CURRICULUM AND DETAILED SYLLABI

FOR

TCE ONLINE COURSES

FOR THE UG/PG STUDENTS ADMITTED FROM THE

ACADEMIC YEAR 2018-19 ONWARDS

THIAGARAJAR COLLEGE OF ENGINEERING
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21ECMA0	DISCRETE TIME SIGNAL PROCESSING

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

Discrete Time Signal Processing is concerned with the representation, transformation and manipulation of signals and the information they contain. Signal Processing has developed rapidly over the past few decades and has numerous applications in the field of Audio and Speech Processing, Radar, Sonar, Robotics, Big data, Bio medical and many more. In this course, we begin with the review of Signals and Systems including the summary of analysis and synthesis equation for Fourier Transforms tools and z-transform. An in-depth computation of DFT and FFT algorithms in spectral analysis and filtering applications is presented. This course develops different methods of filter design in both IIR and FIR and the corresponding structures.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Compute DFT and IDFT coefficients of a given discrete time sequence using Fast Fourier Transform algorithms	Apply
CO2	Design Linear phase FIR digital filters using windowing and frequency sampling methods	Apply
CO3	Design IIR digital filters from analog filters namely Butterworth, and Chebyshev for a given specification	Apply
CO4	Draw the implementation structure of FIR and IIR discrete time systems using block diagram and signal flow graph representation.	Apply

CO – PO Mapping

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

Syllabus

Module 1: Review of signals and systems: Concept of frequency in discrete-time signals, summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling and z-transform

Module 2: Discrete Fourier Transform (DFT) : Deriving DFT from DTFT, properties of DFT - periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT). Linear filtering using FFT

Module 3:Finite Impulse Response Filters: Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations

Module 4:Infinite Impulse Response: Characteristics of practical frequency selective filters. characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain.Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

Course Designers

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21EEMA0	FPGA BASED DIGITAL SYSTEM DESIGN

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

Digital designs once built-in custom silicon is increasingly implemented in field programmable gate arrays (FPGAs), but effective FPGA system design requires an understanding of new techniques developed for FPGAs. This course deals with basic digital system design, Introduction to ROM,PLDs, CPLDs, FPGA fabrics and introduces essential FPGA concepts and programming.The course covers the technological background of FPGA both theoretically as well as practical implementation of digital solutions.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Design digital circuits using PROMs and SPLDs (Programmable Logic Array (PLA),Programmable Array Logic(PAL)	Apply
CO2	Describe the architecture and features of CPLDs	Understand
CO3	Explain architecture and features of SRAM, Flash and antifuse based FPGA	Understand
CO4	Develop Verilog based programs and simulate digital circuits	Apply
CO5	Implement digital circuits in Xilinx FPGA processor using Hardware description Language experimentally	Apply

CO – PO Mapping

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

Syllabus

Module -1 : Evolution and Basics of ICs and Digital System Design

Evolution of Integrated Circuits – Digital Logic Family – Basics of Logic gates – Boolean Algebra – Digital circuit design using Boolean Algebra and K - Map

Module- 2:ROM, SPLD, CPLD Architecture and Features of FPGA and designing techniques.

Architecture of ROM – ROM Programming – Architecture of SPLDs – SPLDs programming – Architecture of CPLDs – Basics of FPGAs– Structure of FPGAs

Module-3 : Verilog Coding and Simulation of Digital Systems using Xilinx
Verilog HDL Basics- Gate level, Data flow and Behaviour Modelling – Simulation of simple digital circuits

Module -4:Implementation of Digital circuits in FPGA processor
Spartan 6 FPGA features – Education FPGA kit – FPGA pin assignment – Implementation of simple digital circuits using FPGA hardware – Interfacing Input/Output devices with FPGA

Course Designers

- Dr. R.Helen , rheee@tce.edu
- Dr. D.Kavitha, dkavitha@tce.edu

21ITMA0	DATA VISUALIZATION

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

Today's fast world requires the data to be presented in an abstract and appealing way to attract the audience. Most of the websites like social media, e-Commerce use info-graphics and dashboards to engages their visitors. The use of different data visualization techniques makes all these requirements possible through this four weeks Data Visualization Course. This course predominantly uses Python libraries for creating charts, interactive figures and animations

Prerequisite

Nil

Course Outcomes

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

CO Number	Course Outcome Statement	Blooms Level
CO1	Use python libraries for data visualization	Apply
CO2	Conduct exploratory data analysis using Python	Analyze
CO3	Interpret results of exploratory data analysis	Analyze
CO4	Paraphrase the results for documentation	Analyze

CO – PO Mapping

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

Syllabus

Module 1 Basic Plotting
Line plot - Bar plot - Pie Chart - Scatter Plot - Histogram - Stacked Bar Charts - Sub Plots - Matplotlib, Searborn, Plotly - Seaborn Styles
Module 2 Applied Visualizations
Box plot - Density Plot - Area Chart - Heat map - Tree map - Graph Networks
Module 3 Interactive Visualizations and Animations
Dynamic charts - Dynamic maps - Animation types - 2D, 3D, Motion Animation - Animation Principles - Altair Package - Statistical Visualizations
Module 4 Principles of Information Visualization
Visual Perception and Cognition - Gestalt's Principles - Tufte's Principles - Applications of Principles of Information Visualization - Dashboard Design

Course Designers

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21ITMB0	ANDROID MOBILE APPLICATION DEVELOPMENT

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

This course provides knowledge and skills on recent technologies in native mobile application development. It is designed to meet the current business needs in the market. It provides a platform for the students to create innovative and robust mobile applications for the society.

Prerequisite

Any basic programming language

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Understand the basic concept of oops needed to develop a mobile application.	Understand
CO2	Apply the main components of UI which includes layouts, widget and views to build a mobile application.	Analyze
CO3	Use appropriate menus and notifications for developing an interactive mobile application with the	Analyze
CO4	Design and development of mobile applications which includes required services and databases for solving societal and environmental IT problems.	Apply

CO – PO Mapping

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

Syllabus

Module 1.OOPS and Basic GUI

Introduction to OOPS concepts - Classes - Encapsulation - Inheritance - Polymorphism- Interfaces - GUI Fundamental concepts.

Module 2:.Introduction to Android

Android Studio Installation - Android APIs - Widgets - Layouts and Views - Activities and Intents

Module 3:. Menus and Notifications

Menu Types : Option Menu - Context Menu - Pop Menu - Notification : Status Notification - Toast Notification - Dialogue Notification

Module 4. Services and Data Storage Mechanisms

Exploration of Lifecycle Operations - Creating and Registering services- Location based Services - Broadcast receivers, Files -Internal Storage - External storage - Shared Preferences - SQLite Database – Firebase

Course Designers

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21ITMC0	APPLIED DATA SCIENCE WITH PYTHON

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

Data scientists who can handle, analyze data and contribute to data driven decisions and products are the need of the hour. Data science is an interdisciplinary field focused on extracting knowledge and making better decisions in various domains such as banking, finance, entertainment, healthcare, agriculture, sensors, instrumentation and robotics etc. The course enables the students to learn and use python libraries for solving real time applications that use supervised and unsupervised learning technique

Prerequisite

Nil

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Explain the need for data pre-processing and visualization techniques.	Understand
CO2	Analyse the performance of different supervised learning algorithms like decision Tree, Random Forest, Linear Regression, Logistic Regression etc.	Analyze
CO3	Compare the performance of unsupervised learning algorithms like K-Means, K-Medoidsetc for grouping the given data	Analyze
CO4	Select appropriate data preprocessing techniques, models and visualization techniques to solve hidden solutions related to business/ social-related challenges	Apply

CO – PO Mapping

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

Syllabus

Module -1- Introduction to Data Science, Python Data Structures, Python Numpy Package Data Science - Need, Applications, Difference between data analysis and data analytics. Python- Variables, data types, control structures, Operators, Simple operations, Array and its operations, Numpy operations, Matrix and its operations

Module 2 Data preparation and preprocessing using Pandas dataframe, Exploratory Data Analysis, Data Visualization Dealing missing values, Normalization, statistical description about the data, Accessing the data, Summary of the data, Relationship between the data, Data Visualization using matplotlib

Module 3 Supervised Learning Algorithms Decision Tree Algorithm, ID3 Classifier, Random Forest, Classifier Accuracy, Linear Prediction, Logistic Regression – Case study

Module 4 Unsupervised Learning Algorithms Various distance Function, Dissimilarity between the mixed types of data, K-Means Algorithm, K- Medoids Algorithm -Case Study

Course Designers

1. Dr.C.Deisy, hodit@tce.edu
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3. Dr.K.V.Uma, kvuit@tce.edu
4. Mrs.S.Pudumalar, spmit@tce.edu

21ITMD0	Essentials of Blockchain	Category	L	T	P	Credit
		PSE-EX	1	0	0	1

Preamble

Blockchain is an emerging technology platform for developing decentralized applications and data storage, over and beyond its role as the technology underlying the cryptocurrencies. The basic tenet of this platform is that it allows 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. The objective of this course is to provide conceptual understanding of how block chain technology can be used to innovate and improve business processes. The course covers the technological underpinning of blockchain operations in both theoretical and practical implementation of solutions using blockchain technology.

Prerequisite

Nil

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom;s Level
CO1	Explain the fundamental characteristics of blockchain using bitcoin.	Understand
CO2	Demonstrate the application of hashing and public key cryptography in protecting the blockchain	Apply
CO3	Explain the elements of trust in a Blockchain: validation, verification, and consensus.	Understand
CO4	Perform a transaction in bitcointestnets.	Apply
CO5	·Develop smart contracts in Ethereum framework	Apply

CO – PO Mapping

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

Syllabus

Module -1- Blockchain technology and Bitcoin:

Bitcoin eco system - peer - to - peer permission less network - addresses in bitcoin. Transactions - syntax, structures, and validation, Blocks - structure, Merkle tree and validation, blockchain, Mining - target/difficulty, hash rates, consensus, forking.

Module 2 Cryptographic Applications in Blockchain

Wallets - hash functions - public key cryptography - elliptic curve cryptography - digital signatures

Module 3 Smart Contracts - Ethereum

Smart Contracts- Objectives and principles for the design of Blockchain systems, Understanding Ethereum, EthereumBasics , Writing smart contracts using Ethereum

Module -4 Enterprise Applications of Blockchain

Issues and Needs of Blockchain, Benefits and Challenges of Blockchain Implementation - Smart Health Care, Transportation, Smart City and Supply Chain Management

Course Designers

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4. Mrs.R.Parkavi, rpit@tce.edu

21ITME0	MODERN TESTING PRACTICES: A PRIMER TO TESTING CERTIFICATION

Category	L	T	P	Credit
PSE-EX				1

Preamble

Testing is an indispensable part of quality software development and deployment. Demand for QA professionals is always persistent in the software Industry. Good analytical skills and proper training on the testing tools and practices would open a sea of opportunities for fresh graduates in the QA domain. Hence, this course on modern testing practices and tools has been designed with the following objectives:

- To expose the learners to the skills required to pursue a career in the field of software quality assurance
- To acquire the necessary skills to successfully pursue and complete standard ISTQB and CSTE certifications.
- To bridge the industry-academia gap by imparting knowledge on contemporary software development and testing practices

.Prerequisite

Nil

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Demonstrate the traditional and agile software development approaches and testing practices.	*Understand*
CO2	Identify Test conditions for the given application and design test cases by employing suitable techniques	*Apply*
CO3	Develop test scripts and execute them using appropriate tools	*Apply*
CO4	Automate the test execution using Junit framework, Selenium IDE and Selenium Webdriver	*Apply*
CO5	Implement behaviour driven development and user story-based testing using cucumber.	*Apply*

CO – PO Mapping

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

Syllabus

Module 1: Traditional and Agile approach to software development

SDLC Models - Traditional Testing - Testing types - Testing levels - Agile Testing- Continuous Integration -Behavior Driven Development - Test Process

Module 2: Test cases design and Authoring

Test Design Techniques: Equivalence Partitioning, Boundary value analysis, Decision Tables, State Transition Charts - User story based Testing - Regression Testing - Test Plan Authoring

Module 3: Test Automation for Unit and Functional testing

White box testing Junit Framework - Functional testing with Selenium - User story based testing with Cucumber

Module k 4: Testing tools: JIRA, Selenium and Cucumber

Test Management with JIRA - Integration of github and zephyr with JIRA - Testing with Selenium IDE - Testing with Selenium Webdriver - Feature based testing with cucumber - Integration of Selenium framework and cucumber.

Course Designers

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2. Ms.S.ThiruchadaiPandeeswari, eshwarimsp@tce.edu

21MTMA0	INDUSTRIAL AUTOMATION

Category	L	T	P	Credit
PSE-EX				1

Preamble

Industrial automation is one of the most notable and impactful steps toward solving complicated real time manufacturing applications. By using new, creative, and integrated technologies and services, industrial automation makes it possible to improve product quality, reliability, and production rate while lowering manufacturing and design costs. The course covers both theoretical and practical aspect of industrial automation through Fluid power and PLC for solving real time applications problems.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Blooom's Level
CO1	Explain the construction, working and control strategies of different industrial drives and valves.	Understand
CO2	Design pneumatic and Electro pneumatic circuits for solving real time problems.	Apply
CO3	Design Hydraulic and proportional hydraulic circuits for Industry 4.0 applications.	Apply
CO4	Develop PLC program for low level industrial applications	Analyze

CO – PO Mapping

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

Syllabus

Module 1- Fluid Power Automation- Introduction: Introduction- Classification of Fluid Power automation (FPA) – Significance of FPA- Gas Law- Direction flow and pressure control valves- Directional control valve – 3/2-way valve – 4/2-way valve – 5/2-way valve - Shuttle valve –check valve - Pressure control valve – Simple and compound relief valve, pressure reducingvalve, sequence valve, counter balance valve. Flow control valve.

Module 2 Pneumatic & Hydraulic Circuits : Design requirements-Speed control circuits, Direct Flow control circuits- OR, AND Function - Penumo hydraulic circuit, Fail safe circuit, Sequential circuit and cascade circuit design for real time industry applications – Simulation demonstration of sequential and cascade circuit.

Module 3 Electro Pneumatic and Proportional Hydraulic circuits: Introduction to relay and solenoid – Electro Pneumatic control – Solenoid actuated valves – Circuit diagram -

Sequential circuit and cascade circuit design – Proportional Hydraulic circuit operation-Simulation demonstration of electro sequential and cascade circuit.

Module -4 Introduction to PLC :PLC architecture – I/O Section -Discrete I/O Modules - Analog I/O Modules-Special I/O Modules –I/O Specifications- PLC functions – PLC Programming Languages-PLC Modes of Operation - Designing aLadder Diagram for large process–Programming Timers-Programming counters

Course Designers

1. Mr. S. Julius Fusic, sjf@tce.edu
2. Mr. H. Ramesh,rameshh@tce.edu

21DSMA0	APPLIED STATISTICS AND PYTHON PROGRAMMING

Category	L	T	P	Credit
PSE-EX				1

Preamble

Applied Statistics includes planning for the collection of data, managing data, analyzing, interpreting and drawing conclusions from data, and identifying problems, solutions and opportunities using the analysis. This course helps the learners to build critical thinking and problem solving skills in data analysis and empirical research. Learners will learn where data come from, what types of data can be collected, study data design, data management, and how to effectively carry out data exploration and visualization with python programming.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Apply the basic concepts of distributions, charts and various types of measures.	Apply
CO2	Apply the concepts of estimation and its type in mean, proportion and variance.	Apply
CO3	Demonstrate the concept of testing of hypothesis for small and large samples by using various tests like t-test, z-test and chi-square test	Apply
CO4	Apply the concept of Correlation and regressions to engineering problems	Apply
CO5	Apply multiple regression and correlation analysis, Inferences about population parameters and Modeling techniques.	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**S**	**M**	**L**		**M**							
Co2	**S**	**M**	**L**		M							
CO3	**S**	**M**	**L**	**L**	M							
CO4	**S**	**M**	**L**	L	M							
CO5	**S**	**M**	**L**	L	M							

Syllabus

Module 1: DESCRIPTIVE STATISTICS: Frequency distribution – Bar graphs and Pie charts – Histogram- Ogive – Simpson's paradox – Measures of Location.

Module 2: Measures of Variability – Measures of distribution shape, relative location and detecting outliers – Exploratory Data analysis, Stem-and-leaf display – Measures of Association between two variables.

Module 3: Hypothesis Testing: General concepts - Errors in Hypothesis testing - One-and two-tailed tests - Tests concerning mean, proportion, and variance - Tests for Goodness of fit and independence of attributes.

Module 4: CORRELATION AND REGRESSION: introduction - Estimation using the regression line - Correlation analysis -Limitations, errors

Course Designers

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21DSMB0	PREDICTIVE ANALYTICS WITH REGRESSION: SIMPLIFIED

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

Predictive analytics encompasses a variety of statistical techniques from data mining, predictive modelling, and machine learning that analyse current and historical facts to make predictions about future or otherwise unknown events. It finds its applications in all the Engineering disciplines including Manufacturing, Cyber Security, Tele communication and Smart Grid applications. This course will be introducing the real time applications of Predictive analytics in various engineering domains and enable students to apply specific statistical and regression analysis methods applicable to predictive analytics to identify new trends and patterns and uncover relationships

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Apply the concept of linear regression to simple prediction problems, residual analysis, confidence and prediction intervals	Apply
CO2	Apply the concept of multiple linear regression to find interpretation of prediction variables, regression coefficients, heteroscedasticity and multicollinearity	Apply
CO3	Apply the concept of logistic regression to find simple solutions for classification problems and evaluate the models	Apply
CO4	Explain the different methods of improvement in regression models including multinomial regression, regularization, cross validation and feature subset selection	Understand

CO – PO Mapping

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

Syllabus

Module 1: Introduction to Predictive analytics. Models and methods, Role of regression in predictive learning; SIMPLE LINEAR REGRESSION: Calculating the coefficients, Coefficient of determination, Significance test, Confidence and Prediction intervals. Demonstrations in Python and Excel

Module 2:MULTIPLE LINEAR REGRESSION: Basic concepts, Coefficient of determination, Interpretation of regression coefficients Categorical variables, heteroscedasticity, Multi-co linearity, outliers and influential observations, Demonstrations in Python

Module 3: LOGISTIC REGRESSION:Logistic function, Estimation of probability using Logistic regression, Evaluating logistic regression models- Demonstrations in Python

Module 4: PERFORMANCE IMPROVEMENT:Bias and variance, Regularization, Feature subset selection, Feature extraction, Cross validation, Other performance measures-Demonstrations in Python

Course Designers

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TCE ONLINE COURSES - ASSESSMENT

1. ***Components of assessment:***

Total marks awarded towards completion of course: 100

- Internal Assessment: 50 marks (Maximum)
- External Assessment : 50 marks (Maximum)
- Total marks: Internal assessment + External Assessment = 100 marks

2. Internal assessment:

Internal assessment shall be conducted as quiz and assignments as mentioned in the respective courses. There shall be a minimum of one graded quiz per week that shall be completed within 14 days from the start date of the quiz. Number of attempts allowed is 2 and highest mark shall be taken.

In addition to the quiz, there shall be assignments in the courses which has to be duly submitted within 14 days from the start date of the quiz. The course coordinators shall evaluate the assignments and release the final scores for the assignments. The decision of course coordinators is final.

The scores of all the modules including weekly quizzes and assignments shall be averaged to 50 marks, contributing to internal assessment mark.A grading scheme shall be specified explicitly in the introduction module for every course.

3. External Assessment:

External assessment shall be conducted as proctored online examination scheduled by the Controller of Examinations.. Only one attempt is allowed.

4. Award of Academic Credits:

A learner enrolled in a course is eligible for receiving the academic credit in the course when all of the following requirements are satisfied.

a. The learner has obtained a minimum average score of 50% of maximum marks in internal assessment activities
b. The learner has obtained a minimum score of 50% of maximum marks in External assessment

. The classification of grades based on the consolidated score is as follows:

Range of Consolidated Score (CS)	Letter Grade	Grade Point
90 ≤ CS ≤ 100	S	10
80 ≤ CS < 90	A	9
70 ≤ CS <80	B	8
60 ≤ CS <70	C	7
50 ≤ CS <60	D	6
0 ≤ CS <50	U	0

22ARMA0/ 22ARMB0/ 22ARMC0/ 22ARMD0	VISUAL ARTS -A TOOL OF CREATIVITY

Category	L	T	P	Credit
	1	0	0	1

Preamble

The both Creativity and Productivity is based on Art. The curriculum of engineering courses based on productivity almost. Instead of raw engineering curriculum and in them, infusing the art will chances the rising questions, in breaking the existing thinking to cultivate students' ability of divergent thinking and enhance their creativity indeed. In short, art could directly or indirectly train students' creativity, ability of self-expression and the ability of critical thinking. Further, it promotes team participation to inspire students to have more creativity, possibility and diversity. Therefore, this course shall lead their observational skills towards creative-productivity

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Recognize art as a powerful medium to create	Understand
CO2	Recall to refer and compare to keep the evolutional discipline	Remember
CO3	Experiment new ideas innovatively	Apply
CO4	Illustrate according to the Engineering Design	Apply

CO – PO Mapping

B.E./B.Tech. (22ARMA0)

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

M.C.A. (22ARMB0)

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

M.Sc. Data Science(22ARMC0)

CO	PO1	PO2	PO3
CO1	**L**	**-**	**L**
CO2	**L**	**-**	**L**
CO3	**L**	**-**	**L**
CO4	**L**	**-**	**L**

B. Arch (22ARMD0)

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

Syllabus

Module 1: An introduction: Visual Arts a tool of Creativity, Creativity – Creation – Creative, STEM to STEAM, Production – Productivity, The wheel for the whole - Cart wheel – Potter wheel - Pottery wheel evolved to all Engineering - Cart wheel evolved to all transportations

Module 2: Productivity Vs Creativity: An Introduction on Creativity, Realistic - Abstract – Aesthetic, On Productivity, The Creativity of Primitive Men - Creativity according to the Prehistoric and Historic Period – Demonstrating rock art - on a conceptual creativity on the axis of aesthetic, The early structural engineering of Stonehenge – Pyramid, Relief sculpture of Descent of the Ganges – Marble sculpture of Pieta

Module 3: Contemporary Creativity according to Productivity: Initial spark of the mind – scribbling the same – watercolour conversion – IT tool conversion – Clay modelling – miniature modelling – Full scale modelling, Standing on own leg – entrepreneurship a fine solution

Module 4: Hands on assignments: To explore Entrepreneurship, learning the art to use as a tool to sketch accordingly - Bike Mirror - elegant Ceiling and Pedestal fans - Interior Lamp creatively - Web camera and CCTV Camera – Scale down model according to the provided reference. Innovative Silencers for bike.

Course Designers

1. Prof. Dr. S. A. V. Elanchezian, (drsavelan@tce.edu)
2. Prof. R. Vinoth Kumar (rvkarch@tce.edu)

22ITMA0 / 22ITMB0 / 22ITMC0	PROGRAMMING IN C - A PRIMER FOR PLACEMENT

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

The course aims to explore structural and procedural programming concepts and software code organization. The course enables the learners to build mathematical and algorithmic logics to develop programs/applications of medium complexity using C language.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Write programs using a core portion of the C run-time library including: input/output, string manipulations and recursion	Apply
CO2	Program effectively with pointers, arrays, structures, and dynamically allocated memory and describe their internal representations.	Apply
CO3	Develop C programs with optimal time and space complexity.	Apply
CO4	Select appropriate problem solving technique to provide solutions for the given problem.	Apply

CO – PO Mapping

B.E./B.Tech. (22ITMA0)

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

M.C.A **(22ITMB0)**

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

M.Sc. Data Science **(22ITMC0)**

CO	PO1	PO2	PO3
CO1	S	M	L
CO2	S	M	L
CO3	S	M	L
CO4	S	M	L

M.E (22ITMD0)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	M	M		L			M	L	M	
CO2	S	M	M		L			M	L	M	
CO3	S	M	M		L			M	L	M	
CO4	S	M	M		L			M	L	M	

Syllabus

Module 1: Programming constructs: Structured Programming Languages – Data types – Operators – Conditional Constructs – Looping Constructs – Functions - Recursion – Scope Rules

Module 2: Arrays: 1D Array – 2D Array – Multi Dimensional Array – Arrays and Functions – Strings – String Functions

Module 3: Structures and Pointers: Structures – Array of Structures – Pointers –– Pointers and Arrays – Pointers and Functions - Pointers and Structures – Dynamic Memory Allocation – Unions - Enumerators - Bit Fields – Files – Preprocessor – Command Line Arguments

Module 4: Algorithm Analysis: Time Complexity Analysis **-** Big Oh Notation – Searching and Sorting – Palindrome - kth Smallest Element – Array Rotations – Matrix Problems - Backtracking

Course Designers

1. Dr.A.M.Abirami, abiramiam@tce.edu
2. Dr.P.Karthikeyan, karthikit@tce.edu
3. Dr.C.Jeyamala, jeyamala@tce.edu

22ITME0/ 22ITMF0/ 22ITMG0/ 22ITMH0/	PROGRAMMING IN JAVA: A PRACTICAL APPROACH

Category	L	T	P	Credit
PSE-EX	2	0	0	2

Preamble

This course will provide exposure to object-oriented programming (OOP) concepts using Java from the placement perspective. It covers core concepts of Java and advanced features like collections, exceptions and thread communication.

Prerequisite

Nil

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Apply Basic Programming concepts such as type casting, control structures and looping statements to execute a given program.	Apply
CO2	Develop applications that use File I/O Operations and strings.	Apply
CO3	Implement abstraction and package concepts for the given scenario.	Apply
CO4	Apply object-oriented concepts like encapsulation, polymorphism and inheritance to solve the given problem.	Apply
CO5	Develop applications that use collections and exceptions for the given requirements.	Apply
CO6	Implement multi thread and inter-thread – communication to solve the given problem	Apply

CO – PO Mapping

B.E./B.Tech. (22ITME0)

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

M.C.A **(22ITMF0)**

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

M.Sc. Data Science **(22ITMG0)**

CO	PO1	PO2	PO3

CO1	**S**	**M**	**L**
CO2	**S**	**M**	**L**
CO3	**S**	**M**	**L**
CO4	**S**	**M**	**L**
CO5	**S**	**M**	**L**
CO6	**S**	**M**	**L**

M.E **(22ITMH0)**

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

Syllabus

Module 1: Basic Programming Concepts: - Keywords - Variables - Identifiers - Datatypes - Operators – Type Conversions - Selection control structures - Iteration control structures

Module 2: Basics of OOPS: Need for OOP - Class and objects - Methods and parameters - Constructors - Instance and local variables - this keyword - - Access modifiers – Encapsulation

Module 3: Arrays and Strings: Working with Arrays - Array manipulation - Working with Strings - String manipulation methods

Module4: Inheritance and Polymorphism: Association- Aggregation - Inheritance and its types - super keyword - Method overloading – Constructor Overloading - Method overriding

Module 5: Abstraction and Packages: Abstract classes – Interface - Packages - Creating user defined packages

Module 6: Collections: Classes and Interfaces -Lists - Set - Hash Set -Tree Set – Hash Map - Stack – Queue

Module 7: Exception Handling: Exceptions - Types of exceptions - Exception Handling mechanism - Multiple catch blocks - Nested try blocks - throw and throws keyword - finally block- creating custom exception

Module 8: Inter Thread Communication: Thread life cycle, creation & priority - Multiple threads, Synchronization - Inter thread communication

Course Designers

1. Dr.S.Sridevi, sridevi@tce.edu
2. Mrs.C.V.Nisha Angeline , cvnait@tce.edu
3. Dr.S.Ilankumaran, siit@tce.edu
4. Mr.P.Manoj Kumar, pmkit@tce.edu

22ITMI0/ 22ITMJ0/ 22ITMK0/ 22ITML0	DATABASE MANAGEMENT SYSTEM: ROAD MAP TO PLACEMENT AND GATE PREPARATION

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

This course helps GATE Exams aspirant students by delivering core concepts, principles and techniques of a database management system, thereby equipping them to design and implement a database application built over those concepts. It also focuses on advanced level areas like transaction processing, concurrency control and recovery management

Prerequisite

Nil

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Make use of relational algebra, and tuple calculus to solve the given query	Apply
CO2	Demonstrate simple and complex SQL queries for a given database.	Apply
CO3	Apply various normalization techniques to improve the database design.	Apply
CO4	Apply File indexing techniques like B tree, B+ tree for effective retrieval of data.	Apply
CO5	Apply concurrency control and transaction processing techniques for the given scenario	Apply

CO – PO Mapping

B.E./B.Tech. 22ITMI0

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

M.C.A (**22ITMJ0)**

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

M.Sc. Data Science (**22ITMK0)**

CO	PO1	PO2	PO3
CO1	S	M	L
CO2	S	M	L
CO3	S	M	L
CO4	S	M	L
CO5	S	M	L

M.E (**22ITML0**)

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

Syllabus

Module 1: Solving Problems in Data Modeling and Query Language: Identification of relationship in ER diagram. Solving problems using Relational Algebra. Use of Primary key and Foreign Key Constraints. Identification/Writing appropriate queries. Use of different Constraints and String functions.

Module 2: Implementation and Discussion on Extended Query Language: Solving Queries with Join operations. Appropriate solutions for subqueries using Single row and Multi row subquery functions. Apply Complex Queries for the given Schema. Creation and Updation of View

Module 3: Analyzing the Relation using Normalization and File Organization: Brief Introduction to Normal Form. Identification of Normal form in the given relation. Analyze the Relation Schema for 1NF,2NF,3NF, BCNF,4Nfand 5 NF.Need for File Indexing-B and B+ tree. Solution for File Indexing.

Module 4: Exploration of Transaction and Concurrency Control techniques: Properties and States of Transaction. Identification of Serial Schedule, Conflict Serializability. Use of Two phase locking Protocol and Time stamp ordering. Applying Deferred update, Immediate Update and Shadow Paging

Course Designers

1. Dr.C.Deisy ,cdcse@tce.edu
2. Dr.S.Sridevi, sridevi@tce.edu
3. Dr.K.V.Uma, kvuit@tce.edu
4. Ms.S.Pudumalar,spmit@tce.edu

22ITMM0/ 22ITMN0/ 22ITMP0/ 22ITMQ0/	STATISTICAL MODELING AND ANALYSIS

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

The realm of statistical modeling makes mathematical evaluation for the application to get authenticated against the observed data. There are different types of statistical models known as tests that can be used to analyze data. The objective behind this course is to describe and predict information, observe the characteristics and pattern behind the data, validate and test the data model, evaluate the data model with mathematical inference and representation, use a limited sample to make intelligent and accurate conclusions about a greater population.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Practice t-tools and permutation-based alternatives including bootstrapping, multiple-group comparisons, analysis of variance, linear regression, model checking, and refinement.	Apply
CO2	Modeling Statistical computing and simulation-based emphasis as well as basic programming in the SPSS, Rapid miner statistical package.	Apply
CO3	Develop tools for real-life applications by evaluating assumptions	Apply
CO4	Predict real word data with mathematical models and statistical assumptions.	Apply

CO – PO Mapping

B.E./B.Tech. (22ITMM0)

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

M.C.A **(22ITMN0)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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

M.Sc. Data Science **((22ITMP0)**

CO	PO1	PO2	PO3
CO1	S	M	L
CO2	S	M	L
CO3	S	M	L
CO4	S	M	L

M.E (22ITMQ0)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	M	M		L						S

CO2	**S**	**M**	**M**		**L**						**S**
CO3	**S**	**M**	**M**		**L**						**S**
CO4	**S**	**M**	**M**		**L**						**S**

Syllabus

Module 1: Introduction to Analytics: Overview - Data and its processing platforms - Analytics Process Model - Analytics Model Requirements-Types of Analytics - Predictive analytics - Descriptive Analytics - Text Analytics - Social Media Analytics -Survival Analytics

Module 2: Introduction to Statistics: Introduction to statistical modeling – Exploratory data analysis – Probability and Distributions - Properties of random variables - Bayesian and frequentist approaches to statistical inference

Module 3: Descriptive Statistics: Univariate descriptive statistics – Sampling and estimation - Hypothesis testing– Multivariate descriptive statistics – Normal distributions– inference

Module 4: Statistical Modeling: ANOVA – MANOVA – Regression – Estimation of model accuracy and testing – Principal Component Analysis - Factor Analysis

Course Designers

1. Mrs.R.Parkavi , rpit@tce.edu
2. Mrs.C.Santhiya, csit@tce.edu

22ITMR0/ 22ITMS0/ 22ITMT0/ 22ITMU0/	CLOUD COMPUTING FOR BEGINNERS

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

Cloud computing has grown to be an inevitable paradigm with several use-cases including applications leveraging modern technologies like IoT, Big Data and Machine learning. This course provides a strong foundation of knowledge on Cloud Computing concepts and services, facilitating the usage of Cloud based services and tools in application development and deployment. This course also aims to impart the basic skills needed to become a cloud practitioner or carry out research projects in this domain

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Identify the application requirements for computing & storage and effectively use cloud based environments for the same	Understand
CO2	Employ cloud service models for application development and deployment	Apply
CO3	Examine the technologies that enhance cloud computing such as execution environment virtualization, storage virtualization and distributed storage.	Apply
CO4	Recognize the use of cloud in building IoT systems, sophisticated prediction and recommender systems and smart systems for healthcare, transportation and agriculture.	Apply
CO5	Simulate and create cloud environments using cloudsim and openstack respectively	Apply

CO – PO Mapping

B.E./B.Tech. (22ITMR0)

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

M.C.A **(22ITMS0)**

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

M.Sc. Data Science (**22ITMT0)**

CO	PO1	PO2	PO3
CO1	S	M	L
CO2	S	M	L
CO3	S	M	L
CO4	S	M	L
CO5	S	M	L

M.E **(22ITMU0)**

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

Syllabus

Module 1 - Application Provisioning Requirements : Web application architecture - Identification of necessary Infrastructure - Traditional IT infrastructure - Cloud based IT infrastructure.

Module 2 - Virtualization : Types of Execution environment virtualization - Full, Para and Partial virtualization – Levels of Virtualization - Virtual Machine Managers - Storage Virtualization - Network Virtualization

Module 3 - Cloud Service Models: Software as a service - Platform as a service - Infrastructure as a service - Storage as a service - ID as a service - Database as a service

Module 4- Cloud Research and Practice : Use cases of Cloud in IOT, Machine learning, Smart healthcare, transportation and agriculture - Simulating a cloud environment using cloudsim - Create a cloud environment using openstack - Resource provisioning and scheduling in cloud

Course Designers

1. Dr.S.Padmavathi, spmcse@tce.edu
2. Dr.K.Indira, kiit@tce.edu
3. Mrs. C.Santhiya, csit@tce.edu
4. Mrs. S. Thiruchadai Pandeeswari, eshwarimsp@tce.edu

22ITMV0/ 22ITMW0/ 22ITMX0/ 22ITMY0/	BIG DATA TOOLS AND TECHNIQUES

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

The term big data has been used repeatedly with technologies concerning IoT, Machine learning, Artificial Intelligence with the aspect in the generation of huge amount of data. With the generated data the algorithms and its tools explores the patterns and insights that makes the data into a decision support model. The course aims to provide practical experience in big data techniques and technologies that can be used significantly with different forms of real-time data.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Explain the big data platforms like Hadoop and Spark for data sharing, services, respositories to manage big data	Apply
CO2	Use scripting technologies Hive and pig for big data processing	Apply
CO3	Use NoSql database models for different big data applications	Apply
CO4	Use python packages and libraries for big data applications	Apply

CO – PO Mapping

B.E./B.Tech. (22ITMV0)

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

M.C.A **(22ITMW0)**

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

M.Sc. Data Science ((**22ITMX0)**

CO	PO1	PO2	PO3
CO1	S	M	L
CO2	S	M	L
CO3	S	M	L
CO4	S	M	L

M.E **(22ITMY0)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	M	M		L			M	L	M	
CO2	S	M	M		L			M	L	M	
CO3	S	M	M		L			M	L	M	
CO4	S	M	M		L			M	L	M	

Syllabus

Module 1: Big Data Analytics Platforms - Hadoop, Spark: Introduction - Big Data Technologies - Introduction to Hadoop - Hadoop Architecture- Design of HDFS- Mapreduce - Hadoop Ecosystem - Spark - Architecture -Spark streaming

Module 2: Scripting technologies - Pig , Hive: Introduction - Pig -Execution types - running PIG programs -PIG Latin Structure- statement - Expression - Function
Hive Shell - HiveQL queries -Services- Tables

Module 3: NoSQL Data Models: Introduction - Aggregate data models - Distribution models -Key value - Document data model - Columnar data model - Graph data model -case study

Module 4:Python for Big data Applications: Big Data Technology: Time series data - NLP - Chatbot - Classification models- Weather forecasting - Sensor data analysis

Course Designers

1. Dr.R. Suganya , rsuganya@tce.edu
2. Dr.A.M. Abirami, abiramiam@tce.edu

22CSMA0	DIGITAL & ARCHITECTURE- A GATE PERSPECTIVE

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

This course will introduce Learners who is aiming to appear for GATE Examination about two foundational areas of computer science namely the Digital logic and Computer architecture and organization. This course will provide a deeper level of understanding and confidence for the learners to solve the problems in the respective domain.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Perform minimization of Boolean functions using Boolean algebra	Apply
CO2	Design the given combinational and sequential circuit	Apply
CO3	Compare the different addressing modes and Identify the pipeline hazards	Apply
CO4	Perform the cache mapping techniques	Apply

CO – PO Mapping

B.E./B.Tech. (22CSMA0)

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

Syllabus

Module 1: Boolean Algebra: Number representation and Computer Arithmetic

Module 2: Combinational and sequential circuit: Minimization

Module 3: Machine instructions and addressing modes, ALU, Data path and control unit, Instruction pipelining, Pipeline hazards

Module 4: Memory hierarchy: Cache, main memory and secondary memory storage: I/O interface (Interrupt and DMA mode)

Course Designers

1. Dr.C.Senthilkumar , cskcse@tce.edu
2. Mr.M.Sivakumar, mskcse@tce.edu

22CSME0/ 22CSMF0/ 22CSMG0/ 22CSMH0/	FUNDAMENTALS OF MODERN CRYPTOGRAPHY

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

Cryptography is the science of information and communication security. This course will discuss common security weaknesses, vulnerabilities, attacks and mitigation approaches using cryptographic operations. The focus of the course is on confidentiality, data integrity and non-repudiation security services.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Explain conceptually the network security issues, challenges, mechanisms and the need for Security Services	Understand
CO2	Encrypt and Decrypt messages using Private Key Cryptosystems and Public Key Cryptosystems	Apply
CO3	Demonstrate data integrity and non-repudiation security services through hashing and signing mechanisms	Apply

CO – PO Mapping

B.E./B.Tech (22CSME0)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L						M		M		L
CO2	S	M	L					M		M		L
CO3	S	M	L					M		M		L

M.C.A **(22CSMF0)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L				M	L		L	L		
CO2	S	M	L			M	L		L	L		
CO3	S	M	L			M	L		L	L		

M.Sc. Data Science (**22CSMG0)**

CO	PO1	PO2	PO3
CO1	S	M	L
CO2	S	M	L
CO3	S	M	L

M.E **(22CSMH0)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	M	L						M	L		
CO2	S	M	L					M	L		
CO3	S	M	L					M	L		

Syllabus

Module 1: Introduction and Classical ciphers – Network security issues and challenges, The CIA Triad: Confidentiality, Integrity and Availability, Classical Ciphers, Shanon's theory, Basic principles of Modern Cryptography

Module 2: Private Key Cryptosystems – Introduction to Galois Field, Advanced Encryption Standard (AES) algorithm, Pseudo Random Number Generation algorithms, RC4 stream cipher

Module 3: Public Key Cryptosystems - Introduction to Number Theory, RSA algorithm, Private-Key Management and the Public-Key Distribution

Module 4: Message Authentication and Digital Signature – MAC and Hash algorithms, MD5 and SHA, Digital Signature Standards

Course Designers

1. Dr. M.Suguna - mscse@tce.edu
2. Ms. Raja Lavanya - rlit@tce.edu

22CSMI0/ 22CSMJ0/ 22CSMK0/ 22CSML0/	DATA STRUCTURES – PLACEMENT BOOTCAMP

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

Data Structures – Placement Bootcamp course helps the learners to face the placement confidently. This course comprises of two levels of learning: in the first level, the learner can understand various data structures and their operations for manipulating them. And in second level, learner can develop the ability to solve challenging problems by choosing appropriate data structures.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Apply the concepts of linear data structures including stack, queue and linked list for suitable applications in trade off with time and space complexity.	Apply
CO2	Apply the concepts of nonlinear data structures including binary tree, binary search tree and heap tree for suitable applications in trade off with time and space complexity.	Apply

CO – PO Mapping

B.E./B.Tech (22CSMI0)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L		L			M	M	M		L
CO2	S	M	L		L			M	M	M		L

M.C.A **(22CSMJ0)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	L		L	L	L		M	M	M	
CO2	S	M	L		L	L	L		M	M	M	

M.Sc. Data Science**(22CSMK0)**

CO	PO1	PO2	PO3
CO1	S	M	L
CO2	S	M	L

M.E **(22CSML0)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	M	M		L			M	L	M	
CO2	S	M	M		L			M	L	M	

Syllabus

Module 1: Review of C Programming - Basics, Data Types, Array, Condition Statement, Iterative Statement, Functions, Structure. **Abstract Data Type** - Abstract Data Type. **Introduction to Data Structures** – Introduction. **Performance Measure** - Time and Space Complexity, Compute Time Complexity - Operation Count, Compute Time Complexity - Operation Count, Asymptotic Measure - Big-oh, Omega, Theta.

Module 2: Linked List - Definition, Compare with Array, Types. **Singly Linked List** - Definition, Operation – Traversal, Create, Insert, Delete, Application - Polynomial Addition. **Circular Linked List** - Definition, Differ from SLL, Application - Josephus Problem. **Doubly**

Linked List - Definition, Differ from SLL, Application - Palindrome Checking. Challenging Questions.

Module 3: Stack - Definition, Operations - Push, Pop, Peek, Implementation - Linked List, Applications - Matching Braces, Infix to Postfix, Postfix Evaluation. **Linear Queue** - Definition, Operations - Enqueue, Dequeue, Implementation - Linked List, Application - Job Scheduling, Drawback of linear queue. **Circular Queue** - Definition, Variant from linear queue, Application - Job Scheduling. Challenging Questions.

Module 4: Binary Tree - Terminologies and Properties, **Binary Tree** – Definition, Representation, Traversal - Inorder, Preorder, Postorder, Level order, Application - Expression Tree. **Binary Heap -** Definition, Representation, Operations – Insert, Delete Min / Max, Build Heap, Increase / Decrease Key, Application - Huffman Coding. **Binary Search Tree –** Definition, Operations – Search, Insert, Delete, Traversal. Challenging Questions

Course Designers

1. Dr. M.K.Kavitha Devi - mkkdit@tce.edu
2. Ms. Raja Lavanya - rlit@tce.edu

Category	L	T	P	Credit
PSE-EX	1	0	0	1

22EEMA0/ 22EEMB0 **SMART GRID IMPLEMENTATIONS AND FEASIBILITIES**

Preamble

Electric power systems throughout the world are facing radical change stimulated by the pressing need to decarbonise electricity supply, to replace ageing assets and to make effective use of rapidly developing information and communication technologies. These aims all converge in the Smart Grid. This course is designed to study about smart grid technologies, wide area monitoring, phasor measurement unit, smart metering and integration of renewable energy sources in smart grid and related case studies.

Prerequisite

Nil

Course Outcomes

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

CO Number	Course Outcomes	Blooms level
CO1	Explain the concepts and technologies of infrastructure in the Smart Power Grid architecture.	Understand
CO2	Develop Wide Area monitoring and Control system using PMU technologies	Apply
CO3	Explain the Communication, Measurement and Computing Technologies in the smart grid.	Understand
CO4	Apply the Smart metering concepts in demand management for the given applications.	Apply
CO5	Design various renewable sources and PHEVs in the given sample grid system.	Apply

Mapping with Programme Outcomes

B.E. (22EEMA0)

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

M.E (22EEMB0)

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

CO5	S	L	M	M	L	L			L		L

S- Strong; M-Medium; L-Low

Syllabus

Module 1: INTRODUCTION TO SMART GRID: Need for smart grid - Smart Grid definitions - Benefits of smart grid - Overview of enabling technologies in smart grid - vision of smart grid - International experience - smart grid demonstration and deployment efforts

Module 2: WAMS TECHNOLOGY: PMU Technologies: importance, Operation, applications and advantages, PMU Placement, Wide Area Monitoring and its application.

Module 3: SMART METERING TECHNOLOGY: Introduction –Smart metering: Evolution - Key components – Smart meters: over view of the hardware used - Communications infrastructure and protocols for smart metering, smart metering infrastructure - Educational institution case study.

Module 4: SMART METERING INFRASTRUCTURE APPLICATIONS: Demand-side management and demand response, Distributed energy resource and energy storage, Smart homes with home energy management systems, missing value detection, outlier identification, Case studies in smart grid, Puducherry Smart Grid Pilot Project

Module 5: RENEWABLE ENERGY RESOURCES: Solar PV, Wind system, Small Hydro, Plugged hybrid electric vehicles and storage devices – optimal placement of PHEV and renewable energy resources, case studies

Course Designers:

1. Dr. P. Venkatesh pveee@tce.edu
2. Dr.S.Charles Raja charlesrajas@tce.edu
3. Mr. G. R. Hemanth grheee@tce.edu

22DSMA0	Engineering Mathematics – II

Category	L	T	P	Credit
PSE-EX	1	0	0	1

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

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Compute the Laplace transform and inverse Laplace transform of different functions and solve the given initial value problem using Laplace transform.	Apply
CO2	Apply matrix algebra techniques for transformations of conic sections into principle axes	Apply
CO3	Solve the model developed for the given system using ordinary differential equation.	Apply
CO4	Compute divergence and curl of vector functions and Apply the concepts of vector differentiation and vector integration to fluid flow and heat transfer problems.	Apply

CO – PO Mapping

B.E./B.Tech. (22DSMA0)

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

Syllabus

Module 1: 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.

Module 2: 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.

Module 3: 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.

Module 4: 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

Course Designers

1. Mrs. B. Surya Devi, bsdca@tce.edu
2. Ms. H. Sri Vinodhini, srivinodhini@tce.edu

22DSMB0/ 22DSMC0/ 22DSMD0/ 22DSME0	PROBLEM SOLVING USING PYTHON

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

This course is enables the students to learn problem-solving methodologies through python programming in an effective manner. A practical exposure to the students to gain generic problem solving skills that have applicability to a wide range of real-world problems. The course emphasizes on introduction to problem solving and basics of python programming and apply the python programming concepts like fruitful functions, tuples and dictionary in solving real world problems.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Develop algorithmic solutions to simple computational problems.	Apply
CO2	Develop simple Python programs for solving problems.	Apply
CO3	Demonstrate built-in data types in Python- lists, tuples, and dictionaries.	Apply
CO4	Apply Problem Solving Strategies using python programming constructs.	Apply

CO – PO Mapping

B.E./B.Tech. (22DSMB0)

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

M.C.A **(22DSMC0)**

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

M.Sc. Data Science ((**22DSMD0)**

CO	PO1	PO2	PO3
CO1	S	M	M
CO2	S	M	M
CO3	S	M	M
CO4	S	M	M

M.E **(22DSME0)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	M	S	L	M	M	M	M	M	M	M
CO2	S	M	S	L	M	M	M	M	M	M	M
CO3	S	M	S	L	M	M	M	M	M	M	M
CO4	S	M	S	L	M	M	M	M	M	M	M

Syllabus

Module 1: Introduction to Python Programming
Introduction-Installation-Algorithm-Flow chart- Keywords and basic data types- int, float, bool, strings and List.

Module 2: Control Flow and Functions
Decision control structures- Looping control structures- Case control structures.

Module 3: Function and Lists
Functions- Fruitful Function-Recursion; Lists: list operations- list methods-list iteration- list comprehension.

Module 4: Tuples and Dictionaries.
Tuples: tuple assignment- tuple as return value; Dictionaries: operations and methods.

Course Designers

1. Prof.R.Saraswathi Meena, rsmca@tce.edu
2. Prof.B.Ramprakash, brhca@tce.edu

22ECMA0/ 22ECMB0/ 22ECMC0/ 22ECMD0	CMOS VLSI CIRCUITS AND SYSTEMS

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

CMOS technology has claimed the preeminent position in modern electrical system design. It has enabled the widespread use of wireless communication, the Internet, and personal computers. No other human invention has seen such rapid growth for such a sustained period. The course aims at understanding the basic concepts of Digital CMOS VLSI circuit by studying logic design, physical structure and how they are combined to build systems for efficient data processing

Prerequisite

Digital Logic Circuits

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Inspect the short channel effects of MOSFETs	Apply
CO2	Predict the behavior of the CMOS Inverter circuits.	Apply
CO3	Demonstrate the CMOS combinational logic circuits.	Apply
CO4	Construct the CMOS sequential logic circuits.	Apply

CO – PO Mapping

B.E./B.Tech. (22ECMA0)

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

M.C.A **(22ECMB0)**

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

M.Sc. Data Science ((**22ECMC0)**

CO	PO1	PO2	PO3
CO1	S	M	L
CO2	S	M	L
CO3	S	M	L
CO4	S	M	L

M.E **(22ECMD0)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	S	M	M		L			M	L	M	
CO2	S	M	M		L			M	L	M	
CO3	S	M	M		L			M	L	M	
CO4	S	M	M		L			M	L	M	

Syllabus

Module 1: MOS TRANSISTER BASICS: MOSFET as Switch -MOSFET Structure-Types of MOSFET- Threshold Voltage of MOSFET-Current- Voltage Characteristics-Transfer

Characteristics and Sub Threshold Slope - Types of Device Scaling -Short Channel Effect-Second Order Effect- Body Effect- Channel Length Modulation- - Velocity Saturation- Drain Induced Barrier Lowering -Punch through.

Module 2: ELECTRONIC ANALYSIS OF CMOS INVERTER: Basic Idea of CMOS Inverter-Switch Model of Inverter-Static Behaviour-Voltage Transfer Characteristics - Switching Threshold-Noise Margin-Gain Calculation -Propagation Delay -Inverter Capacitances-Optimum NMPS-PMOS Ratio-Sizing of Inverter Chain-Dynamic Power Dissipation-Source of Leakage Currents-Static Power Dissipation-Power-Delay Product and Energy – Delay Product

Module 3: COMBINATIONAL LOGIC DESIGN: Static and Dynamic Logic Design - Static Properties of Complementary CMOS Gates-Propagation Delay of Complementary CMOS Gates - Ratioed Logic- Pseudo NMOS inverter- Pass-Transistor Logic- Differential Pass Transistor Logic - Performance of Pass – Transistor and Transmission Gate -Dynamic CMOS Designs -Domino Logic and its properties -np-CMOS

Module 4: SEQUENTIAL LOGIC DESIGN: Timing Merits for Sequential Circuits-Classification of memory elements -Static Latches and Registers-The Bi-stability Principle-Multiplexer based Latches- Master – slave Edge Triggered Register- Low-Voltage Static Latches- Dynamic Latches and Registers- Dynamic Transmission Gate Edge Triggered Registers -C2MOS Register-True Single Phase Clocked Register-Alternative Register Styles-Pulse Registers -Sense Amplifiers Based Register.

Course Designers

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2. Dr.N.B.Balamurugan, nbbalamurugan@tce.edu
3. Dr.D.Gracia Nirmala Rani, gracia@tce.edu

22ECME0/ 22ECMF0/ 22ECMG0/ 22ECMH0/	IOT SYSTEM DESIGN USING ARDUINO

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

This course aims to provide students to course learn about the 'things' that get connected in the Internet of Things to sense and interact with the real world environment, and to explore and interact with the IoT bridge between the cyber and physical worlds.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's level
CO1	Explain ARDUINO hardware details and environment	Understand
CO2	Explain the core elements of ARDUINO programming language	Understand
CO3	Demonstrat the concepts of serial communication	Understand
CO4	Use common input and output devices	Understand
CO5	Apply the ARDUINO programming into real time applications	Apply

CO – PO Mapping

B.E./B.Tech. (22ECME0)

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

S- Strong; M-Medium; L-Low

M.C.A **(22ECMF0)**

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

M.Sc. Data Science **(22ECMG0)**

CO	PO1	PO2	PO3
CO1	M	L	L
CO2	M	L	L
CO3	S	M	L
CO4	S	M	L

M.E. **(22ECMH0)**

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

Syllabus

Module 1: Arduino Platform: Functional Block diagram and AT mega 328p architecture, Getting Started with Arduino, CCS and AVR Studio 7 Blinking LED, Pin function, Overview of main feature –I/O ports, Features-timers, interrupts, GPIO LED, Switch Based LED Control, Features, PWM, Serial Port, Features-ADC, Introduction to Arduino IDE, Writing, saving, compiling with IDE, Display Interface 7 Segment, Display Interface 16X2 Matrix.

Module 2: Arduino Programming: Introduction to Arduino C Programming, Arduino C Data types, Decision making in C, Sensor Interfacing For Temperature Monitoring, Program Loop in C, Functions in C, Introduction to pointers, PWM Based Servo Motor Interfacing, Using pointers effectively, Structures, Unions, and Data storage, Arduino Libraries, Serial Communication.

Module 3: Analog And Serial Communication: Introduction to Analog communication, Pulse Width Modulation, RS232, Actuators - Steppers Motors, I2C, Actuators - DC Motors, SPI Protocol.

Module 4: IO Programming: Introduction to Timers / Counters, Timer Programming, Interrupt Programming, Timer Programming, Watch Dog Timer, Interrupts, Interrupts programming, External Interrupt, I2C.

Module 5: Case Studies – Project: Wireless communication using ZigBee, Bluetooth, Robotics-Motor and Sensor, Security RFID, Infrared, GPS Navigation.

Course Designer

1. Mr. M. Senthil Nathan, msnece@tce.edu

22MTMA0/ 22MTMB0/ 22MTMC0/ 22MTMD0	INDUSTRIAL DRIVES AND CONTROL

Category	L	T	P	Credit
PSE-EX	1	0	0	1

Preamble

Nowadays, the Industries are increasingly demanding automation in all their application sectors. Automation results into better quality, increased production and reduced costs. Robots and machine tools are now essential elements of each automated manufacturing work unit. In all sectors, managing factors like motion, speed, position, and torque are crucial for increasing output and quality while lowering energy and equipment costs. The majority of industrial machine control applications are shared by electric drives. Automation systems cannot function without variable speed drives, which regulate the speed of a.c. and d.c. motors. This course equips students with the knowledge and expertise on a variety of industrial drives and controls, allowing them to design and build automated systems to satisfy the demands of digital production.

Prerequisite

NIL

Course Outcomes

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

CO Number	Course Outcome Statement	Bloom's Level
CO1	Design pneumatic and Electro pneumatic circuits for industrial applications.	Apply
CO2	Design Hydraulic and proportional hydraulic circuits for industrial applications.	Apply
CO3	Select and program permanent magnet and servo motors for Industrial Applications	Apply
CO4	Construct and implement PLC programming for industrial drives control.	Apply

CO – PO Mapping

B.E./B.Tech. (22MTMA0)

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

M.C.A ((**22MTMB0)**

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

M.Sc. Data Science ((**22MTMC0)**

CO	PO1	PO2	PO3
CO1	S	M	L
CO2	S	M	L
CO3	S	M	L
CO4	S	M	L

M.E **(22MTMD0)**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11

CO1	**S**	**M**	**M**		**L**			**M**	**L**	**M**	**L**
CO2	**S**	**M**	**M**		**L**			**M**	**L**	**M**	**L**
CO3	**S**	**M**	**M**		**L**			**M**	**L**	**M**	**L**
CO4	**S**	**M**	**M**		**L**	**L**		**M**	**L**	**M**	**L**

Syllabus

Module 1: Fluidic System: Components of fluidic drive systems-Actuators-Control valves Classification Proportional and servo valves- Electro pneumatic circuit –Proportional Hydraulic circuits- Fluidic sequential circuit design using classical, cascade and step counter methods.

Module 2: PLC Programming: Role of PLC in Industry 4.0 application- PLC Programming-Ladder Logic-Functional Block diagram-Bit Logic Function and ladder conversion- Timer and Counter using Functional Block diagram.

Module 3:PLC Integration: SCADA and Programming using SCADA-HMI programming-PLC programming interfaced with Pneumatic and Hydraulic application.

Module 4:PLC drives and Applications: Servo Drive- Sensor less BLDC drive- Control Logic and P,PI,PID controller- VFD controller- Servo drive application in Industry 4.0

Course Designers

1. Prof. H Ramesh , rameshh@tce.edu
2. Dr.S.Julius Fusic, sjf@tce.edu