering.

Learning Resources

1. Pankaj Jalote, “An Integrated Approach to Software Engineering”, Narosa Publishing House, 3rd edition, 2014.
2. Roger S.Pressman, “Software Engineering A Practitioner’s Approach’, McGraw Hill, 6th edition, 2014.3.
3. Agile Project Management: Creating Innovative Products (2nd Edition) 2nd Edition by Jim Highsmith.
4. P. Bourque and R.E. Fairley, eds., *Guide to the Software Engineering Body of Knowledge, Version 3.0*, IEEE Computer Society, 2014; www.swebok.org.
5. https://cloudacademy.com/blog/introduction-to-devops/
6. https://www.edx.org/learn/software-engineering/

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**Software Process**		
1.1	Traditional Process Models Vs Agile Process model	2	CO1
1.2	Software Quality Attributes	1	
1.3	Roles and responsibilities of software project manager		
1.4	Devops-lifecycle process	2	
1.5	Devops principles and practices	1	
2	**Software Requirements Analysis**		

2.1	Requirement Gathering techniques	1	CO2,CO6
2.2	User story map	1	
2.3	Functional Requirements	1	
2.4	Non-functional Requirements	1	
2.5	Use Cases	1	
2.6	Documentation	1	
3	**Software Design**		
3.1	Design concepts	1	CO3
3.2	Design notations	1	
3.3	Design techniques	4	CO3,CO6
3.4	Design guidelines	1	
3.5	Design Tools	2	
3.6	Documentation		
4.	**Software Development**		
4.1	Coding standards	1	CO6
4.2	code inspection ,reviews and walkthroughs	1	
5.	**Software Testing**		
5.1	Testing process	1	CO4
5.2	Testing levels		
5.3	Black box testing	1	
5.4	White box testing	1	
5.5	Unit testing	1	
5.6	Integration testing	1	
5.7	System testing	1	
5.8	Test Case generation	2	CO4,CO6
6	**Software Configuration and maintenance management**		
6.1	Tasks	1	CO5
6.2	version control		
6.3	tracking	1	
6.4	Software release and maintenance	1	
6.5	Reverse engineering and reengineering.	1	
	Total Lectures	**36**	

Course Designers:

1. Santhiya.C santhiya.c@gmail.com
2. Pudumalar.S spmit@tce.edu

18ITGE0	CLOUD TECHNOLOGIES	Category	L	T	P	Credit
		GE	3	0	0	3

Preamble

Cloud technologies are pervasive, touching our daily lives whenever accessing the World Wide Web, a mobile app, or making retail. The objective of this course is to provide a comprehensive study of cloud concepts and capabilities across the various cloud service models**.** The students will able to apply principles of best practice in cloud application design and management through the study of the state-of –the –art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo etc.

Prerequisite

NIL

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage*** in %
CO1	Explain the core concepts behind the cloud computing paradigm	19
CO2	Discuss the virtualization and their role in enabling the cloud system model	17
CO3	Make use ofthe appropriate cloud service model for a given application	17
CO4	Utilize the fundamental concepts of cloud storage such as Amazon S3 for the real time application	14
CO5	Choose the appropriate infrastructure to solve the core issues such as resource provisioning and managing SLAs	19
CO6	Deploy applications over commercial cloud computing infrastructures such Amazon Web services, Google App Engine	14

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TPS2	Understand	Respond	Guided Response	1.3, 2.3.1,3.2.3
CO2	TPS2	Understand	Respond	Guided Response	1.3, 2.3.1, 3.2.3
CO3	TPS3	Apply	Value	Mechanism	1.3, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO4	TPS3	Apply	Value	Mechanism	1.3, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO5	TPS3	Apply	Value	Mechanism	1.3, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5
CO6	TPS3	Apply	Value	Mechanism	1.3, 2.4.5, 2.4.6, 2.5.1, 3.1.1, 3.2.1 – 3.2.6, 4.5.3, 4.5.5

Mapping with Programme Outcomes and Programme Specific Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L											L		
CO2	M	L			L								L		
CO3	S	M	L			L			M	L	M	M	M	L	M
CO4	S	M	L		L				L	M		M	M	L	L
CO5	S	M	L		M	L			L	M	M	M	M	M	M
CO6	S	M	L		L	M		L	M	M	M	M	M	M	M

S- Strong; M-Medium; L-Low

AssessmentPattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	30	20	10	-	-	-	10
Understand	30	30	30	-	-	-	30
Apply	40	50	60	100	100	100	60
Analyse	0	0	0	-	-	-	-
Evaluate	0	0	0	-	-	-	-
Create	0	0	0	-	-	-	-

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject/Assignment/Practical Component
Perception	-
Set	-
Guided Response	20
Mechanism	80
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment

Course Outcome 1(CO1):

1. Compare between cloud and On-premise computing.
2. Explain the layers of Paas Architecture.
3. List the Platforms that are used for large-scale Cloud Computing.

Course Outcome 2(CO2):

1. Explain VM Cloning.
2. List the key components of VM infrastructure.
3. State the main components of Vcenter Server Architecture.

Course Outcome 3(CO3):

1. Select the essential things that must be followed before going to cloud computing platform.
2. Identify the various modes for Implementing Iaas Strategy in cloud.
3. Model a cloud computing which will have a best system integrator.

Course Outcome 4 (CO4):

1. Compare and contrast various storage architectures of cloud.
2. Apply security strategies for the given cloud architecture.
3. Interpret the security criteria for building internal cloud.

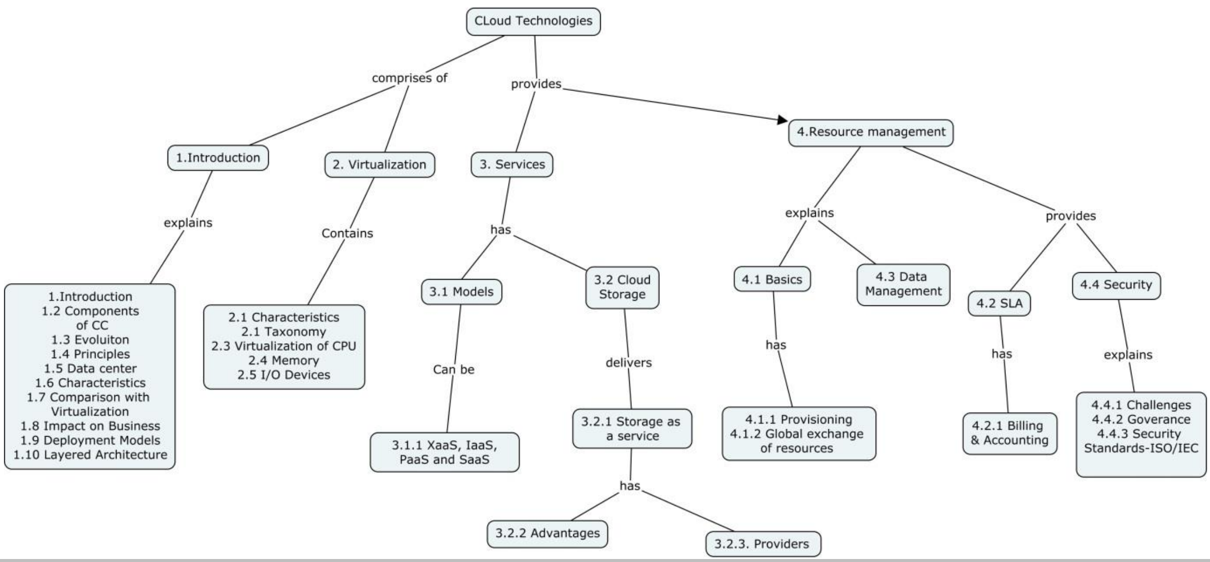
Course Outcome 5 (CO5):

1. Develop an internal cloud platform which satisfies win-win approach for both customer and developer.
2. Plan and deliver a best SLA strategy for your client.
3. Identify which type of resource provisioning is needed for a given demand.

Course Outcome 6(CO6):

1. You have a distributed application that periodically processes large volumes of data across multiple Amazon EC2 Instances. The application is designed to recover gracefully from Amazon EC2 instance failures. You are required to accomplish this task in the most cost effective way. Choose the best type of instances which meets your requirement and justify.
2. Develop a cloud environment in which you will optimize the availability of your application.
3. Select the best strategy for transporting the application data to the cloud environment.

Concept Map



Syllabus

Introduction to Cloud Computing: Introduction – Component of CC – Evolution of cloud computing- Underlying principles of Parallel and Distributed computing-Data center-Cloud characteristics-Comparing CC with Virtualization, Impact of CC on Business –Cloud Deployment Models, Layered Cloud Architecture Development.

Virtualization: Characteristics, Taxonomy, Virtualization of CPU, Memory, I/O Devices, Pros &Cons. **Case study**: Xen, KVM, VMware, and Microsoft Hyper-V.

Cloud computing Services: Cloud Service Models - XaaS, IaaS, PaaS and SaaS.Cloud Storage- Storage as Service-Advantages of cloud storage-Cloud storage providers-S3.

Resource management and security in cloud: Introduction– Resource Provisioning– Global Exchange of Cloud Resources – Service Level Agreements (SLAs), Billing & Accounting, Managing Data- Security Overview – Cloud Security Challenges – Security Governance – Security Standards-ISO/IEC Standards

Case Study – Cloud Platforms- Megdhoot-Amazon AWS, Google App Engine, Microsoft Azure, Cloud Software Environments - CloudSim

Learning Resources

1. RajkumarBuyya , James Broberg, AndrzejGoscinski: Cloud Computing Principles and Paradigms, Willey 2014.
2. RajkumarBuyya, Christian Vacchiola, S.ThamaraiSelvi “Mastering Cloud Computing”, McGraw Hill, 2013.
3. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter ,Cloud Computing: A Practical Approach, , McGraw Fill, 2010.
4. ArshadeepBahga, Vijay Madisetti, Cloud Computing, A Hands on approach, University Press.
5. Barrie Sosinsky , Cloud Computing Bible, Wiley Publishers, 2010.

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.	**Introduction to Cloud Computing**		
1.1	Introduction	2	CO1
1.2	Component of CC		
1.3	Evolution of cloud computing		
1.4	Underlying principles of Parallel and Distributed computing	1	CO1
1.5	Data center	1	CO1
1.6	Cloud characteristics	1	CO1
1.7	Comparing CC with Virtualization		
1.8	Impact of CC on Business		
1.9	Cloud Deployment Models	1	CO1
1.10	Layered Cloud Architecture Development	1	
2	**Virtualization**		
2.1	Characteristics	1	CO2
2.2	Taxonomy		
2.3	Virtualization of CPU	1	
2.4	Memory	1	
2.5	I/O Devices	1	
2.6	Pros &Cons		
	Case study: Xen, KVM, VMware, and Microsoft Hyper-V	2	CO2
3	**Cloud computing Services**		
3.1	Cloud Service Models	2	CO3
3.1.1	XaaS, IaaS, PaaS and SaaS	4	
3.2	Cloud storage	1	CO4
3.2.1	Storage as Service	1	
3.2.2	Advantages of cloud storage	1	
3.2.3	Cloud storage providers-S3	2	
4	**Resource management and security in cloud**		

4.1	Introduction	1	CO5
4.1.1	Resource Provisioning		
4.1.2	Global Exchange of Cloud Resources	1	CO5
4.2	Service Level Agreements (SLAs)	2	
4.2.1	Billing & Accounting		
4.3	Managing Data	1	
4.4	Security Overview		
4.4.1	Cloud Security Challenges	1	
4.4.2	Security Governance	1	CO5
4.4.3	Security Standards-ISO/IEC Standards		
	Case Study – Cloud Platforms ,Megdhoot ,Amazon AWS, Google App Engine, Microsoft Azure, Cloud Software Environments - CloudSim	5	CO6
	Total Lectures	**36**	

Course Designers:

1. Dr.S.Padmavathi spmcse@tce.edu
2. Mrs.C.Santhiya csit@tce.edu

18ITGF0	Assistive Technology

Category	L	T	P	Credit
GE	3	0	0	3

Preamble

This course gives the design and evaluation of Assistive Technologies with ethics, policies. It covers the attributes of many impairments and assisting or enabling technologies currently use. It's a course to design, prototype and evaluate the assistance with new/existing devices. Bridging the gap between people and assistive devices develop the client centred projects for various disability in the society.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	Weightage in %
CO1	Fundamentals of disability, communicating with the disability people and their needs	20
CO2	Understand the existing devices and technology used to assist the disability people	20
CO3	Analyse the gap between people and devices,	12
CO4	Finding the issues in Human Interface Design, Product idea, physical and cognitive impairments	14
CO5	Client Centred Design for various disabilities	10
CO6	Case studies for various disabilities design/modify/fabricate/devices to assist the people based on their needs	24

*** Weightage depends on Bloom's Level, number of contact hours,

CO Mapping with CDIO Curriculum Framework

CO #	TCE Proficiency Scale	Learning Domain Level			CDIO Curricular Components (X.Y.Z)
		Cognitive	Affective	Psychomotor	
CO1	TSP2	Understand	Respond		1.2,2.3.1,2.3.2
CO2	TSP2	Understand	Respond		1.2, 2.2, 2.3.1, 2.3.2, 3.1.4, 3.1.5
CO3	TSP3	Apply	Value		1.2, 2.2, 2.3.1, 2.3.2, 3.1.4, 3.1.5
CO4	TSP3	Apply	Value		1.2, 2.3.1, 2.3.2, 2.3.3, 4.4.1, 4.5.3, 4.5.5
CO5	TSP4	Analyse	Organise		1.2, 4.3.4, 4.6.1
CO6	TSP4	Analyse	Organise		1.2, 4.3.4, 4.5.3, 4.5.6, 4.6.1

Mapping with Programme Outcomes and Programme Specific Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	L										L	L		L
CO2	M	L										M	L		L
CO3	S	M	L									M	M		L
CO4	S	M	L		L							S	M	L	L
CO5	S	S	M	L	L			L	M			S	S	L	M
CO6	S	S	M	L	M	S	M	M	M	M		S	S	S	M

S- Strong; M-Medium; L-Low

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment			Assignment			Terminal Examination
	1	2	3	1	2	3	
Remember	20	10	10	-	-	-	10
Understand	30	30	20	20	-	-	20
Apply	50	40	40	40	50	50	40
Analyse		20	30	40	50	50	30
Evaluate							
Create							

Assessment Pattern: Psychomotor

Psychomotor Skill	Mini project /Practical Component/Observation
Perception	-
Set	-
Guided Response	-
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Sample Questions for Course Outcome Assessment**

Course Outcome 1 (CO1)
1. Discuss the first language exceptions for ability people
3. Discuss the workplace disablity etiquetee
4. Describe the key elements of inclusive culture

Course Outcome 2 (CO2)
1. Explain about IDEA (Individual with Disability Education Act)
2. Discuss the features of Smart Beetle device for visually challenging people
3. Discribe the purpose of mousekeys

Course Outcome 3 (CO3)
1. Illustrate the barriers faced by ability people and WHO initiatives
2. Show the High Tech Environment Assistive Technology for ability people
3. Illustrate Disability Theology with respect to Moral,Medical, Human, Social and econmic model

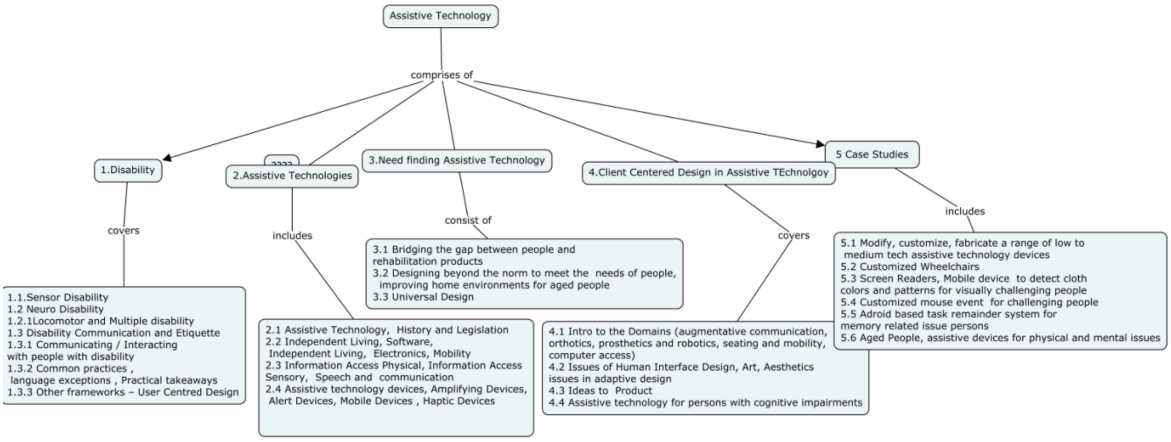
Course Outcome 4 (CO4)
1. Illustrate orthotics and prosthetics devices with diagram
2. List the accessability desing aspects for ability people
3. Illustrate the working of Augmentative Communication devices in detail

Course Outcome 5 (CO5)
1. Discover the Enhancement needed for wheel chiar based on environment factors
2. Analyse screen readers in the maket and discss its design issues
3. Compare cognitive and physical imparments

Course Outcome 6 (CO6)
1. Discover the mouse event for challenging people to control the mouse with eyes

2. Experiment new app to give remainders for aged people with memory issue
3. Experiment mobile device to detect cloth colors and patterns for visually challenging people

Concept Map



Syllabus

Disabilities – Sensor Disabilities – Neurodevelopmental Disabilities – Locomotors and Multiple Disabilities **Disability Communication and Etiquette** – Communicating / Interacting with people with disability – Common practices – people-first language exceptions – Practical takeaways – other frameworks – User Centered Design

Assistive Technology - History and Legislation – Independent Living – Software, Independent Living - Electronics – Mobility – Information Access Physical – Information Access – Sensory – Speech and communication– Assistive technology devices– Amplifying Devices – Alert Devices –Mobile Devices - Haptic Devices

Need finding and Assistive Technology – Bridging the gap between people and rehabilitation products – Designing beyond the norm to meet the needs of people- improving home environments for aged people

Client-centered design in Assistive Technology - Intro to the Domains (augmentative communication, orthotics, prosthetics and robotics, seating and mobility, computer access,) - Issues of Human Interface Design - Art, Aesthetics issues in adaptive design –Ideas to Product – Assistive technology for persons with cognitive impairments

Case Studies - Modify, customize, fabricate a range of low to medium tech assistive technology devices – Customized Wheelchairs – Screen Readers - Mobile device to detect cloth colors and patterns for visually challenging people – Customized mouse event for challenging people to control the mouse with eyes – Android-based task-reminder and sequencing system for a person with a brain injury causing deficits in working memory- Aged People – assistive devices for physical and mental issues

Learning Resources

1. Cook, Albert M., and Jan Miller Polgar. *Cook & Hussey's Assistive Technologies: Principles and Practice*. 3rd ed. Mosby Elsevier, 2007. ISBN: 9780323039079.
2. Bryant, D. P. & Bryant, B. R. (2012). Assistive technology for people with disabilities.Upper Saddle River, New York:Pearson

Course Contents and Lecture Schedule

Module No.	Topic	No. of Lecture Hours	CO
1	**Disabilities**		
1.1	Sensor Disabilities	1	CO1
1.2	Neurodevelopmental Disabilities , Locomotors and Multiple	2	
1.3	Disability Communication and Etiquette	1	
1.3.1	Communicating / Interacting with people with disability	1	
1.3.2	Common practices , people-first language exceptions , Practical takeaways	1	
1.3.3	Other frameworks – User Centred Design	1	
2	**Assistive Technology**		
2.1	Assistive Technology, History and Legislation	2	CO2
2.2	Independent Living, Software, Independent Living, Electronics, Mobility	2	
2.3	Information Access Physical, Information Access Sensory, Speech and communication	2	
2.4	Assistive technology devices, Amplifying Devices, Alert Devices, Mobile Devices , Haptic Devices	2	
3	**Need finding and Assistive Technology**		
3.1	Bridging the gap between people and rehabilitation products	2	CO3
3.2	Designing beyond the norm to meet the needs of people, improving home environments for aged people	2	
3.3	Universal Design	2	CO4
4	**Client-cantered design in Assistive Technology**		
4.1	Intro to the Domains (augmentative communication, orthotics, prosthetics and robotics, seating and mobility, computer access)	2	CO4
4.2	Issues of Human Interface Design, Art, Aesthetics issues in adaptive design	1	CO5
4.3	Ideas to Product	1	
4.4	Assistive technology for persons with cognitive impairments	2	
5	**Case Studies**		
5.1	Modify, customize, fabricate a range of low to medium tech assistive technology devices	1	CO6
5.2	Customized Wheelchairs	1	
5.3	Screen Readers, Mobile device to detect cloth colors and patterns for visually challenging people	2	
5.4	Customized mouse event for challenging people to control the mouse with eyes	1	
5.5	Android-based task-reminder and sequencing system for a person with a brain injury causing deficits in working memory	1	
5.6	Aged People, assistive devices for physical and mental issues	3	
	Total Hours	36	

Course Designers

Dr.D.Tamilselvi dtamilselvi@tce.edu
Mrs.T.Manju tmanju@tce.edu