Course Code	Course Title						Core/Elective
PE 512IT	**COMPUTER GRAPHICS**						**Elective**
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	**30**	**70**	**3**

COURSE OBJECTIVES:

- Acquire knowledge about device level algorithms for displaying two dimensional output primitives for raster graphics system.
- Acquire knowledge about the basic concepts of representing 3D objects in 2D.
- To introduce computer graphics techniques transformations, clipping, curves and surfaces.

COURSE OUTCOMES:

Student will able to

- Describe the steps in graphics programming pipline
- Apply affine transformations for viewing and projections
- Create realistic images of geometrical objects in 2-D and modeling implementation
- Describe the mathematical principles to represent curves and surfaces

UNIT-I

Overview of Graphics Systems-Video display devices, raster-scansystems, Random-scan system, graphics monitors and workstations, InputDevices, hard copy devices, Graphics Software. Output Primitives, Line driving, algorithms, Circle generating algorithms, ellipse generating algorithms, pixel addressing, Filled-area primitives, Fill area functions, cell array, character generation.

UNIT-II

Attributes of output primitives: Line attributes, curve attributes, color and Gray scale level, Area fill attributes, character attributes, Bundled attributes, Enquiry function. Two dimensional Geometric transformations:Basic transformations, Homogeneous coordinates, composite transformations, other transformations, transformations between coordinate systems, affine transformations, transformation functions, Raster methods for transformations.

UNIT-III

Two dimensional viewing: Viewing pipeline, viewing transformation, viewing functions, line clipping-Cohen Sutherland line clippingLiangBarskyline clipping. Sutherland-Hodgmanpolygon clipping, Weller Atherton polygon clipping.

UNIT-IV

Structures and Hierarchical Modeling: Structure concepts, editing structures, Basic modeling concepts, hierarchical modeling with structures. Graphical user interfaces and Interactive input

Methods: The user Dialogue, logical classification of input devices, input functions and Models, Interactive picture construction techniques.

UNIT-V

Three dimensional object representations: Polygon surface, curved lines and surfaces, spline representations, Bezier curves and surfaces, - spline curves and surfaces.

CSG methods: Octress, BSP Trees, Three Dimensional Transformation Three dimensional viewing: Viewing coordinates, projections, visible surface detection methods Back- face Detections, Depth-buffer methods, depth sorting methods, Gour and shading, Phong shading.

Suggested Reading:

1. HeamDonald, PaulineBakerM.,"Computer Graphics",2nd edition, PHI,1995.
2. HaningtonS.,"ComputerGraphicsAProgramming Approach",2nd edition,McGraw Hill.
3. David F. Rogers.,"Procedural ElementsforComputerGraphics",2nd edition,TataMcGraw Hill, 2001.

PW 961 CS *With effect from the academic year 2019-2020*

SUMMER INTERNSHIP

University Examination	50 Marks
Credits	2

Course Objectives:

- To train and provide hands-on experience in analysis, design, and programming of information systems by means of case studies and projects.
- To expose the students to industry practices and team work.
- To provide training in soft skills and also train them in presenting seminars and technical report writing.

Course Outcomes:
Student will be able to :

- Get Practical experience of software design and development, and coding practices within Industrial/R&D Environments.
- Gain working practices within Industrial/R&D Environments.
- Prepare reports and other relevant documentation.

Summer Internship is introduced as part of the curricula of encouraging students to work on problems of interest to industries. A batch of three students will be attached to a person from the Computer Industry/Software Companies/R&D Organization for a period of 8 weeks. This will be during the summer vacation following the completion of the III year Course. One faculty coordinator will also be attached to the group of 3 students to monitor the progress and to interact with the industry co-ordinate (person from industry).

After the completion of the project, student will submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the Department. Award of sessionals are to be based on the performance of the students, to be judged by a committee constituted by the department. One faculty member will co-ordinate the overall activity of Industry Attachment Program.

Unit V

MEAN Stack, SMACK Stack: Introduction to MEAN Stack, SMACK Stack, Apache, Building Backend and Testing, Angular JS, Node JS, Express and Mongo DB

Suggested Reading:

1. Robert W. Sebesta, "Programming with World Wide Web", Eighth Edition, Pearson Education, 2008.
2. John Pollak, "JQuery - A Beginners Guide", McGraw Hill Education, 2014.
3. AgusKurniawan,"AngularJS Programming by Example",PE Press, First Edition
4. Colin J Ihrig, : Full Stack JavaScript Development with MEAN, SitePoint, 2015 Edition
5. Raul Estrada,:Fast Data Processing Systems with SMACK Stack,Packt, December 2016

Course Code	Course Title						Core/Elective
PC 601 IT	**WEB APPLICATION DEVELOPMENT**						**Core**
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	3	1	-	-	**30**	**70**	**3**

Course Objective:

- To develop dynamic web applications using the concepts of HTML 5.0 and CSS
- To understand the document structure and schemas and represent data in that format
- To develop applications using Query and represent objects in JSON notation
- To implement applications using angular JS
- To understand the MEAN Stack and SMACK stack and develop applications using the framework

Course Outcomes:

Students will able to

- Design and develop dynamic web sites using Html 5.0, CSS, Query.
- Develop web content publishing applications that accesses data in XML or JSON format
- Develop single page web applications using Angular JS
- Design and develop big data applications using Mean stack and SMACK stack Frameworks.

Unit I

HTML and CSS

Introduction: Web Application Fundamentals: protocols and web servers

HTML5.0: Basic tags, Form elements and attributes, validation

Cascading Style Sheets: CSS selectors, CSS BOX Model, CSS Positioning

Unit II

XML: The Syntax of XML, XML Document Structure, Document Type Definitions, Name Space, XML Schemas

Unit III

Java Script and JQuery: JQuery: Introduction to JQuery, JQuery Syntax, Selectors, HTML Manipulation, Effects and Events

JSON: JSON Introduction, Syntax, Data Types, Objects, Schema, Comparison with XML.

Java Script: Introduction to JavaScript, Selecting elements in the documents, Event handling

Unit IV

Angular JS: Preparing Development Environment, Angular modules and Controllers, Input Validation, Data Binding and Templates, Angular JS Services

3. **MS Excel :** Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions- like sum, average, standard deviation, and charts.

4. **Internet** and **HTML:**

   a) Telnet/Secure Shell (Remote login to university computers)

   b) Electronic Mail (Communicating with email software)

   c) File Transfer Protocols (transferring files between networked computers)

   d) World Wide Web (Interface, Navigation, Search Tools)

   e) Publishing Web Pages (Using HTML editors to create personal web sites)

   f) Create the web-page (With title, text, frames, hyperlinks to some sites, pictures, lists, tables, fonts and colors) without using any web authoring tools.

5. **Documentation Using LATEX:** Introduction to Linux Commands, Introduction to LateX, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar tool, Page Formatting, Single/Multi column, Pictures/Objects, Drawing, Hyperlinks, Header/Footer, and Tables.

Suggestion Reading:

1. Peter Norton, "*Introduction to Computers*" , 6th Edition, McGraw Hill Publishers,
2. Leslie Lamport, "*Latex: A Document Preparation System*", 2nd Edition, Pearson Education India, 1994.
3. Stefan Kottwitz, "*LaTeX Beginner's Guide*", Shroff/Packt Publishers, First Edition, 2012.

Course Code	Course Title						Core/Elective
ES 930 CS	Computer Skills Lab						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	0	0	0	2	25	50	1

Course Objectives:

- To learn assembling and disassembling of PC Hardware
- To understand the installation of Operating systems
- To be able to acquire skills in Productivity tools

LIST OF EXPERIMENTS:

I PC Hardware

1. Identify the peripherals of a computer. (Processor, Memory chips, Mother board, Disk drives, and Controller card such as AGP board, Network cards, Sound card, as well as Parallel and Serial ports etc.,)
2. Disassembling and Assembling PC in working condition. Load the Operating Systems with partitions for Windows and Linux, configure for Network.

II Productivity Tools:

1. **Documentation Using MS-Word** - Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, and Bookmarks.
2. **Presentation using MS-PowerPoint**: Creating presentation slides and Enhancing Slides with features like Organizational charts, Excel Charts, Word Art, Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object.

Course Code	Course Title						Core/Elective
PE 513IT	**MULTIMEDIA TECHNOLOGIES**						**Elective**
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	**30**	**70**	**3**

Course Objective:

- Acquire knowledge about the basic concepts of multimedia data formats, protocols, and Compression techniques of digital images.
- To learn JPEG and MPEG families of standards and wired and wireless networking protocols.
- To develop simple multimedia applications.

Course Outcomes:

- Understand the technical details of common multimedia data formats, protocols, and compression techniques of digital images, video and audio content.
- Describe the technical details of JPEG and MPEG families of standards.
- Discuss the significance of "Quality of Service" in multimedia networking.
- Describe the principles and technical details of several wired and wireless networking protocols.
- Develop simple but demonstrative multimedia applications.

UNIT – I

Introduction to Multimedia: What is Multimedia, Multimedia and hypermedia, World Wide Web, Overview of Multimedia software Tools. Multimedia Authorizing and Tools, Multimedia Authoring, Some Useful Editing and Authoring Tools, VRML

UNIT – II

Graphics and Image Data Representation: Graphics/image data types, Popular File Formats, Color in image and Video and Color Science, color Models in Images, Color Models in Video

UNIT – III

Fundamental Concepts in Video and audio: Types of Video signals, Analog Video, Digital Video, Digitization of sound, Musical instrument Digital interface (MIDI), quantization and transmission of Audio

UNIT – IV

Multimedia Data Compression: Lossless Compression Algorithms, lossy Compression Algorithms, Image Compression Standards, The JPEG2000 Standard, Basic Video Compression Techniques, MPEG Video coding I— MPEG –I and 2, Basic Audio Compression techniques.

UNIT – V:

Multimedia communication and Retrieval: Multimedia Network Communications and Applications, Wireless Networks, Content Based Retrieval in Digital Libraries

Suggested Reading:

1. Ze-Nian Li & Mark S. Drew. *Fundamentals of Multimedia.*. Upper Saddle River, NJ: Pearson Education.

PC 403 IT **SCRIPTING LANGUAGES**

Instruction:	4 Periods per week
Duration of University Examination:	3 Hours
University Examination(SEE):	70 Marks
Sessionals(CIE):	30 Marks

Course Objectives:

1. To understand why Python is a useful scripting language for developers.
2. To learn how to design and program Python applications.
3. To learn how to use lists, tuples, and dictionaries in Python programs.
4. To learn how to write loops and decision statements in Python.
5. To learn how to write functions and pass arguments in Python.
6. To learn how to read and write files in Python.

Unit- I

INTRODUCTION: Origin of Scripting , Scripting Today, Definition of scripting language, Characteristics of Scripting Languages, Uses for Scripting Languages, How scripting languages differ from non-scripting languages; Types of scripting languages.

Unit- II

Introduction to Python: Python - History Language Features, Installing Python, Environment Setup, Running a Python Script, Python Versions: 2.x vs. 3.x,

Data Types, Operators, Expressions- Comments Indentation, Built-in Data Types, Variables, Operators, Expressions.

Unit-III

Control Statements: if Statements for Statement, while Statement, Use of range () in for loop, Use of break, continue, else in Loops, Use of pass Statement

Standard I/O Operations Input from Standard Input Device, Output to Standard Output Device Formatting String with %, Formatting string with format()

Unit-IV

Sequences, Strings: Lists, Tuples, Sets, Dictionaries, Strings and String Operations.

Functions: Function Definitions, Function Calling, DocStrings, Local Variables and Global Variables, Built-in Functions

Unit-V

File Handling: Opening modes, with statement, Closing a file, File read positions in Python, Renaming and deleting files in Python, The rename() method, The remove() method, Python file object methods.

Suggested Reading:

1. Martin C Brown, "Python: The Complete Reference", McGrawHill Education,2001.
2. Mark Chen, "Python: The Ultimate Beginner's Guide for Becoming Fluent in Python Programming", CreateSpace Independent Publishing Platform, October 2016.

Course Code	Course Title						Core/Elective
PE 613 IT	**INTERNET OF THINGS (IoT)**						Elective
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	**30**	**70**	**3**

COURSE OBJECTIVES:

- To assess the vision and introduction of IoT.
- To Understand IoT Market perspective.
- To Implement Data and Knowledge Management and use of Devices in IoT
- To Understand State of the Art - IoT Architecture.
- To classify Real World IoT Design Constraints, Industrial Automation in IoT.

COURSE OUTCOMES:

- Student will able to
- Understand the basics and IoT reference architecture
- Understand the implementation of different IoT protocols.
- Classify the design constraints and build real world IoT based projects.

UNIT I

Overview: IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management

UNIT II

Reference Architecture: IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture-Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT III

IOT Data Link Layer & Network Layer Protocol: PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART,Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

UNIT IV

Transport & Session Layer Protocols: Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

UNIT V

Service Layer Protocols & Security: Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer

Suggested Books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Aves and, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
4. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
5. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
6. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

Course Code	Course Title						Core / Elective
MC 901 CE	**Gender Sensitization**						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	0	0	0	**30**	**70**	3

Course Objectives

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- Information about some key biological aspects of genders.
- Reflect critically on gender violence.
- Exposure on egalitarian interactions between men and women.

Course Outcomes

After completing this course, the student will be able to

- Develop a better understanding of important issues related to gender in contemporary India.
- Sensitize to basic dimensions of the biological, sociological, psychological and legal aspects of gender through discussion of materials derived from research, facts, everyday life, literature and film.
- Get a finer grasp of how gender discrimination works in our society and how to counter it.
- Develop a sense of appreciation of women in all walks of life.

UNIT – I

Understanding Gender: Why should we study it? Socialization: making women, making men. Introduction, preparing for womanhood, growing up male, first lessons in caste, different masculinities, just relationships, being together as equals, Mary Kom and Onler Love and acid just do not mix, love letters, mothers and fathers, further reading, rosa parks, the brave heart.

UNIT – II

Gender and Biology: Missing women, sex selection and its consequences, declining sex ratio, demographic consequence, gender spectrum, beyond the binary, two or many, struggles with discrimination, our bodies, our health.

UNIT – III

Gender and Labour: Housework, the invisible labour, my mother doesn't work, share the Load, women's work, its politics and economics, fact and fiction, unrecognized and unaccounted work, wages and conditions of work.

UNIT – IV

Issues of Violence: Sexual harassment - Say No! , Sexual harassment, no eve teasing, coping with everyday harassment, "Chupulu" domestic violence, speaking out, is home a safe place? When women unite, rebuilding lives, new forums for justice, thinking about sexual violence, blaming the victim, I fought for my life, the caste face of violence.

UNIT – V

Gender Studies Knowledge: Through the lens of gender, point of view, gender and the structure of knowledge. Unacknowledged women artists of Telangana: Whose history? Questions for historians and others: reclaiming a past, writing other histories, missing pages from modern Telangana history.

Suggested Readings:

1. A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu, ***Towards a World of Equals: A Bilingual Text book on Gender***, Telugu Akademi, Hyderabad, 1st Edition, 2015.
2. www.halfthesky.cgg.gov.in

Course Code	Course Title						Core/Elective
MC453HS	**SOCIETY OUTREACH PROGRAM**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	-	-	-	2	**50**	---	**2 Units**

Course Objectives:

- To prepare the students to sensitize the society on social issues, particularly on environment, health and literacy.
- To prepare the students to learn the concept PAY BACK TO SOCIETY .
- To change the attitude of the society.

Course Outcome:

- Able to find the scientific solutions for a specific problem in the society.
- Able to demonstrate the leadership qualities.
- Able to bring out their talent.
- Able to develop interpersonal skills and team-spirit.

The Society Outreach Program gives students the opportunity to understand and involve in community service. Projects are student-led and may encompass the activities related to the following:

Environmental issues,
Health education for the community and sanitation,
Communal harmony and peace education,
Legal Awareness/Rights,
Human rights and rights of vulnerable groups;
Panchayats and development issues;
Women's Empowerment and
Social issues and gender issues.
Awareness on Solid waste management and any possible solutions;
Awareness on natural resources, solar energy and wind energy;
Awareness of work culture, punctuality, discipline, cleanliness in house and surroundings, and Intake of quality food;

Note:

The students are required to make a study and/or participate in society outreach programmes and submit a report.
The department will appoint a project coordinator who will be incharge of the following:

- Grouping of students (a maximum of three in group) • Allotment of project guides
- Project monitoring at regular intervals

The students shall give a presentation for about 30 minutes they have worked/ studied. The work carried out, the report and the presentation carry 50 marks.

With effect from the Academic year 2017-2018

PE 601 CS

Graph Theory and Its Applications

Credits:3

Instruction : (3L + 1T) hrs per week | Duration of SEE : 3 hours

CIE : 30 Marks | SEE : 70 Marks

Course Objectives:

- To familiarize a variety of different problems in Graph Theory
- To learn various techniques to prove theorems
- To understand and analyze various graph algorithms

Course Outcomes:

Student will be able to

- Write precise and accurate mathematical definitions of objects in graph theory
- Validate and critically assess a mathematical proof
- Develop algorithms based on diverse applications of Graphs in different domains

UNIT-I

Preliminaries: Graphs, isomorphism, subgraphs, matrix representations, degree, operations on graphs, degree sequences

Connected graphs and shortest paths: Walks, trails, paths, connected graphs, distance, cut-vertices, cut-edges, blocks, connectivity, weighted graphs, shortest path algorithms
Trees: Characterizations, number of trees, minimum spanning trees

UNIT- II

Special classes of graphs: Bipartite graphs, line graphs, chordal graphs

Eulerian graphs: Characterization, Fleury's algorithm, chinese-postman-problem

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UNIT -III

Hamilton graphs: Necessary conditions and sufficient conditions

Independent sets, coverings, matchings: Basic equations, matchings in bipartite graphs, perfect matchings, greedy and approximation algorithms

UNIT- IV

Vertex colorings: Chromatic number and cliques, greedy coloring algorithm, coloring of chordal graphs, Brook's theorem

Edge colorings: Gupta-Vizing theorem, Class-1 graphs and class-2 graphs, equitable edge-coloring

UNIT- V

Planar graphs: Basic concepts, Eulers formula, polyhedrons and planar graphs, charactrizations, planarity testing, 5-color-theorem

Directed graphs: Out-degree, in-degree, connectivity, orientation, Eulerian directed graphs, Hamilton directed graphs, tournaments

Suggested Reading:

1. F.Harry, Graph theory, Narosa Publications, 1988.
2.C.Berge: Graphs and Hypergraphs, North Holland/Elsevier, 1973
3. J A Bondy and U.S. R Murthy, Graph Theory with Applications, Elsevier Science Ltd, 1976.
4. Douglas B West, Introduction to Graph Theory, Prentice Hall, 2004

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Course Code	Course Title						Core / Elective
OE 781 CE	**Road Safety Engineering**						**Open Elective-III**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- Introduction to various factors considered for road safety and management
- Explain the road safety appurtenances and design elements
- Discuss the various traffic management techniques

Course Outcomes

At the end of the course, the students will be able to

1. Prepare accident investigation reports and database
2. Apply design principles for roadway geometrics improvement with various types of traffic safety appurtenances/tools
3. Manage traffic including incident management

UNIT – I

Road Accidents: Causes, scientific investigations and data collection, Analysis of individual accidents to arrive at real causes, statistical methods of analysis of accident data, Basic concepts of Road accident statistics, Safety performance function: The empirical Bayes method Identification of Hazards road location. Application of computer analysis of accident data.

UNIT – II

Safety in Road Design: Operating the road network for safety, highway operation and counter measures, road safety audit, principles-procedures and practice, code of good practice and checklists, vehicle design factors & Driver characteristics influencing road safety.

UNIT – III

Road Signs and Traffic Signals: Classification, Location of Signs, measures of sign effectiveness, Types of visual perception, sign regulations, sign visibility, sign variables, Text versus symbols. Road Marking: Role of Road markings, Classification, visibility. Traffic Signals: Need, Signal face. Illumination and location of Signals, Factors affecting signal design, pedestrians' safety, fixed and vehicle actuated signals. Design of signals, Area Traffic control. Delineators, Traffic Impact Attenuators, Road side rest areas, Safety Barriers, Traffic Aid Posts.

UNIT – IV

Traffic Management Techniques: Integrated safety improvement and Traffic Calming Schemes, Speed and load limit, Traffic lights, Safety cameras, Tests on driver and vehicles, pedestrian safety issues, Parking, Parking enforcement and its influence on Accidents. Travel Demand Management; Methods of Traffic management measures: Restriction of Turning Movements, One-way streets, Tidal Flow Operation Methods, Exclusive Bus Lanes and Closing Side-streets; Latest tools and techniques used for Road safety and traffic management. Road safety issues and various measures for road safety; Legislation, Enforcement, Education and Propaganda, Air quality, Noise and Energy Impacts; Cost of Road Accidents.

UNIT – V

Incident Management: Introduction, Characteristics of Traffic Incidents, Types of Incidents, Impacts, Incident management process, Incident traffic management; Applications of ITS: Motorist information, Equipment used; Planning effective Incident management program, Best practice in Incident management

programs. National importance of survival of Transportation systems during and after all natural disasters especially cyclones, earthquakes, floods etc. and manmade disasters like sabotage, terrorism etc.

Suggested Readings:

1. Guidelines on Design and Installation of Road Traffic Signals, IRC:93.
2. Specification for Road Traffic Signals, IS: 7537-1974.
3. Principles and Practice of Highway Engineering by L.R. Kadiyali and N.B. Lal.
4. Hand Book of T.E. Myer Kutz, Editor McGraw Hill, 2004.

Course Code	Course Title						Core / Elective
OE 782 CS	**Software Engineering**						**Open Elective-III**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

- To introduce the basic concepts of software development- processes from defining a product to shipping and maintaining that product
- To impart knowledge on various phases, methodologies and practices of software development
- To understand importance of software modelling using UML
- To understand the importance of testing in software development and study various testing strategies and software quality metrics.

Course Outcomes

At the end of the course students will be able to:

1. Acquire knowledge about different software development processes and their usability in different problem domains.
2. Understand the process of requirements collection, analysing, and modelling requirements for effective understanding and communication with stakeholders.
3. Design and develop the architecture of real world problems towards developing a blueprint for implementation.
4. Use the UML language to design various models during software development life cycle.
5. Understand the concepts of software quality, testing and maintenance.

UNIT-I

The software Problem: Cost, Schedule and Quality, Scale and change, Software Processes: - Process and project, Component Software Processes, Software Development Process Models, Project management Process.

UNIT-II

Software Requirements Analysis and Specification: Value of a good SRS, Requirements Process, Requirements Specification, Functional Specification with Use Cases, Other approaches for analysis. Software Architecture: Role of Software Architecture Views, Component and connector view, Architectural styles for C & C view, Documenting Architecture Design, Evaluating Architectures.

UNIT-III

Planning a Software Project: Effort Estimation, Project Schedule and staffing, Quality Planning, Risk Management Planning, Project Monitoring Plan, Detailed Scheduling. Design: Design concepts, Function oriented Design, Object Oriented Design, Detailed Design, Verification, Metrics.

UNIT-IV

Coding and Unit Testing: Programming Principles and Guidelines, incrementally developing code, managing evolving code, unit testing, code inspection, Metrics. Testing: Testing Concepts, Testing Process, Black Box testing, White box testing, Metrics.

UNIT-V

Maintenance and Re-engineering: Software Maintenance, supportability, Reengineering, Business process Reengineering, Software reengineering, Reverse engineering; Restructuring, Forward engineering, Economics of Reengineering. Software Process Improvement: Introduction, SPI process, CMMI, PCMM, Other SPI Frameworks, SPI return on investment, SPI Trends.

Suggested Readings:

1. Pankaj Jalote, "Software Engineering- A Precise Approach", Wiley India, 2010.
2. Roger. S. Pressman, "Software Engineering - A Practitioner's Approach", 7th Edition, McGraw Hill Higher Education, 2010.
3. Deepak Jain, "Software Engineering", Oxford University Press, 2008.
4. Rajib Mall, "Fundamentals of Software Engineering", 4th Edition, PHI Learning, 2014.
5. Ian Sommerville, "Software Engineering", 10th Edition, Addison Wesley, 2015.

Course Code	Course Title						Core / Elective
MC 771 EG	**Human Values and Professional Ethics**						**Mandatory**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	-

Course Objectives

Student has to understand the

- To develop a critical ability to distinguish between essence and form, or between what is of value and what is superficial, to life.
- To move from discrimination to commitment. It is to create an ability to act on any discrimination in a given situation.
- It encourages students to discover what they consider valuable. After learning the course, they should be able to discriminate between valuable and the superficial in real situations in their life.

Course Outcomes

At the end of the course, the students will be able to

1. It ensures students sustained happiness through identifying the essentials of human values and skills.
2. It facilitates a correct understanding between profession and happiness
3. It helps students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
4. Ability to develop appropriate technologies and management patterns to create harmony in professional and personal life.

UNIT - I

Course Introduction - Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self-Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self-exploration. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT - II

Understanding Harmony in the Human Being - Harmony in Myself!: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT - III

Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of justice and program for its fulfillment; Trust and Respect as the foundational values of relationship. Difference between intention and competence. Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family)

UNIT - IV

Understanding Harmony in the nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT - V

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.

Suggested Readings:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.Ivan IIlich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
3. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
4. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986
5. Smriti Shristava, "Human Values and Professional Ethics", Katson Publications,2007

Course Code	Course Title						Core/Elective
MC111PO	**Indian Constitution (Common to All Branches)**						Mandatory Course
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**-**

Course Objectives

- To create awareness among students about the Indian Constitution.
- To acquaint the working conditions of union, state, local levels, their powers and functions.
- To create consciousness in the students on democratic values and principles articulated in the constitution.
- To expose the students on the relations between federal and provincial units.
- To divulge the students about the statutory institutions.

Course Outcomes

After completing this course, the student will

1. Know the background of the present constitution of India.
2. Understand the working of the union, state and local levels.
3. Gain consciousness on the fundamental rights and duties.
4. Be able to understand the functioning and distribution of financial resources between the centre and states.
5. Be exposed to the reality of hierarchical Indian social structure and the ways the grievances of the deprived sections can be addressed to raise human dignity in a democratic way.

UNIT-I

Evolution of the Indian Constitution: 1909 Act, 1919 Act and 1935 Act. Constituent Assembly: Composition and Functions; Fundamental features of the Indian Constitution.

UNIT-II

Union Government: Executive-President, Prime Minister, Council of Minister
State Government: Executive: Governor, Chief Minister, Council of Minister
Local Government: Panchayat Raj Institutions, Urban Government

UNIT-III

Rights and Duties: Fundamental Rights, Directive principles, Fundamental Duties

UNIT-IV

Relation between Federal and Provincial units: Union-State relations, Administrative, legislative and Financial, Inter State council, NITI Ayog, Finance Commission of India

UNIT-V

Statutory Institutions: Elections-Election Commission of India, National Human Rights Commission, National Commission for Women

Suggested Readings:

1. D.D. Basu, Introduction to the constitution of India, Lexis Nexis, New Delhi
2. Subhash Kashyap, Our Parliament, National Book Trust, New Delhi
3. Peu Ghosh, Indian Government &Politics, Prentice Hall of India, New Delhi
4. B.Z. Fadia & Kuldeep Fadia, Indian Government &Politics, Lexis Nexis, New Delhi

Course Code	Course Title						Core/Elective
HS201EG	**Effective Technical Communication in English**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

To expose the students to:

- Features of technical communication
- Types of professional correspondence
- Techniques of report writing
- Basics of manual writing
- Aspects of data transfer and presentations.

Course Outcomes

On successful completion of the course, the students would be able to:

1. Handle technical communication effectively
2. Use different types of professional correspondence
3. Use various techniques of report writing
4. Acquire adequate skills of manual writing
5. Enhance their skills of information transfer and presentations

UNIT I

Definition and Features of Technical communication: Definition and features of technical communication (precision, relevance, format, style, use of visual aids), Differences between general writing and technical writing, Types of technical communication (oral and written)

UNIT II

Technical Writing-I (Official correspondence): Emails, IOM, Business letters, Business proposals.

UNIT III

Technical writing-II (Reports): Project report, Feasibility report, Progress report, Evaluation report.

UNIT IV

Technical writing- III (Manuals): Types of manuals, User manual, Product manual, Operations manual.

UNIT V

Information Transfer and Presentations: Non-verbal (bar diagram, flow chart, pie chart, tree diagram) to verbal (writing), Verbal (written) to non-verbal, Important aspects of oral and visual presentations.

Suggested readings:

1. Raman, Meenakshi & Sharma, Sangeeta. (2015). *Technical Communication: Principles and Practice* (3rd ed.). New Delhi.
2. Rizvi, Ashraf, M. (2017). *Effective Technical Communication* (2nd ed.). Tata McGraw Hill Education. New Delhi.
3. Sharma, R. C., & Mohan, Krishna. (2017). *Business Correspondence and Report Writing: A Practical Approach to Business & Technical Communication* (4th ed.). Tata McGraw Hill Education. New Delhi.

Course Code	Course Title						Core/Elective
HS202CM	**Finance and Accounting**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The course will introduce the students

- To provide basic understanding of Financial and Accounting aspects of a business unit
- To provide understanding of the accounting aspects of business
- To provide understanding of financial statements
- To provide the understanding of financial system
- To provide inputs necessary to evaluate the viability of projects
- To provide the skills necessary to analyse the financial statements

Course Outcomes

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

1. Evaluate the financial performance of the business unit.
2. Take decisions on selection of projects.
3. Take decisions on procurement of finances.
4. Analyse the liquidity, solvency and profitability of the business unit.
5. Evaluate the overall financial functioning of an enterprise.

UNIT-I

Basics of Accounting: Financial Accounting–Definition- Accounting Cycle – Journal - Ledger and Trial Balance-Cash Book-Bank Reconciliation Statement (including Problems)

UNIT-II

Final Accounts: Trading Account-Concept of Gross Profit- Profit and Loss Account-Concept of Net Profit-Balance Sheet (including problems with minor adjustments)

UNIT-III

Financial System and Markets: Financial System-Components-Role-Considerations of the investors and issuers- Role of Financial Intermediaries. Financial Markets-Players- Regulators and instruments - Money Markets Credit Market- Capital Market (Basics only)

UNIT-IV

Basics of Capital Budgeting techniques: Time Value of money- Compounding- Discounting- Future Value of single and multiple flows- Present Value of single and multiple Flows- Present Value of annuities-Financial Appraisal of Projects– Payback Period, ARR- NPV, Benefit Cost Ratio, IRR (simple ratios).

UNIT-V

Financial statement Analysis: Financial Statement Analysis- Importance-Users-Ratio Analysis-liquidity, solvency, turnover and profitability ratios.

Suggested Readings:

1. Satyanarayana. S.V. and Satish. D., Finance and Accounting for Engineering, Pearson Education
2. Rajasekharan, Financial Accounting, Pearson Education

Course Code	Course Title						Core/Elective
HS213MP	**Industrial Psychology**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

The course will introduce the students to

- To Know Industry Structures and functions.
- Develop an awareness of the major perspectives underlying the field of Industrial Psychology
- Understanding for the potential Industrial Psychology has for society and organizations now and in the future.

Course Outcomes

After completing this course, the student will be able to:

1. Understanding of key concepts, theoretical perspectives, and trends in industrial psychology.
2. Evaluate the problems thorough and systematic competency model.
3. Analyse the problems present in environment and design a job analysis method.
4. Create a better work environment for better performance.
5. Design a performance appraisal process and form for the human behavior.

UNIT-I

Industrial Engineering: Meaning, Definition, Objective, Need, Scope, Evolution and developments. Concept of Industrial Engineering, Historical development of Industrial Engineering, main departments of Industry.

Organization Structure: Introduction, Principles of Organization, Organizational theories, Departmentalism, Authority, power, Organizational effectiveness, structuring the Organization, Organizational change, Organization charts.

UNIT-II

Motivation, Morale and Behavioural Science: Motivation, Characteristics, Kinds of motivation, Thoughts of motivational philosophy, Human needs, Incentive as motivators, Managing Dissatisfaction and frustration, Morale, Absenteeism, Behavioural Science.

Social environment: Group dynamics in Industry Personal psychology, Selection, training, placement, promotion, counselling, job motivations, job satisfaction. Special study of problem of fatigue, boredom and accidents.

UNIT-III

Understanding Consumer Behavior: Consumer behaviour, study of consumer preference, effects of advertising, Industrial morale: The nature and scope of engineering psychology, its application to industry

UNIT-IV

Work Methods: Efficiency at work, the concept of efficiency, the work curve, its characteristics, the work methods; hours of work, nature of work, fatigue and boredom, rest pauses. The personal factors; age abilities, interest, job satisfaction, the working environment, noise, illumination, atmospheric conditions, increasing efficiency at work; improving the work methods, Time and motion study, its contribution and failure resistance to time and motion studies, need for allowances in time and motion study.

UNIT-V

Work and Equipment Design: Criteria in evaluation of job-related factor, job design, human factors, Engineering information, input processes, mediation processes, action processes, methods design, work space and its arrangement, human factors in job design. Accident and Safety: The human and economic costs of accidents, accident record and statistics, the causes of accidents situational and individual factors related to accident reduction.

Suggested Readings:

1. TR Banga and SC Sharma, *Industrial Engineering and Management*, Khanna Publishers, 11th Edn., 2014.
2. Tiffin, J and McCormic E.J., *Industrial Psychology*, Prentice Hall, 6th Edn., 1975.
3. McCormic E.J., *Human Factors Engineering and Design*, McGraw Hill, 4th Edn.,1976.
4. Mair, N.R.F., *Principles of Human relations*
5. Gilmer, *Industrial Psychology*
6. Ghiselli & Brown, *Personnel and Industrial Psychology.*
7. Myer, *Industrial Psychology.*
8. Dunnete, M.D., *Handbook of Industrial and Organizational Psychology.*
9. Blum & Taylor, *Industrial Psychology*

Course Code	Course Title						Core/Elective
BS206BZ	**Biology for Engineers**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

Gain vivid knowledge in the fundamentals and uses of biology, human system and plant system.

Course Outcomes

After completing this course, the student will be able to:

1. Apply biological engineering principles, procedures needed to solve real-world problems.
2. Understand the fundamentals of living things, their classification, cell structure and biochemical constituents.
3. Apply the concept of plant, animal and microbial systems and growth in real life situations.
4. Comprehend genetics and the immune system.
5. Know the cause, symptoms, diagnosis and treatment of common diseases.
6. Apply basic knowledge of the applications of biological systems in relevant industries.

UNIT-I

Introduction to Life: Characteristics of living organisms, Basic classification, cell theory, structure of prokaryotic and eukaryotic cell, Introduction to Biomolecules: definition, general classification and important functions of carbohydrates, lipids, proteins, vitamins and enzymes.

UNIT-II

Biodiversity: Plant System: basic concepts of plant growth, nutrition, photosynthesis and nitrogen fixation. Animal System: Elementary study of digestive, respiratory, circulatory, excretory systems and their functions. Microbial System: History, types of microbes, economic importance and control of microbes.

UNIT-III

Genetics and Evolution: Theories of evolution and Evidences; cell division–mitosis and meiosis; evidence of laws of inheritance; variation and speciation; nucleic acids as a genetic material; central dogma; Mendel laws, gene and chromosomes.

UNIT-IV

Human Diseases: Definition, causes, symptoms, diagnosis, treatment and prevention of diabetes, cancer, hypertension, influenza, AIDS and Hepatitis. Immunity immunization, antigen – antibody immune response.

UNIT-V

Biology and its Industrial Applications: Transgenic plants and animals, stem cell and tissue engineering, bioreactors, bio pharming, recombinant vaccines, cloning, drug discovery, biological neural networks, bioremediation, biofertilizer, biocontrol, biofilters, biosensors, biopolymers, bioenergy, biomaterials, biochips, basic biomedical instrumentation.

Suggested Readings:

1. A Text book of Biotechnology, R.C. Dubey, S. Chand Higher Academic Publications, 2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011.
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004

4. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
5. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
6. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012.

Course Code	Course Title						Core/Elective
MC113PY	**Essence of Indian Traditional Knowledge (Common to All Branches)**						Mandatory Course
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**-**

Course Objectives

The course will introduce the students to

- To get a knowledge in Indian Culture
- To Know Indian Languages and Literature and the fine arts in India
- To explore the Science and Scientists of Medieval and Modern India

Course Outcomes

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

1. Understand philosophy of Indian culture.
2. Distinguish the Indian languages and literature.
3. Learn the philosophy of ancient, medieval and modern India.
4. Acquire the information about the fine arts in India.
5. Know the contribution of scientists of different eras.

UNIT - I

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT - II

Indian Languages, Culture and Literature: Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India

Indian Languages and Literature-II: Northern Indian languages & literature

UNIT - III

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT – IV

Fine Arts in India (Art, Technology& Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT – V

Education System in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

Suggested Reading:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition",ISBN: 81246033375, 2005
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN 13: 978-8187276333, 2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", ISBN 81-7450 494-X, 200

EC 594

CODING THEORY AND TECHNIQUES

Instruction	3 Periods per week	University Examination - Duration	3 Hours
Sessionals	20 Marks	University Examination - Marks	80 Marks

UNIT – I

Introduction:

Digital communication system, Wireless channel statistical models, BER performance in AWGN and fading channels for different modulation schemes, BER performance of CDMA, FH – CDMA in AWGN and fading channels, capacity of fading channels with CSI, Diversity reception, channel coding Theorem, Channel coding gain.

UNIT – II

Block Coding:

Galois fields, polynomials over Galois fields, RS codes, Decoding Techniques for RS codes, LDPC encoder and decoder, Performance analysis of RS and LDPC codes. BCH codes.

UNIT – III

Convolution codes:

Linear convolution encoders, Structural properties of Convolution codes, Viterbi decoding technique for convolution codes – Soft / Hard decision, concatenation of block codes and convolutional codes, performance analysis, concept of Trellis coded modulation.

UNIT – IV

Turbo Codes:

Parallel concatenation, Turbo encoder, Iterative decoding using BCJR algorithm, Performance analysis.

UNIT – V

Space – Time Coding:

MIMO systems, MIMO fading channels, rate gain & diversity gain, transmit diversity, Alamouti scheme, OSTBC codes, Linear space – time codes, trellis space – time codes, Space – time codes with no CSI

Suggested Reading:

1. S.B. Wicker, Error control systems for Digital communication and storage, Prentice-hall 1995.
2. E. Biglieri, Coding for Wireless Channels, Springer,2007.
3. K.L.Du & M.N.S.Swamy, Wireless Communication Systems: From RF Subsystems to 4G Enabling Technoligies, Cambridge,2010.
4. J.G. Proakis & M. Salehi, Digital Communications, Mc Graw-Hill, 2008.

EC 432 *w.e.f Academic year 2017-2018*

Embedded C and VLSI Design LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25

Part A

Write an embedded C program to demonstrate on ARM Micro controller Kit

1. Round Robin Task Scheduling
2. Preemptive Priority Based Task Scheduling
3. Priority Inversion
4. Timing Concept
5. Message and Queues
6. Semaphores
7. Multi Tasking concept of Real Time Application

Part B

Interfacing Programs using embedded C on ARM Micro controller Kit

8. Program to interface 8-Bit LED and switch interface
9. Program to implement Buzzer interface on IDE environment
10. Program to display message in a 2 line x 16 characters LCD display and verify the result in debug terminal
11. Stepper motor interface
12. ADC & Temperature sensor LM35 interface
13. Transmission from kit and reception from PC using serial port.

Part C

Transistor Level implementation of CMOS circuits using VLSI CAD tool

14. Basic Logic Gates: Inverter, NAND and NOR
15. Half Adder and Full Adder
16. 4:1 Multiplexer
17. 2:4 Decoder

Note: A minimum of 10 experiments to be performed and at least 3 experiments from each part to be performed.

Course Code	Course Title						Core / Elective
PC403EC	**PROBABILITY THEORY AND STOCHASTIC PROCESS**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	1	-	-	**30**	**70**	**3**

Course Objectives

- To understand different types of Random variables their density distribution functions
- To learn one Random variable characteristic functions of different variables using their density functions
- To learn the concepts of sequences of Random variables, Properties of Random vectors
- To understand elementary concepts of the Random Processes or distribution functions
- To understand the functions of two Random variables probability density distribution of the joint Random variables

Course Outcomes

- Apply probability and random variables
- Explain temporal and spectral functions of random variables
- Analyze the noise

UNIT-I: Probability and Random Variable

Probability: Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events.

Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables.

UNIT -II: Distribution & Density Functions and Operation on One Random Variable – Expectations

Distribution & Density Functions: Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density, Properties.

Operation on One Random Variable – Expectations: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function.

UNIT-III: Multiple Random Variables and operations

Multiple Random Variables: Joint Distribution Function and its Properties Joint Density Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions.

Operations on Multiple Random Variables:

Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties.

UNIT-IV: Random Processes – Temporal Characteristics:

The Stochastic Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence, First-Order Stationary Processes, Second-Order and Wide-Sense Stationarity, Nth Order and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties, Linear System Response of Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions, Gaussian Random Processes, Poisson Random Process.

UNIT-V: Random Processes – Spectral Characteristics:

The Power Density Spectrum and its Properties, Relationship between Power Spectrum and Autocorrelation Function, Cross-Power Density Spectrum and its Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Some Noise Definitions and Other Topics: White Noise and Colored Noise, Product Device Response to a Random Signal. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Spectral Density of Input and Output of a Linear System.

SUGGESTED READINGS:

1. Peyton Z. Peebles, **Probability, Random Variables & Random Signal Principles**, 4th edition, Tata McGraw Hill, 2001.
2. Athanasius Papoulis and S. Unnikrishna Pillai, **Probability, Random Variables and Stochastic Processes,** 4th edition, McGraw Hill, 2006.
3. Henry Stark and John W. Woods, **Probability and Random Processes with Application to Signal Processing,** 3rd edition, Pearson Education, 2014.
4. P. Ramesh Babu, **Probability Theory and Random Processes,** 1st edition, McGraw Hill Education (India) Private Limited, 2015.

Course Code	Course Title	Core / Elective

Course Code	Course Title						Core/ Elective
PC506EC	**DIGITAL SYSTEM DESIGN THROUGH VERILOG HDL**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
STLD PC302EC	3	-	-	-	30	70	3

Course Objectives:

- Describe verilog HDL and develop digital circuits using gate level and data flow modeling
- Develop verilog HDL code for digital circuits using switch level and behavioral modeling
- Design and develop of digital circuits using Finite State Machines(FSM)
- Prepare Algorithmic State Machines(ASM) of Digital design
- Describes designing with Programmable Logic Devices (PLD's).

Course Outcomes:

- Appreciate the constructs and conventions of the verilog HDL programming in gate level and data flow modeling.
- Generalize combinational circuits in behavioral modeling and concepts of switch level modeling
- Design and analyze digital systems and finite state machines.
- Comprehend advanced features of verilog HDL and apply them to design complex real time digital system using ASMs
- Design various circuits for memory devices and annotate the ASIC/FPGA design flow

UNIT - I

Introduction to HDLs: Overview of Digital Design with Verilog HDL, Basic Concepts, Data types, System tasks and Compiler Directives. Hierarchical modeling, concepts of modules and ports Gate level Modeling, Dataflow modeling-Continuous Assignments, Timing and Delays. Programming Language Interface

Design of Arithmetic Circuits using Gate level/ Data flow modeling –Adders, Subtractors, 4-bit Binary and BCD adders and 8-bit Comparators.

Verification: Functional verification, simulation types, Design of stimulus block.

UNIT - II

Switch Level Modeling and examples. Behavioral Modeling: Structured Procedures, Procedural Assignments, Timing Controls, and Conditional Statements, multi-way branching, Loops, Sequential and Parallel blocks, Generate blocks. Tasks and Functions

Behavioral/dataflow modeling of basic MSI combinational logic modules: ALUs, Encoders, Decoders, Multiplexers, Demultiplexers, Parity generator/checker circuits, Bus Structure. Basic concepts of Static timing analysis, Logic synthesis

UNIT - III

Behavioral modeling of sequential logic modules: Latches, Flip Flops, counters and shift registers applications

Synchronous Sequential Circuits: Analysis and synthesis of synchronous sequential circuits: Mealy and Moore FSM models for completely and incompletely specified circuits, State Minimization-Partitioning Minimization Procedure, sequence detector with verilog HDL modeling Design of a Modulo-8 Counter using the Sequential Circuit Approach and its verilog implementation. One-Hot Encoding

UNIT - IV

Algorithmic State Machines (ASMs):ASM chart, ASM block, simplifications and timing considerations with design example. ASMD chart for binary multiplier and Verilog HDL code, one hot state controller.

Asynchronous Sequential logic: Analysis procedure-Transition table, flow table, race conditions. Hazards with design example of Vending-Machine Controller

UNIT - V

Introduction to ASIC's: Full-custom, standard-cell and Gate array based ASICs. SPLDs: PROM, PAL, GAL, PLA. FPGA and CPLD simplified architecture and applications. ASIC/FPGA Design flow, CAD tools Combinational circuit Design with Programmable logic Devices (PLDs).

Suggested Reading:

1. Samir Palnitkar, "Verilog HDL A Guide to Digital Design and Synthesis," 2nd Edition, Pearson Education, 2006.
2. M. Morris Mano, Michael D. Ciletti, "Digital Design", 4th edition, Pearson Education.
3. Michael John Sebastian Smith, Application Specific Integrated Circuits, Pearson Education Asia, 3rd edition 2001.
4. Stephen Brown and ZvonkoVranesic,"Fundamentals of Digital Logic with Verilog Design",McGraw Hill.
5. Advanced Digital Design with the Verilog HDL Second Edition Michael D. Ciletti Pearson

Course Code	Course Title				CIE	SEE	Core/Elective
HS 204 EG	Business Communication and Presentation Skills (Common to all branches)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	0	0	0	30	70	3

Course Objectives:

- To communicate clearly, accurately and appropriately
- To learn different models of interpersonal communication
- To work in teams effectively and learn how to be effective in using time
- To comprehend the difference between technical and general writing
- To write reports, scientific papers, letters, Statement of Purpose, Resume
- To learn how to plan and prepare to face interviews effectively

UNIT – I

Business Communication: Importance of business communication; ABC of technical communication – Accuracy, Brevity, Clarity; Channels of communication: Downward communication, Upward communication, Diagonal communication, Horizontal communication; Organisational GDs

UNIT – II

Interpersonal Communication and Personality Development: Models of interpersonal development, Johari window, Knapp's model, styles of communication; Team work; Persuasion techniques; Mobile Etiquette, e-mail Etiquette; Time Management

UNIT – III

Technical Written Communication: Differences between Technical Writing and General Writing; Report Writing: Types of Reports, Structure/Format, Language Style, Writing Technical Reports; Writing Scientific Papers

UNIT – IV

Career Oriented Written Communication: Writing SOPs; Job Application: Language style and Format; Résumé writing: design and style; Cover Letter; Business Letters: Letters of enquiry and responses, Letters of complaint, Letters of adjustment, Sales letters; Agenda and minutes of the meeting

UNIT – V

Interview Skills and Group Discussions: Interviews: Purpose, Planning, Preparation, Language and style, Sample interview questions and answers; Group discussions: Types of GDs, Features of good GDs, Preparing for a group discussion

Suggested Readings:

1. E. Suresh Kumar, *Engineering English,* Orient Blackswan, 2014.
2. E. Suresh Kumar et al., *Communication Skills and Soft Skills.* Pearson, 2011.
3. E. Suresh Kumar et al., *English for Success.* Cambridge University Press India Private Ltd, 2010.
4. Sanjay Kumar and Pushp Lata. *Communication Skills. OUP, 2011.*
5. Kavita Tyagi and Padma Misra. *Professional Communication.* PHI, 2011.
6. Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice. OUP, 2011.*

Course Code	Course Title						Core/Elective
HS 253 EG	Communication Skills Lab (Common to all branches)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	0	0	0	2	25	50	1

Course Objectives:

- To learn the appropriate use of language
- To learn to use the appropriate body language
- To participate in group discussions and debates
- To improve their public speaking skills
- To improve their presentation and participation skills
- To learn how interviews are conducted and faced

Notes: a) While teaching the following items, emphasis may be laid on intensive practice in the language lab. Lecturing may be avoided as far as possible.

b) Lab Mannual Recommended.

1. **Role play**: Use of dialogues in a variety of situations and settings
2. **Presentation Skills**: Making effective presentations, Expressions which can be used in presentations, Use of non-verbal communication, Coping with stage fright, Handling questions and answer session
3. **Public Speaking**: Planning, Preparation, Techniques of delivery, Handling stage fear/fright
4. **Group Discussion**: Initiating, continuing and concluding a GD, Giving feedback; Practising case studies and Topic based GDs

5. **Debate**: Differences between a debate and a group discussion, Essentials of a debate, Participating in a debate
6. **Interview Skills**: Facing interviews confidently, Use of suitable expressions during interviews; Mock interviews

Suggested Readings:

1. E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD).* Revised edition, Cambridge University Press India Pvt. Ltd. 2014
2. T. Balasubramanian. *A Text book of English Phonetics for Indian Students.* Macmillan, 2008.
3. Edgar Thorpe. *Winning at Interviews*. Pearson Education, 2006.
4. J. Sethi et al., *A Practical Course in English Pronunciation (with CD).* Prentice Hall of India, 2005.
5. Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews.* Tata McGraw Hill, 2006.

Course Code	Course Title						Core / Elective
PE 822 EC	**Internet of Things**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

- Discuss fundamentals of IoT and its applications and requisite infrastructure
- Describe Internet principles and communication technologies relevant to IoT
- Discuss hardware and software aspects of designing an IoT system
- Describe concepts of cloud computing and Data Analytics
- Discuss business models and manufacturing strategies of IoT products

Course Outcomes

After completing this course, the student will be able to

1. Understand the various applications of IoT and other enabling technologies.
2. Comprehend various protocols and communication technologies used in IoT
3. Design simple IoT systems with requisite hardware and C programming software
4. Understand the relevance of cloud computing and data analytics to IoT
5. Comprehend the business model of IoT from developing a prototype to launching a product.

UNIT – I

Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT: Things in IoT, IoT protocols, Logical Design of IoT: IoT functional Blocks, Communication Models, APIs, IoT enabling Technologies: Wireless Sensor Networks, Cloud Computing, Big Data Analytics (Ref 1)

IoT Applications: Smart Home, Smart Cities, Smart Environment, Smart Energy, Smart Retail and Logistics, Smart Agriculture and Industry, Smart Industry and smart Health (Ref1)

UNIT – II

Internet Principles and communication technology: Internet Communications: An Overview – IP, TCP, IP protocol Suite, UDP. IP addresses – DNS, Static and Dynamic IP addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols – HTTP, HTTPS, Cost Vs Ease of Production, Prototypes and Production, Open Source Vs Closed Source. Prototyping Embedded Devices – Sensors, Actuators, Microcontrollers, SoC, Choosing a platform, Prototyping Hardware platforms – Arduino, Raspberry Pi. Prototyping the physical design – Laser Cutting, 3D printing, CNC Milling (Ref 2)

UNIT – III

API Development and Embedded programming: Getting started with API, writing a new API, Real time Reactions, Other Protocols, Techniques for writing embedded code: Memory management, Performance and Battery Life, Libraries, Debugging. (Ref 2)

Developing Internet of Things: IoT design Methodology, Case study on IoT System for weather monitoring (Ref 1)

UNIT – IV

IoT Systems - Logical Design using Python: Introduction to Python, Data Types and Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/Time Operations., Classes, Python packages for IoT (Ref 1 and Ref 3)

IoT Physical Devices and Endpoints: Raspberry Pi, Interfaces of Pi, Programming pi with Python - Controlling LED and LDR using Pi with python programming.

UNIT – V

Cloud computing and Data analytics and IoT Product Manufacturing: Introduction to Cloud storage models and Communication APIs, Amazon web services for IoT, Skynet IoT Messaging Platform. Introduction to Data Analytics for IoT (Ref 1). Case studies illustrating IoT Design – Smart Lighting, Weather Monitoring, Smart Irrigation. (Ref 1) Business model for IoT product manufacturing, IoT Start-ups, Mass manufacturing, Ethical issues in IoT. (Ref 2)

Suggested Readings:

6. Internet of Things (A Hands-On-Approach), Vijay Madisetti, ArshdeepBahga, VPT Publisher, 1st Edition, 2014.
7. Designing the Internet of Things, Adrian McEwen (Author), Hakim Cassimally. Wiley India Publishers.
8. Fundamentals of Python, Kenneth A Lambert and B.L. Juneja, Cengage Learning
9. *Internet of Things* - Converging Technologies for smart environments and Integrated ecosystems, River Publishers.
10. *Internet of things* -A hands on Approach, Arshdeep Bahga, Universities press.

EC 411 *Effect from the academic year 2017 - 2018*

OPTICAL FIBER COMMUNICATION
(Elective-I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Course Objectives:

1. Learn concepts of propagation through optical fiber Fiber modes and configurations, Losses and dispersion through optical fiber.
2. Understand operating principles of light sources and detectors used in optical transmitters and Receivers.
3. Design an optical link in view of loss and dispersion.

UNIT-I

Evolution of fiber optic system, Elements of Optical Fiber Transmission link, Ray Optics, Optical Fiber Modes and Configurations, Mode theory of Circular Waveguides, Overview Low frequency data transportation of Modes and Key concepts, Linearly Polarized Modes, Single Mode Fibers and Graded Index fiber structure and.

UNIT-II

Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Waveguides-Information Capacity determination, Group Delay, Material Dispersion, Waveguide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in Guided Index fibers, Mode Coupling, Types of OFC Connectors and issues involved Design Optimization of Single and cut-off wavelength.

UNIT-III

Direct and indirect Band gap materials, LED structures, Light source materials, Quantum efficiency, LED power, Modulation of LED, laser Diodes, Modes and Threshold condition, Rate equations, External Quantum efficiency, Resonant frequencies, Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers, Power Launching and coupling, Lensing schemes, Fiber-to-Fiber joints, Fiber splicing.

UNIT-IV

PIN and APD diodes, Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise, Comparison of Photo detectors, Fundamental Receiver Operation, preamplifiers, Error Sources, Receiver Configuration, Probability of Error, Quantum Limit.

UNIT-V

Point-to-Point link system considerations -Link Power budget, Rise - time budget, Noise Effects on System Performance, Operational Principles of WDM and Applications. Erbium-doped Amplifiers. Introductory concepts of SONET/SDH Network. Multiple signal interface in fibers, Bandwidth utilization, Interface with nano-electronic devices.

Suggested Reading:

1. Gourd Keiser, *"Optical Fiber Communication,"* 4/e, TMH, 2000.
2. J.Senior, *"Optical Communication, Principles and Practice,"* PHI, 1994.
3. J.Gower, *"Optical Communication System,"* PHI, 2001.
4. Binh, *"Digital Optical Communications,"* First Indian Reprint 2013, (Taylor & Francis), Yesdee Publications.

Course Code	Course Title						Core / Elective
PE 842 EC	**Fuzzy Logic and Applications**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
DCCN PE672EC	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

- The concepts of regular sets and Fuzzy sets
- To gain the knowledge of Fuzzy relations
- Different Fuzzification methods & Membership function
- Different Defuzzification methods
- Fuzzy Associative Memories, FAM system Architecture & its applications

Course Outcomes

1. To distinguish crisp sets & Fuzzy sets and perform operations on Fuzzy sets
2. Define Fuzzy relations & apply operations on different Fuzzy relations
3. To convert crisp sets to Fuzzy sets using different Fuzzification methods
4. To convert Fuzzy sets to Crisp sets using different Defuzzification methods
5. To understand Fuzzy Associative Memories & FAM system Architecture

UNIT-I

Basics of Fuzzy sets: Introduction to Fuzzy sets, Operation on Fuzzy sets, Properties of Fuzzy sets, Extensions of Fuzzy set concepts, Extension principle and its applications.

UNIT-II

Fuzzy Relations: Basics of fuzzy relations, Operations on fuzzy relations, Properties of Fuzzy relations, Fuzzy Equivalence & Fuzzy Tolerance relations, Various types of Binary fuzzy relations.

UNIT-III

Membership Functions: Features of the membership function, Fuzzification, Membership value assignments: Intuition, Inference, Rank ordering, Neural Networks.

UNIT-IV

Defuzzification, Different Defuzzification methods: Max-membership principle, Central method, weighted average method, Mean-max membership, Center of sums, Center of largest area, First (or last) of maxima.

UNIT-V

Fuzzy Associative Memories: FAMs as Mappings, Fuzzy Hebb FAMS, Bi-directional FAM theorem for Correlation-Minimum Encoding, Correlation-Product Encoding, Superimposing FAM rules, FAM system Architecture, Example of Invented pendulum, Basic structure and operation of Fuzzy logic control system, Applications of Fuzzy controllers.

Suggested Readings:

1. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill, 1995.
2. C.T. Lin and C.S. George Lee, "Neural Fuzzy Systems", PHI, 1996.
3. Bant A KOSKO, "Neural Networks and Fuzzy Systems", PHI, 1994.
4. Altrock, C.V., "Fuzzy Logic and Neuro Fuzzy Applications explained", PHI, 1995.
5. John Harris, "Introduction to fuzzy logic applications", Springer, 2000.

Course Code	Course Title						Core / Elective
MC901EG	**GENDER SENSITIZATION**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
-	L	T	D	P			
	3	-	-	-	30	70	0

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and How to counter it.
- Students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.

UNIT - I

Understanding Gender: Why Should We Study It? Socialization: Making Women, Making Men: Introduction-Preparing for Womanhood-Growing up male-First lessons in caste-Different Masculinities; **Just Relationships: Being Together as Equals:** Mary Kom and Onler-Love and acid just do not mix-Love Letters-Mothers and Fathers-Further reading: Rosa Parks-The brave heart.

UNIT - II

Gender And Biology: Missing Women: Sex selection and Its Consequences – Declining sex ratio. Demographic Consequences; **Gender Spectrum: Beyond the Binary –** Two or many – Struggles with discrimination; **Our Bodies, Our Health.**

UNIT - III

Gender And Labour: Housework: the Invisible Labour: "My mother doesn't work"- Share the Load"; **Women's Work; Its Politics and Economics:** Fact and fiction-Unrecognized and unaccounted work- Wages and conditions of work.

UNIT - IV

Issues of Violence: Sexual Harassment: Say No! : Sexual harassment – not eve-teasing-Coping with everyday harassment-"Chupulu"; **Domestic Violence: Speaking Out:** Is home a safe place? When women unite-Rebuilding lives-New forums for justice; **thinking about Sexual Violence:** Blaming the victim – "I fought for my life". The caste face of violence

UNIT - V

Gender Studies: Knowledge - Through the Lens of Gender - Point of view - Gender and the structure of knowledge – Unacknowledged women artists of Telangana: **Who's History? Questions for Historians and Others:** Reclaiming a past-Writing other histories-Missing pages from modern Telangana history.

Suggested Readings:

1. A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, VasudhaNagarajAsma Rasheed, GoguShyamala, DeepaSreenivas and Susie Tharu, *"Towards a World of Equals: A Bilingual Text book on Gender"* Telugu Akademi, Hyderabad, 1st Edition, 2015.
2. www.halfthesky.cgg.gov.in

Course Code	Course Title						Core / Elective
OE 772 CS	**Data Science Using R Programming**						**Open Elective-II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

- To learn basics of R Programming environment: R language, R- studio and R packages
- To learn various statistical concepts like linear and logistic regression, cluster analysis, time series forecasting
- To learn Decision tree induction, association rule mining and text mining

Course Outcomes

At the end of the course, the students will be able to

1. Use various data structures and packages in R for data visualization and summarization
2. Use linear, non-linear regression models, and classification techniques for data analysis
3. Use clustering methods including K-means and CURE algorithm

UNIT – I

Data Science: Introduction to data science, Linear Algebra for data science, Linear equations, Distance, Hyper planes, Half spaces, Eigen values, Eigenvectors.

UNIT II

Statistical Modelling, Random variables, Probability mass/density functions, sample statistics, hypothesis testing.

UNIT III

Predictive Modelling: Linear Regression, Simple Linear Regression model building, Multiple Linear Regression, Logistic regression

UNIT IV

Introduction to R Programming, getting started with R: Installation of R software and using the interface, Variables and data types, R Objects, Vectors and lists, Operations: Arithmetic, Logical and Matrix operations, Data frames, functions, Control structures, Debugging and Simulation in R.

UNIT V

Classification: performance measures, Logistic regression implementation in R, K-Nearest neighbours (KNN), K-Nearest neighbours implementation in R, Clustering: K-Means Algorithm, K-Means implementation in R.

Suggested Readings:

1. Nina Zumel, Practical Data Science with R, Manning Publications, 2014.
2. Peter Bruce and Andrew Bruce, Practical Statistics for Data Scientists, O'Reilly, 2017.
3. Hadley Wickham and Garrett Grolemund, R for Data Science, O'Reilly, 2017.
4. Roger D Peng, R Programming for Data science, Lean Publishing, 2016.
5. Rafael A Irizarry, Introduction to Data Science, Lean Publishing,2016.

Course Code	Course Title						Core / Elective
OE 771 CE	**Green Building Technologies**						**Open Elective-II**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**-**	**-**	**-**	**30**	**70**	**3**

Course Objectives

- To impart knowledge of the principles behind the green building technologies.
- To know the importance of sustainable use of natural resources and energy.
- To understand the principles of effective energy and resources management in buildings.
- To bring awareness of the basic criteria in the green building rating systems.
- To understand the methodologies to reduce, recycle and reuse towards sustainability.

Course Outcomes

After completing this course, the student will be able to

1. Define a green building, along with its features, benefits and rating systems.
2. Describe the criteria used for site selection and water efficiency methods.
3. Explain the energy efficiency terms and methods used in green building practices.
4. Select materials for sustainable built environment & adopt waste management methods.
5. Describe the methods used to maintain indoor environmental quality.

UNIT-I

Introduction to Green Buildings: Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development. Green building rating systems – GRIHA, IGBC and LEED, overview of the criteria as per these rating systems.

UNIT- II

Site selection and planning: Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect, maximize comfort by proper orientation of building facades, day lighting, ventilation, etc.

Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, reducing landscape water demand by proper irrigation systems, water efficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.

UNIT-III

Energy Efficiency: Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy. Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air-conditioning systems in buildings, zero ozone depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.

UNIT-IV

Building materials: Methods to reduce embodied energy in building materials: (a) Use of local building materials (b) Use of natural and renewable materials like bamboo, timber, rammed earth, stabilized mud blocks, (c) use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, vitrified tiles, materials from agro and industrial waste. (d) reuse of waste and salvaged materials

Waste Management: Handling of construction waste materials, separation of household waste, on-site and off-site organic waste management

UNIT-V

Indoor Environmental Quality for Occupant Comfort and Wellbeing: Daylighting, air ventilation, exhaust systems, low VOC paints, materials & adhesives, building acoustics. Codes related to green buildings: NBC, ECBC, ASHRAE, UPC etc.

Suggested Readings:

1. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
2. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.
3. *Alternative building materials and technologies* by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao.
4. *Non-Conventional Energy Resources* by G. D. Rai, Khanna Publishers.
5. *Sustainable Building Design Manual*, Vol.1 and 2, TERI, New Delhi 2004.
6. Mike Montoya, *Green Building Fundamentals*, Pearson, USA, 2010.
7. Charles J. Kibert, *Sustainable Construction - Green Building Design and Delivery*, John Wiley & Sons, New York, 2008.
8. Regina Leffers, *Sustainable Construction and Design*, Pearson / Prentice Hall, USA, 2009.

Course Code	Course Title					Core/Elective
HS 204 EG	Business Communication and Presentation Skills (Common to all branches)					Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	0	0	0	30	70	3

Course Objectives:

- To communicate clearly, accurately and appropriately
- To learn different models of interpersonal communication
- To work in teams effectively and learn how to be effective in using time
- To comprehend the difference between technical and general writing
- To write reports, scientific papers, letters, Statement of Purpose, Resume
- To learn how to plan and prepare to face interviews effectively

UNIT – I

Business Communication: Importance of business communication; ABC of technical communication – Accuracy, Brevity, Clarity; Channels of communication: Downward communication, Upward communication, Diagonal communication, Horizontal communication; Organisational GDs

UNIT – II

Interpersonal Communication and Personality Development: Models of interpersonal development, Johari window, Knapp's model, styles of communication; Team work; Persuasion techniques; Mobile Etiquette, e-mail Etiquette; Time Management

UNIT – III

Technical Written Communication: Differences between Technical Writing and General Writing; Report Writing: Types of Reports, Structure/Format, Language Style, Writing Technical Reports; Writing Scientific Papers

UNIT – IV

Career Oriented Written Communication: Writing SOPs; Job Application: Language style and Format; Résumé writing: design and style; Cover Letter; Business Letters: Letters of enquiry and responses, Letters of complaint, Letters of adjustment, Sales letters; Agenda and minutes of the meeting

UNIT – V

Interview Skills and Group Discussions: Interviews: Purpose, Planning, Preparation, Language and style, Sample interview questions and answers; Group discussions: Types of GDs, Features of good GDs, Preparing for a group discussion

Suggested Readings:

1. E. Suresh Kumar, *Engineering English,* Orient Blackswan, 2014.
2. E. Suresh Kumar et al., *Communication Skills and Soft Skills.* Pearson, 2011.
3. E. Suresh Kumar et al., *English for Success.* Cambridge University Press India Private Ltd, 2010.
4. Sanjay Kumar and Pushp Lata. *Communication Skills. OUP, 2011.*
5. Kavita Tyagi and Padma Misra. *Professional Communication.* PHI, 2011.
6. Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice. OUP, 2011.*

Course Code	Course Title						Core/Elective
ES 930 CS	Computer Skills Lab						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	0	0	0	2	25	50	1

Course Objectives:

- To learn assembling and disassembling of PC Hardware
- To understand the installation of Operating systems
- To be able to acquire skills in Productivity tools

LIST OF EXPERIMENTS:

I PC Hardware

1. Identify the peripherals of a computer. (Processor, Memory chips, Mother board, Disk drives, and Controller card such as AGP board, Network cards, Sound card, as well as Parallel and Serial ports etc.,)
2. Disassembling and Assembling PC in working condition. Load the Operating Systems with partitions for Windows and Linux, configure for Network.

II Productivity Tools:

1. **Documentation Using MS-Word** - Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, and Bookmarks.
2. **Presentation using MS-PowerPoint**: Creating presentation slides and Enhancing Slides with features like Organizational charts, Excel Charts, Word Art, Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object.

3. **MS Excel :** Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions- like sum, average, standard deviation, and charts.

4. **Internet** and **HTML:**

   a) Telnet/Secure Shell (Remote login to university computers)

   b) Electronic Mail (Communicating with email software)

   c) File Transfer Protocols (transferring files between networked computers)

   d) World Wide Web (Interface, Navigation, Search Tools)

   e) Publishing Web Pages (Using HTML editors to create personal web sites)

   f) Create the web-page (With title, text, frames, hyperlinks to some sites, pictures, lists, tables, fonts and colors) without using any web authoring tools.

5. **Documentation Using LATEX:** Introduction to Linux Commands, Introduction to LateX, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar tool, Page Formatting, Single/Multi column, Pictures/Objects, Drawing, Hyperlinks, Header/Footer, and Tables.

Suggestion Reading:

1. Peter Norton, "*Introduction to Computers*" , 6th Edition, McGraw Hill Publishers,
2. Leslie Lamport, "*Latex: A Document Preparation System*", 2nd Edition, Pearson Education India, 1994.
3. Stefan Kottwitz, "*LaTeX Beginner's Guide*", Shroff/Packt Publishers, First Edition, 2012.

Course Code	Course Title						Core/Elective
MC111PO	**Indian Constitution (Common to All Branches)**						Mandatory Course
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**2**	**-**	**-**	**-**	**30**	**70**	**-**

Course Objectives

- To create awareness among students about the Indian Constitution.
- To acquaint the working conditions of union, state, local levels, their powers and functions.
- To create consciousness in the students on democratic values and principles articulated in the constitution.
- To expose the students on the relations between federal and provincial units.
- To divulge the students about the statutory institutions.

Course Outcomes

After completing this course, the student will

1. Know the background of the present constitution of India.
2. Understand the working of the union, state and local levels.
3. Gain consciousness on the fundamental rights and duties.
4. Be able to understand the functioning and distribution of financial resources between the centre and states.
5. Be exposed to the reality of hierarchical Indian social structure and the ways the grievances of the deprived sections can be addressed to raise human dignity in a democratic way.

UNIT-I

Evolution of the Indian Constitution: 1909 Act, 1919 Act and 1935 Act. Constituent Assembly: Composition and Functions; Fundamental features of the Indian Constitution.

UNIT-II

Union Government: Executive-President, Prime Minister, Council of Minister
State Government: Executive: Governor, Chief Minister, Council of Minister
Local Government: Panchayat Raj Institutions, Urban Government

UNIT-III

Rights and Duties: Fundamental Rights, Directive principles, Fundamental Duties

UNIT-IV

Relation between Federal and Provincial units: Union-State relations, Administrative, legislative and Financial, Inter State council, NITI Ayog, Finance Commission of India

UNIT-V

Statutory Institutions: Elections-Election Commission of India, National Human Rights Commission, National Commission for Women

Suggested Readings:

1. D.D. Basu, Introduction to the constitution of India, Lexis Nexis, New Delhi
2. Subhash Kashyap, Our Parliament, National Book Trust, New Delhi
3. Peu Ghosh, Indian Government &Politics, Prentice Hall of India, New Delhi
4. B.Z. Fadia & Kuldeep Fadia, Indian Government &Politics, Lexis Nexis, New Delhi

Course Code	Course Title						Core / Elective
ES156CE	**Engineering Graphics & Design (Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	1	-	4	-	**50**	**50**	3

Course Objectives

- To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare you to communicate effectively
- To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Outcomes

The students will able to

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design
3. Exposure to engineering graphics standards
4. Exposure to solid modeling
5. Exposure to computer-aided geometric design
6. Exposure to creating working drawings
7. Exposure to engineering communication

Sheet No	Description of the Topic	Contact Hours	
		Lecture	Drawing
1	Principles of Engineering Graphics and their significance, usage of drawing instruments.	1	
2	**Conic Sections – I** Construction of ellipse, parabola and hyperbola given focus and eccentricity.	1	2
3	**Conic Sections – II** Construction of ellipse (given major and minor axis), parabola (given base and height), rectangular hyperbola.		2
4	**Cycloids** (cycloid & epicycloid)	1	2
5	**Involutes** (involute of triangle, square & circle)		2
6	**Scales** (plain & diagonal scales)	1	2 + 2
7	**Introduction to AutoCAD** Basic commands and simple drawings.		2 + 2
8	**Orthographic Projection** Projections of points situated in different quadrants.	1	2
9	**Projections of straight lines – I** Line parallel to both the reference planes, line perpendicular or inclined to one reference plane.	1	2
10	**Projections of straight lines – II** Line inclined to both the reference planes.	1	2
11	**Projections of planes – I** Perpendicular planes	1	2

12	**Projections of planes – II** Oblique planes		2
13	**Projections of solids – I** Polyhedra and solids of revolution, Projections of solids in simple position.	1	2
14	**Projection of solids – II** Projections of solids when the axes inclined to one or both the reference planes.	1	2 + 2
15	**Section of solids – I** When the sectional plane is parallel or perpendicular to one reference plane.	1	2
16	**Section of solids – II** When the sectional plane is inclined to one reference plane.		2
17	**Development of surfaces – I** Prisms and Cylinders	1	2
18	**Development of surfaces – II** Pyramids and Cones		2
19	**Intersection of surfaces – I** Intersection of cylinder and cylinder	1	2
20	**Intersection of surfaces – II** Intersection of cylinder and cone		2
21	**Isometric projection – I** planes and simple solids	1	2
22	**Isometric projection – II** combination of two or three solids		2
23	Conversion of Isometric Views to Orthographic Views	1	2
24	**Floor plans** of 2 or 3 rooms including windows, doors, and fixtures such as WC, bath, sink, shower, etc.	1	2

Suggested Text:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. S.N Lal, Engineering Drawing with Introduction to Auto CAD, Cengage Learning India Pvt Lid, New Delhi, 2018.
4. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
5. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6. (Corresponding set of) CAD Software Theory and User Manuals

NOTE:

1. At least 20 sheets must be covered.
2. Sheet number 1 to 6 (Graph sheets / drawing sheets)
3. Sheet number 7 to 24 (AutoCAD drawings)

Course Code	Course Title						Core/Elective
Mandatory Course	GENDER SENSITIZATION						Core
Prerequisite	Contact Hours per week				CIE	SEE	Credits
	L	T	D	P			
-	3	--	--	--	30	70	0

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT I

Understanding Gender

Gender: Why Should We Study It? Socialization: Making Women, Making Men
Introduction Preparing for Womanhood Growing up Male First lessons in Caste. Different Masculinities

Just Relationships: Being Together as Equals, Mary Kom and Onler Love and Acid just do not Mix. Love Letters Mothers and Fathers Rosa Parks-The Brave Heart

UNIT – II

Gender and Biology

MissingWomen: Sex Selection and Its Consequences Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary Two or Many? Struggles with Discrimination Our Bodies Our Health

UNIT – III

Gender and Labour

Housework: The Invisible Labour "My Mother doesn't Work." "Share the Load."

Course Code	Course Title						Core/Elective
PC551ME	**COMPUTER AIDED PRODUCTION DRAWING & CAM LAB**						**Core**
Prerequisite	**Contact Hours per week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Machine Drawing	--	--	--	**2**	**25**	**50**	**1**

Course Objectives:

- To learn design criteria of machine components, selection of materials and manufacturing Process.
- To learn application of principles to design helical coiled and leaf springs, gears, curved beams, sliding contact and rolling element bearings, chain drives, IC engine components and fly wheels.
- To familiarize with NC features, part programming using G and M codes, APT, CNC, DNC and FMS etc.

Course Outcomes:

- Create the models of the components
- Demonstrate the documentation and presentation skills
- Prepare the production drawings of the parts from the given assembly drawing
- Generate the bill of materials and indicate details pertaining to manufacturing requirements.
- To recognize the importance of Computer Aided Manufacturing and prepare a simple part program to perform machining on a CNC machine.
- To produce various machine components by performing different machining operations.

LIST OF EXPERIMENTS

1) Part modeling from given assembly drawings using any solid modeling package.
2) Geometrical dimensioning and tolerance representation on part drawings.
3) Conventional practices indicating Dimensional, Form & Position tolerances.
4) Calculation of limits, suggestion of suitable fits for mating parts with Interference detection.
5) Surface finish, surface treatments- specification and indication methods on the drawings.
6) Generation of production drawings in 2D from part models representing Limits, fits, tolerances, Surface finish, geometrical and form tolerance etc.
7) Preparation of Process sheet incorporating Tool work orientation diagrams.
8) Facing, Turning, Step turning, Taper turning & Contouring on CNC Lathe.
9) Pocketing and Contouring on CNC Milling.
10) Simulation and Development of NC code using CAM software.
11) Programming for integration of various CNC machines, robots and material handling system.
12) Develop simple objects using 3D printing technology.

Note: Minimum ten experiments should be conducted in the semester

Course Code	Course Title						Core/Elective
PC553ME	**DYNAMICS LAB**						**Core**
Prerequisite	**Contact Hours per week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	--	--	--	2	25	50	1

Course Objectives:

- To understand the effects and importance of kinematic and dynamic analysis of mechanisms
- To understand effects and analysis of Single degree freedom vibration systems
- To study the gyroscope, governors and cams
- To carry out the static and dynamic analysis of four bar mechanisms and drives

Course Outcomes:

- To find out natural frequencies of various beams with different constraints
- Evaluate static and dynamic balancing of masses
- To find the gyroscopic effect on vehicles
- To find out kinematic and dynamic behavior of mechanisms

List of Experiments

Governors

1. Centrifugal Governors: Experiment on Performance Characteristic Curves

Gyroscope

2. Estimation of Gyroscopic Couple & Understanding of Gyroscopic Effects on a rotating disc.

Static And Dynamic Balancing Equipment

3. Static and Dynamic Balancing of Rotating Masses

Moment of Inertia

4. Determination of Moment of Inertia of Flywheel and Connecting Rod

Universal Vibration System

5. Damped and Undamped Torsional Vibrations of Single and Double Rotor System.
6. Single DOF (Degrees of Freedom) of Spring Mass Damper System. (Damped and Undamped Systems)
7. Free and Forced Vibration of Simply Supported Cantilever Beam
8. Dunkerley Method to Find Fundamental Frequencies.
9. Modal Analysis of Beam & Disc.

Cam And Follower Apparatus

10. Dynamic Forces In Cams

Gear Trains

11. Velocity Ratios of Simple, Compound, Epicyclic and Diffrential Gear Trains.
12. Critical Speed of Shaft.

Note: Minimum ten experiments should be conducted in the semester

Course Code	Course Title						Core / Elective
OE 601 CE	**DISASTER MANAGEMENT**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To enhance awareness of institutional processes in the country
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

Course Outcomes

- The students will be able to understand impact on Natural and manmade disasters.
- Able to classify disasters and destructions due to cyclones
- Able to understand disaster management applied in India

UNIT-I

Introduction to Disasters: Concepts and definitions of Disaster, Hazard, Vulnerability, Resilience, Risks. Natural and Manmade disasters, impact of drought, review of past disasters and drought in India, its classification and characteristics. Classification of drought, causes, Impacts (including social, economic. political, environmental, health, psychosocial, etc.).

UNIT-II

Disaster: Classifications, Causes, Impacts including social, economic, political, environmental, health, psychosocial etc. Differential Impacts, in terms of caste, class, gender, age, location, disability Global trends in disasters, urban disasters, pandemics, complex emergencies, climate change. Cyclones and Floods: Tropical cyclones & Local storms, Destruction by tropical cyclones and local storms, Cumulative atmospheric hazards/ disasters, Cold waves, Heat waves, Causes of floods, Rood hazards in India.

UNIT-III

Approaches to Disaster Risk Reduction: Disaster cycle, its analysis, Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural sources, roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRis/ULBs), states, Centre, and other stake-holders.

UNIT-IV

Inter-relationship between Disasters and Development: Factors affecting Vulnerabilities, differential impacts, impact of development projects such as darns, embankments, changes in Land-use etc. Climate Change, Adaptation, Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT-V

Disaster Risk Management in India: Hazard and Vulnerability profile of India

Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, OM Act and Policy, other related policies, plans, programmes and legislation)

Field Work and Case Studies: The field work is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located.

Suggested readings:

1) Sharma V. K., "**Disaster Management, National Centre for Disaster Management**", IIPE, Delhi, 1999.
2) Gupta Anil K, and Sreeja S. Nair., "**Environmental Knowledge for Disaster Risk Management**", NIDM, New Delhi, 2011.
3) Nick., **"Disaster Management: A Disaster Manager's Handbook"** Asian Development Bank, Manila Philippines, 1991.
4) Kapur, et al. , "**Disasters in India Studies of Grim Reality**", Rawat Publishers, Jaipur, 2005.
5) Pelling Mark, "**The Vulnerability of Cities: Natural Disaster and Social Resilience**", Earth scan publishers, London, 2003.

Course Code	Course Title						Core / Elective
OE 601 CS	**OPERATING SYSTEMS**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- To understand CPU, Memory, File and Device management
- To learn about concurrency control, protection and security
- To gain knowledge of Linux and Windows NT internals

Course Outcomes

- Explain the components and functions of operating systems.
- Analyze various Scheduling algorithms.
- Apply the principles of concurrency
- Compare and contrast various memory management schemes
- Perform administrative tasks on Linux Windows Systems

UNIT-I

Introduction to Operating Systems: OS structure and strategies, Process concepts, Threads, Inter process communication. CPU scheduling algorithms, Process synchronization, Critical section problem, Semaphores, Monitors.

UNIT-II

Memory Management: Swapping, Contiguous allocation, Paging, Static and Dynamic partitions, Demand paging, Page replacement algorithms, Thrashing, Segmentation, Segmentation with paging. File system interface: File concepts, Access methods and protection. File system implementation: File system structure, Allocation methods, Directory implementation.

UNIT-III

Deadlocks: Necessary conditions, Resource allocation graph, Methods for handling deadlocks, Prevention, Avoidance, Detection and Recovery. Protection: Goals, Domain of protection, Access matrix. Security: Authentication, Threat monitoring, Encryption. UNIT-IV Device Management: Disk scheduling methods, Disk management, Device drivers and interfaces, CPU- Device interactions, I/O optimization.

UNIT-V

Case Studies: The Linux System, Design principles, Kernel modules, Process management, Scheduling, Memory management, File systems, Input and Output, Inter process communication Windows NT, General Architecture, The NT kernel, The NT executive

Suggested Readings:

1. Abraham Silberschatz, Peter B Galvin, ***"Operating System Concepts"***, Addison Wesley, 2006
2. William Stallings, "***Operating Systems-Internals and Design Principles"***, 8th edition, Pearson, 2014
3. Andrew S Tanenbaum, "***Modern Operating Systems"***, 4th edition, Pearson, 2016.

Course Code	Course Title						Core / Elective
OE 602 CS	**OOPS USING JAVA**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- To introduce fundamental object oriented concepts of Java programming Language, such as classes, inheritance packages and interfaces.
- To introduce concepts of exception handling and multi-threading.
- To use various classes and interfaces in java collection framework and utility classes.
- To understand the concepts of GUI programming using AWT controls.
- To introduce Java I/O streams and serialization

Course Outcomes

- Able to develop java applications using OO concepts and packages.
- Able to write multi-threaded programs with synchronization
- Able to implement real world applications using java collection frame work and I/O classes Able to write Event driven GUI programs using AWT/Swing

UNIT – I

Object Oriented System Development: understanding object oriented development, understanding object oriented concepts, benefits of object oriented development. Java Programming Fundamentals: Introduction, overview of Java, data types, variables and arrays, operators, control statements

UNIT – II

Java Programming Object Oriented Concepts: classes, methods, inheritance, packages and interfaces. Exceptional Handling, Multithreaded Programming

UNIT – III

I/O Basics, Reading Console Input and Output, Reading and Writing Files, Print Writer Class, String Handling Exploring Java. Lang, Collections Overview, Collection Interfaces, Collection Classes, Iterators, Random Access Interface, Maps, Comparators, Arrays, Legacy Classes and Interfaces, String Tokenizer

UNIT – IV

Introducing AWT Working with Graphics: AWT Classes, Working with Graphics Event Handling: Two Event Handling Mechanisms, the Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces. AWT Controls: Control Fundamentals, Labels, Using Buttons, Applying Check Boxes, Check box Group, Choice Controls, Using Lists, Managing Scroll Bars, Using Text Field, Using Text Area, Understanding Layout Managers, Menu bars and Menus, Dialog Boxes, File Dialog, Handling events by Extending AWT Components, Exploring the controls, Menus and Layout Managers.

UNIT – V

Java I/O Classes and Interfaces: Files, Stream and Byte Classes, Character Streams, Serialization.

Suggested Readings:

1. Herbert Schildt, **"The Complete Reference JAVA"**, Tata McGraw Hill, 7thEdition, 2005
2. James M Slack, **"Programming and Problem Solving with JAVA"**, Thomson learning, 2002
3. C.Thomas Wu,**"An Introduction to Object-Oriented Programming with Java"**, Tata McGraw Hill, 5thEdition, 2005.

Course Code	Course Title						Core / Elective
OE602EE	BASICS OF POWER ELECTRONICS						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	0	0	0	30	70	3

Course Objectives

- To be able to understand various power switching devices, characteristics and applications.
- To learn and understand the various converters like rectifiers, choppers and inverters principle operation, characteristics and applications.

UNIT I: Power Switching Devices

Concept of power electronics, scope and applications, types of power converters; Power semiconductor switches and their V-I characteristics - Power Diodes, Power BJT, SCR, Power MOSFET, Power IGBT; Thyristor ratings and protection, methods of SCR commutation, UJT as a trigger source, gate drive circuits for BJT and MOSFETs

UNIT II: AC-DC Converters (Phase Controlled Rectifiers)

Principles of single-phase fully-controlled converter with R, RL, and RLE load, Principles of single-phase half-controlled converter with RL and RLE load, Principles of three-phase fully-controlled converter operation with RLE load, Effect of load and source inductances, General idea of gating circuits, Single phase and Three phase dual converters

UNIT III: DC-DC Converters (Chopper/SMPS)

Introduction, elementary chopper with an active switch and diode, concepts of duty ratio, average inductor voltage, average capacitor current Buck converter - Power circuit, analysis and waveforms at steady state, duty ratio control of output voltage. Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage. Buck-Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage

UNIT IV: DC-AC Converters (Inverters)

Introduction, principle of operation, performance parameters, single phase bridge inverters with R, RL loads, 3-phase bridge inverters - 120 and 180 degrees mode of operation, Voltage control of single phase inverters –single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width modulation.

UNIT V: AC-AC Converters

Phase Controller (AC Voltage Regulator)-Introduction, principle of operation of single phase voltage controllers for R, R-L loads and its applications. Cycloconverter-Principle of operation of single phase cycloconverters, relevant waveforms, circulating current mode of operation, Advantages and disadvantages

Suggested Reading:

1. Singh.M.D and Khanchandani.K.B, Power Electronics, Tata McGraw Hill, 2nd Edition, 2006.
2. Rashid.M.H, Power Electronics Circuits Devices and Applications. Prentice Hall of India, 2003
3. M.S.Jamil Asghar, Power Electronics, Prentice Hall of India, 2004 With effect from Academic Year 2016-2017
4. Bimbra.P.S, Power Electronics, Third Edition, Khanna Publishers, 1999
5. Mohan, Undeland, Robbins, Power Electronics, John Wiley, 1996

Course Code	Course Title						Core/Elective
SI 671 ME	**SUMMER INTERNSHIP**						**Core**
Prerequisite	**L**	**T**	**D**	**P**	**CIE**	**SEE**	**Credits**
-	**0**	**0**	**0**	**2**	**50**	**0**	**2***

Course Objectives: To prepare the students

- To give an experience to the students in solving real life practical problems with all its constraints.
- To give an opportunity to integrate different aspects of learning with reference to real life problems.
- To enhance the confidence of the students while communicating with industry engineers and give an opportunity for useful interaction with them and familiarize with work culture and ethics of the industry.

Course Outcomes: On successful completion of this course student will be

- Able to design/develop a small and simple product in hardware or software.
- Able to complete the task or realize a prespecified target, with limited scope, rather than taking up a complex task and leave it.
- Able to learn to find alternate viable solutions for a given problem and evaluate these alternatives with reference to prespecified criteria.
- Able to implement the selected solution and document the same.

Summer Internship is introduced as part of the curricula for encouraging students to work on problems of interest to industries. A batch of two or three students will be attached to a person from an Industry / R & D Organization / National Laboratory for a period of 4 weeks. This will be during the summer vacation following the completion of the VI semester course. One faculty member will act as an internal guide for each batch to monitor the progress and interacts with the Industry guide.

After the completion of the project, students will submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the department. Award of sessional marks are based on the performance of the student at the work place and awarded by industry guide and internal guide (25 Marks) followed by presentation before the committee constituted by the department (25 Marks). One faculty member will coordinate the overall activity of Summer Internship.

Note: * Students have to undergo summer internship of 4 weeks duration at the end of semester VI and credits will be awarded after evaluation in VII semester.

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WITH EFFECT FROM THE ACADEMIC YEAR 2015 – 2016

CE 201

BUILDING PLANNING AND DRAWING

Instruction	6 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Objectives:

- To understand different types of masonries and their applications
- To study about standard dimensions of door, windows, ventilators and other components of buildings.
- To understand the basic concepts of planning of buildings for different story heights

UNIT - I

Introduction : Scope of the subject notation used method of presentation.

Conventional Signs : Conventional representation of building elements Representation of building materials in section. Representation of doors, windows ventilators, cupboards and grills in plan, Representation of electrical and plumbing services. Bricks and brick sections in isometric view

Brick Bonds : Plan and isometric view of wall junctions for half brick wall: one and one and a half brick wall; brick masonry courses in English bond and Flemish bond.

Stone Masonry: Elevation sectional plans and cross sections of walls of ashlars, CRSI and II Sorts, UCRS and RR stone masonry.

UNIT - II

Doors and Windows: Plan, section and elevation of a fully paneled door and fully paneled window, paneled Venetian and glazed doors.

Roofs: Line diagram of simply supported roof trusses

UNIT - III

Stairs : Sketches of forms of stairs (doglegged, open well, bifurcated, etc.). Details of various RC staircases and steel spiral staircases

Foundations : Details of plan and sectional elevation of wall foundations and RC column footings

UNIT - IV

Aspects of building planning, principles of planning, details planning of one/two/three storeyed residential buildings, duplex, development of line diagrams.

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UNIT - V

Drawing of Plans, elevations and sections of a single storey 1-, 2- and 3- bed room residential building.

Suggested Reading :

1. S.P. Arora and S.P. Bindra, A Text Book on Building Construction Dhanpat Rai & Sons, 1993.
2. Y.S. Shahane, Panning and Designing Building., Allies Book Stall third Edition, 2004.
3. M.G. Shah, C.M. Kalae and S.Y. Parki, Building Drawing, Tata McGraw-Hill Book Co., 2002.
4. IS 2210 : 1988 Indian Standard Criteria for Design of Reinforced Concrete Shell Structures and Folded Plates, Bureau of Indian Standards, New Delhi, 1989.

Course Code	Course Title						Core/Elective
HS 204 EG	Business Communication and Presentation Skills (Common to all branches)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	0	0	0	30	70	3

Course Objectives:

- To communicate clearly, accurately and appropriately
- To learn different models of interpersonal communication
- To work in teams effectively and learn how to be effective in using time
- To comprehend the difference between technical and general writing
- To write reports, scientific papers, letters, Statement of Purpose, Resume
- To learn how to plan and prepare to face interviews effectively

UNIT – I

Business Communication: Importance of business communication; ABC of technical communication – Accuracy, Brevity, Clarity; Channels of communication: Downward communication, Upward communication, Diagonal communication, Horizontal communication; Organisational GDs

UNIT – II

Interpersonal Communication and Personality Development: Models of interpersonal development, Johari window, Knapp's model, styles of communication; Team work; Persuasion techniques; Mobile Etiquette, e-mail Etiquette; Time Management

UNIT – III

Technical Written Communication: Differences between Technical Writing and General Writing; Report Writing: Types of Reports, Structure/Format, Language Style, Writing Technical Reports; Writing Scientific Papers

UNIT – IV

Career Oriented Written Communication: Writing SOPs; Job Application: Language style and Format; Résumé writing: design and style; Cover Letter; Business Letters: Letters of enquiry and responses, Letters of complaint, Letters of adjustment, Sales letters; Agenda and minutes of the meeting

UNIT – V

Interview Skills and Group Discussions: Interviews: Purpose, Planning, Preparation, Language and style, Sample interview questions and answers; Group discussions: Types of GDs, Features of good GDs, Preparing for a group discussion

Suggested Readings:

1. E. Suresh Kumar, *Engineering English,* Orient Blackswan, 2014.
2. E. Suresh Kumar et al., *Communication Skills and Soft Skills.* Pearson, 2011.
3. E. Suresh Kumar et al., *English for Success.* Cambridge University Press India Private Ltd, 2010.
4. Sanjay Kumar and Pushp Lata. *Communication Skills. OUP, 2011.*
5. Kavita Tyagi and Padma Misra. *Professional Communication.* PHI, 2011.
6. Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice. OUP, 2011.*

Course Code	Course Title					Core/Elective
ES 930 CS	Computer Skills Lab					Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	0	0	0	2	25	50	1

Course Objectives:

- To learn assembling and disassembling of PC Hardware
- To understand the installation of Operating systems
- To be able to acquire skills in Productivity tools

LIST OF EXPERIMENTS:

I PC Hardware

1. Identify the peripherals of a computer. (Processor, Memory chips, Mother board, Disk drives, and Controller card such as AGP board, Network cards, Sound card, as well as Parallel and Serial ports etc.,)
2. Disassembling and Assembling PC in working condition. Load the Operating Systems with partitions for Windows and Linux, configure for Network.

II Productivity Tools:

1. **Documentation Using MS-Word** - Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, and Bookmarks.
2. **Presentation using MS-PowerPoint**: Creating presentation slides and Enhancing Slides with features like Organizational charts, Excel Charts, Word Art, Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object.

3. **MS Excel :** Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions- like sum, average, standard deviation, and charts.

4. **Internet** and **HTML:**

   a) Telnet/Secure Shell (Remote login to university computers)

   b) Electronic Mail (Communicating with email software)

   c) File Transfer Protocols (transferring files between networked computers)

   d) World Wide Web (Interface, Navigation, Search Tools)

   e) Publishing Web Pages (Using HTML editors to create personal web sites)

   f) Create the web-page (With title, text, frames, hyperlinks to some sites, pictures, lists, tables, fonts and colors) without using any web authoring tools.

5. **Documentation Using LATEX:** Introduction to Linux Commands, Introduction to LateX, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar tool, Page Formatting, Single/Multi column, Pictures/Objects, Drawing, Hyperlinks, Header/Footer, and Tables.

Suggestion Reading:

1. Peter Norton, "*Introduction to Computers*" , 6th Edition, McGraw Hill Publishers,
2. Leslie Lamport, "*Latex: A Document Preparation System*", 2nd Edition, Pearson Education India, 1994.
3. Stefan Kottwitz, "*LaTeX Beginner's Guide*", Shroff/Packt Publishers, First Edition, 2012.

Course Code	Course Title						Core / Elective
ES 106 EE	**Basic Electrical Engineering (Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	1	-	-	**30**	**70**	4

Course Objectives

- To provide an understanding of basics in Electrical circuits.
- To explain the working principles of Electrical Machines and single phase transformers.

Course Outcomes

1. To analyse Electrical circuits to compute and measure the parameters of Electrical Energy.
2. To comprehend the working principles of Electrical DC Machines.
3. To Identify and test various Electrical switchgear, single phase transformers and assess the ratings needed in given application.
4. To comprehend the working principles of electrical AC machines.

Unit-I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

Unit-II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, and RL, RC, RLC combinations (series only). Three phase balanced circuits, voltage and current relations in star and delta connections.

Unit-III

Transformers and 3-ph Induction Motors: Transformers: Electromagnetic induction, Faradays laws, statically induced emf, Lenz law, BH characteristics, ideal and practical transformer, losses and efficiency, Auto-transformer and three-phase transformer connections.

Three Phase Induction motor: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, squirrel cage IM, slip-ring IM, Applications.

Unit-IV

Single-phase induction motor & DC Machines: Single-phase induction motor: Construction and principle of operation, Capacitor start & capacitor run motor, applications

DC Generators: Dynamically induced emf, Flemming's Right hand and Left hand rules, Construction and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications

DC Motors: principle of operation of DC Motor, Types of DC motors, applications.

Unit-V

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Reading:

1. N.K. De, "Basic Electrical Engineering", Universities Press, 2015.
2. J.B. Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K. Kataria & Sons Publications, 2002.

3. J.B. Gupta, "Utilization of Electric Power and Electric Traction" S.K. Kataria & Sons Publications, 2010
4. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "Basic Elactrical Engineering" Tata McGraw Hill, Publications,2009
5. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc., 1995.

Course Code	Course Title						Core / Elective
ES 154 EE	**Basic Electrical Engineering Lab (Common to All Branches)**						**Core**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	**25**	**50**	1

Course Objectives

- To impart the practical knowledge on testing of DC and AC Machines and the usage of common electrical measuring instruments

Course Outcomes

1. Get an exposure to common electrical components and their ratings.
2. Analyse the performance of DC and AC Machines.
3. Comprehend the usage of common electrical measuring instruments.
4. Test the basic characteristics of transformers and electrical machines.

Suggested List of Laboratory Experiments/Demonstrations:

Dem1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
Exp 1. Verification of KVL and KCL, superposition theorem (with DC excitation)
Exp 2 Verification of Thevinens and Nortons theorems (with DC excitation)
Exp 3. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Power factor calculation
Exp 4. Transformers: Observation of the no-load current waveform on an oscilloscope (nonsinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics).
Exp 5. Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
Exp 6. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents).
Exp 7. Measurement of phase voltage/current, line voltage/current and power in a balanced three-phase circuit connected in star and delta
Dem2. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
Exp 8. OCC characteristics of DC Generator
Exp 9. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections.
Exp 10. Power factor improvement of Induction Motor using static capacitors
Exp 11. Load Test of DC Motor

Note - 1:

(i) List of Experiments and Demonstrations suggested above are already available in the Laboratory of the electrical department. No need to purchase any extra equipment except Demonstration2 equipments

(ii) Procurement of Demonstration 2 equipments can be done during the course work of that semester. It can be included in the laboratory.

Note - 2:

(i) Experiments 9, 10 and Demonstration 3 can be incorporated in the Lab syllabus if the topics concerned to the above experiments are considered in new BEE syllabus.

Suggested Reading:

1. J.B. Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K. Kataria & Sons Publications, 2002.
2. J.B. Gupta, "Utilization of Electric Power and Electric Traction" S.K. Kataria & Sons Publications,2010
3. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, "Basic Elactrical Engineering" Tata McGraw Hill, Publications,2009
4. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc., 1995.

Course Code	Course Title						Core / Elective
BS423MT	**Numerical Methods**						Core
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	
	L	T	D	P			Credits
NIL	3	1	-	-	**30**	**70**	3

Course Objectives

- Introduction to few numerical methods to solve non linear equations and system of linear equations
- Basic concepts of numerical differentiation, numerical integration and differential equations
- Concepts of finite differences and their applications

Course Outcomes

- Solution to non linear equations, system of linear equations,differential equations and eigenvalue problems numerically .
- Concepts of numerical differentiation and integration
- Application of finite differences to solve initial and boundary value problems

UNIT-I

Solution of linear and non linear equations: Solution of Algebraic and Transcendental equations-Bisection method, Newton-Raphson method, Solution of linear system of equations- Gauss elimination method, LU decomposition method, Gauss-Jacobi and Gauss-Seidel iteration methods.

UNIT-II

Eigenvalue problems and Interpolation: Eigenvalues and Eigenvectors-Jacobi method for symmetric matrices- Given's method for symmetric matrices, Interpolation, Lagrange's interpolation, Newton's divided difference interpolation, Newton's Forward and Backward difference interpolations.

UNIT-III

Numerical differentiation and Integration : Numerical differentiation, Interpolation approach, Numerical integration-Trapezoidal rule,Simpson's 1/3 rule, Romberg method, Two point and three point Gaussian quadrature formulae, Double integration-Trapezoidal rule, Simpson's 1/3 rule.

UNIT-IV

Numerical solutions of ordinary differential equations : Single step methods, Taylor's series method, Euler's method, Picard's method of successive approximations, Runge-Kutta method of 4^{th} order, Multi step methods, Milne's and Adams-Bash forth Predictor-Corrector methods.

UNIT-V

Finite Differences and their applications: construction of finite difference approximations- Taylor series, forward, backward and central difference approximation,

finite difference approximation of boundary value and initial value problems, 1D and 2D problems- Explicit and implicit and Crank Nicolson schemes, convergence and stability.

Suggested Readings:

1) M.K.Jain,S.R.K.Iyengar and R.K.Jain, ***Numerical methods for scientific and engineering computation*** ,6th edition , New Age International Limited., 2012.
2) Richard L Burden, J. Douglas Faires , ***Numerical Analysis*** , 9th edition, Cengage Learning, 2013.
3) S.S.Sastry, ***Introductory Methods of Numerical Analysis***, 5th edition, PHI Private Limited, 2012.
4) Dr.B.S.Grewal, ***Numerical methods in Engineering and Science***, Khanna Publishers, 2014.
5) StevanC.Chopra, Raymond P.Canal, ***Numerical Methods for Engineers*** ,6th edition, McGraw-Hill company,2010.

Course Code	Course Title						Core / Elective
PE 503 CE	**INFRASTRUCTURE ENGINEERING**						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	0	0	0	**30**	**70**	3

Course Objectives

- To examine the power sector infrastructure requirements including maintenance issues.
- To review various infrastructures needs of roads, railways, water ways and airports in the country.
- To discuss various communication systems and postal services infrastructure requirements.
- To consider the possibilities for housing and construction demand as per the country needs and scope of privatization.

Course Outcomes

- To explain professional issues related to power sector infrastructure needs and maintenance strategies.
- To describe and evaluate roads, railways, waterways and airways infrastructure in any country
- To distinguish different types of communications systems and postal services in the context of infrastructure. To demonstrate importance of housing sector and privatization in the present day context.

UNIT-I

An Overview of Infrastructure Engineering: Urban Infrastructure and Rural Infrastructure in general. An Introduction to Special Economic Zones, Organizations and Players in the field of Infrastructure, The Stages in an Infrastructure Project, Concept of Lifecycle., etc., An Overview of Infrastructure Projects in power Sector, Water Supply and Sanitation Sector, Road, Rail, Air and Port Transportation Sectors and Telecommunications.

UNIT-II

Public and Private Sector Role in Infrastructure Development: A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization , Challenges in Privatization Water Supply, Power, Infrastructure, Road Transportation Infrastructure in India – Case studies preferable.

UNIT-III

Infrastructure Planning and Implementation: Mapping and Facing the Landscape of Risks in Infrastructure Projects, Core Economic and Demand Risks, Political Risks, Socio-Environmental Risks, Cultural Risks in International Infrastructure Projects, Legal and Contractual Issues in Infrastructure, Challenges in Construction and Maintenance of Infrastructure – Case studies preferable.

UNIT-IV

Environmental and Social Impact Assessment Aspects: Categories, Attributes and Parameters, Identification of Environmental and Social Impacts over Project Area and over Project Cycle. Special Considerations Involving Land and Water Interrelationships - Environmental Laws and Regulations, Introduction to B-O-T, BOOT projects & PPP Projects

UNIT-V

Strategies for Successful Infrastructure Project Implementation: Risk Management Framework for Infrastructure Projects, Shaping the Planning Phase of Infrastructure Projects. Governments Role in Infrastructure Implementation, An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions.

Suggested readings:

1) Grigg, Neil, "***Infrastructure Engineering and Management"***, Wiley, 1988.
2) Haas and Hudson, Zaniewski, ***"Modern Pavement Management"***, Krieger, Malabar, 1994.
3) Hudson, Hasnuddin, ***"Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation and Renovation"***, McGraw Hill, 1997.
4) Anjaneyulu, Y & Manickam, V, ***"Environmental Impact Assessment Methodology"***. B.S. Publications, Hyderabad, 2012.
5) P. Chandra, ***"Projects: Planning, Analysis, Selection, Financing, Implementation and Review"***, Tata McGraw-Hill, New Delhi, 2009.
6) A. S. Goodman and M. Hastak, ***"Infrastructure Planning Handbook: Planning, Engineering, and Economics"***, McGraw-Hill, New York, 2006.

Course Code	Course Title						Core / Elective
PE 604 CE	**WATERSHED MANAGEMENT**						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Hydrology and Water Management	3	0	0	0	**30**	**70**	3

Course Objectives

- Description about the concept of watershed and watershed management systems
- Introduction to the characteristics of watershed parameters
- Enhancing the working knowledge to create the data base of watershed using geospatial techniques

Course Outcomes

- Application of Watershed Management practices in conservation vital natural resources like land and Water.
- Awareness on proper use of all available resources of a watershed for optimum production with minimum hazards

UNIT-I

Definition and Concept of Watershed: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

UNIT-II

Characteristics of Watershed: Size, shape, physiographic, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-III

Principles of Erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion.

UNIT-IV

Water Harvesting: Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds and percolation tanks. Land Management: Land use and land capability classification, management of forest, agricultural, grassland and wild land, reclamation of saline and alkaline soils.

UNIT-V

Ecosystem Management: Role of Ecosystem, crop husbandry, soil enrichment, inter mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, silvi pasture, horticulture, social forestry and afforestation. Applications: Planning of watershed management activities, peoples participation, preparation of action plan,

administrative requirements. Social aspects of watershed management, community participation, private sector participation, industrial issues, socio-economy, integrated development, water legislation and implementations, case studies, applications of geospatial techniques in watershed management systems.

Suggested readings:

1) Wurbs R. A. and James W. P., ***'Water Resources Engineering'***, Prentice-Hall of India, New Delhi, 2002
2) Haan C.T., H.P. Johnson, D.L. Brakensiek, ***'Hydrologic Modeling of Small Watersheds'***, ASAE, Michigan, 1982.
3) Majumdar D.K., ***'Irrigation and Water Management'***, PrenticeHall of India, New Delhi, 2000.
4) Murthy, J.V.S., ***'Watershed Management',*** New Age International Publishers, New Delhi, 1998.

Course Code	Course Title						Core / Elective
OE 602 ME	**MATERIAL HANDLING**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- To know about the working principle of various material handling equipments.
- To understand the Material handling relates to the loading, unloading and movement of all types of materials.
- To understand the estimation of storage space and maintenance of material handling equipments.

Course Outcomes

- Able to understand various conveying systems that available in industry.
- Able to understand various bulk solids handling systems and their design features.
- Able to understand and various modern material handling systems and their integration.
- Able to calculate number of MH systems required, storage space, cost and maintenance.

UNIT – I

Mechanical Handling Systems: Belt Conveyors and Desing, Bucket Elevators, Package conveyors, Chain and Flight Conveyors, Screw Conveyors, Vibratory Conveyors, Cranes and Hoists.

UNIT – II

Pneumatic and Hydraulic Conveying Systems: Modes of Conveying and High pressure conveying systems, Low Velocity Conveying System. Components of Pneumatic Conveying Systems: General Requirements, Fans and Blowers, Boots-Type Blowers, Sliding-Vane Rotary Compressors, Screw Compressors, Reciprocating Compressors, Vacuum Pumps.

UNIT – III

Solids Handling: Particle and Bulk Properties- Adhesion, Cohesion and Moisture Content. Gravity Flowof Bulk Solids: Static and Dynamic Pressure Distribution in Bulk Solids. Modes of Flow: Mass Flow, Funnel Flow and Expanded Flow from Hoppers, Bins and Silos.

Unit IV

Modern Material Handling Systems: Constructional features of (i) AGV (ii) automated storage and retrieval systems. Sensors used in AGVs and ASRS.Bar code systems and RFID systems: Fundamentals and their integration with computer-based information systems.

UNIT – V

Total MH Throughput: Calculation for no. of MH systems; storage space estimation based on number of aisles. Maintenance of MH equipment, spare parts management, cost of materials handling, cost per unit load computations

Suggested Readings:

1. Dr. Mahesh Varma, **"Construction Equipment and its Planning & Application"**, Metropolitan Book Co. (P) Ltd., New Delhi, India, 1997.
2. James M. Apple, **"Material Handling Systems Design"**, the Ronald Press Company, New York, USA, 1972.
3. Woodcock CR. and Mason J.S., **"Bulk Solids Handling: An Introduction to Practice Technology"**, Leonard Hill USA, Chapman and Hall, New York.
4. M P Groover etal, **"Industrial Robotics"**, Me Graw Hill, 1999.

Course Code	Course Title						Core / Elective
OE 632 AE	**AUTOMOTIVE SAFETY AND ERGONOMICS**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives:

It is intended to make the students to

- Understand the basics of vehicle collision and its effects
- Understand the various safety concepts used in passenger cars.
- Gain knowledge about various safeties and its equipment.
- Understand the concepts of vehicle ergonomics.
- Gain knowledge about various automotive comforts features.

Course Outcomes:

After the completion of this unit, the student is able to

- Break down the importance of safety in Automobiles
- Describe the various safeties equipment used in Automobiles
- Explain about Vehicle ergonomics and Comforts in Automobiles

UNIT-I

Introduction: Design of the Body for safety, Energy equations, Engine location, Effects of Deceleration inside passenger compartment, Deceleration on impact with stationary and movable obstacle, Concept of Crumble zone and Safety sandwich construction, Active and passive safety, Characteristics of vehicle structures, Optimization of vehicle structures for crash worthiness, Types of crash / roll over tests, Regulatory requirements for crash testing, instrumentation, High speed photography, image analysis.

UNIT-II

Safety Concepts: Active safety- driving safety, Conditional safety, Perceptibility safety and Operating safety, Passive safety: Exterior safety, Interior safety, Deformation behaviour of vehicle body, Speed and acceleration characteristics of passenger compartment on impact, pedestrian safety, human impact tolerance, determination of injury thresholds, severity index, study of comparative tolerance, Study of crash dummies.

UNIT-III

Safety equipments: Seat belt, automatic seat belt fastening system, Collapsible steering column, tilt-able steering wheel, Air bags, electronic systems for activating air bags, Frontal design for safety, collision warning system, Causes of rear end collision, frontal object detection, rear vehicle object detection system, Object detection system with braking system interactions. Anti-lock braking system ESP and EBD systems

UNIT- IV

Vehicle Ergonomics: Introduction to human body - anthropometrics and its application to vehicle ergonomics, Cockpit design, Driver comfort – seating, visibility, Man-machine system- psychological factors – stress, attention, Passenger comfort - ingress and egress, spaciousness, Ventilation, temperature control, Dust and fume prevention and vibration, Interior features and conveniences, Use of modern technology for the same

UNIT-V

Comfort and Convenience System: Cabin comfort - in-car air conditioning – overall energy efficiency, Air management, central and Unitary systems, air flow circuits, air cleaning, ventilation,

With effect from the Academic year 2017-2018

PC 504 CS

Operating Systems

Credits:3

Instruction : (3L + 1T) hrs per week

Duration of SEE : 3 hours

CIE : 30 Marks

SEE : 70 Marks

Course Objectives:

- To introduce the concepts of OS structure and process synchronization
- To study different memory management strategies
- To familiarize the implementation of file system
- To understand the principles of system security and protection
- To discuss the design principles and structure of Windows 7 and Linux

Course Outcomes :

Student will be able to

- Evaluate different process scheduling algorithms
- Describe the steps in address translation and different page replacement strategies
- Compare different file allocation methods and decide appropriate allocation strategy for given type of file
- Explain the mechanisms available in an OS to control access to resource

UNIT-I

Introduction to Operating Systems: OS structure and strategies, Process concepts, Multithreaded Programming, Process scheduling, Process synchronization, Deadlocks.

UNIT-II

Memory management strategies with example architectures: Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging , Virtual memory management : Demand paging, Page replacement, Thrashing.

UNIT-III

File system interface: File concepts, Access methods and protection. File system implementation: File system structure, Allocation methods, Directory implementation of file systems, Mass storage structures, I/O systems

Scanned with CamScanner

UNIT-IV

System Protection : Principles and Domain, Access Matrix and implementation, Access control and access rights, Capability based systems, Language based Protection,
System Security: Problem, Program threats, cryptography, user authentication, implementing security defenses, Firewalling, Computer security Classification

UNIT-V

Case Studies: The Linux System–Design principles, Kernel modules, Process management, Scheduling, Memory management, File systems, Input and Output, Inter process communication. Windows 7 –Design principles, System components, Terminal services and fast user switching File systems, Networking, Programmer interface.

Suggested Reading:

1. Abraham Silberschatz, Peter B Galvin, Operating System Concepts, 9th edition, Wiley, 2016
2. William Stallings, Operating Systems-Internals and Design Principles, 8th edition, Pearson, 2014
3. Andrew S Tanenbaum, Modern Operating Systems, 4th edition, Pearson, 2016.

Course Code	Course Title						Core / Elective
PE 504 CE	**SOFT COMPUTING SKILLS IN CIVIL ENGINEERING**						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	0	0	0	**30**	**70**	3

Course Objectives

- Impart the knowledge of various soft computing techniques
- Understand programming concept and optimization Techniques
- Know the applications of soft computing techniques in Water Resources Engineering

Course Outcomes

- Competence in understanding the optimization principles
- Able to solve simple numerical problems and applications using L.P., D.P.
- The students will be able to understand some of the soft computing techniques like Neural Network, Fuzzy Logic techniques in water Resources

UNIT - I

Optimization Techniques: Introduction, one dimensional Un-constrained minimization , Linear Programming, Generalized formation for simple problems, Solution to Linear Programming by Simplex method, Big M method, two-phase linear programming. Formulation of Linear Programming problems for simple case studies in water resources.

UNIT - II

Dynamic Programming: Introduction to dynamic programming. Bellman's p1inciple, General principles of recursive optimization. Method of forward dynamic programming and back ward dynamic programming. Formulation of recursive relationship for water resources problems (allocation problem, capacity expansion and net works).

UNIT- III

Artificial Neural Networks: Fundamental concepts, Biological Neural networks, Basic Models in Neural Networks, Comparison of Biological Neuron and artificial neuron, terminology of neural networks. Supervised Learning networks and calculation of error Back propagation networks (algorithm and architectures)

UNIT - IV

Fuzzy Sets: Introduction to fuzzy sets and classical sets, fuzzy set operations and properties.Fuzzy relations, fuzzy membership functions, Fuzzy logic, fuzzy quantifiers and fuzzy inferences. Fuzzy rule based methods and defuzzification methods. Application of fuzzy methods in water resources

UNIT - V

Genetic Algorithms: Fundamentals of genetic algorithms, basic concepts, binary coding, fitness function, Reproduction, (Roulett wheel selection, Tournament selection). Cross over and mutation operations, convergence of algorithm. Simple applications in water resources

Suggested readings:

1) Raja Sekharan, S. and Vijaya Laxmi Pai, G.A. ***"Neural Networks, Fuzzy Logic, and Genetic Algorithm"*** M/s. Prentice Hall, New Delhi, 2003.
2) Jang,J.S.R, Tsai Sun, C.H. and Eiji Mizutsanil. ***"Neuro-Fuzzy and Soft Computing."*** Pearson Education New Delhi, 2004.
3) Ashok. D. Belegundu and Chandraputala, T.R. ***"Optimization concepts and Applications in Engineering"*** M/s. Pearson Education New Delhi, 2002.
4) Vedula, S., Mujumdar, P.P. ***"Water resources Systems."*** McGraw-Hill publishers. New Delhi, 2005.

Course Code	Course Title						Core / Elective
PE 601 CE	**Earthquake Resistant Design of Buildings**						Elective
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
RCC & SEDD -I (Concrete)	3	0	0	0	**30**	**70**	3

Course Objectives

- Learn the causes of earthquake and effects of ground motion and modeling of structures.
- Study the response spectra and structural dynamics of MDOF systems.
- Discover the different analysis and design approaches like equivalent lateral force method and inelastic time history analysis.
- Be trained in the ductile detailing of reinforced concrete structures as per IS 4326 and IS 13920.
- Learn the seismic analysis of masonry buildings.

Course Outcomes

- Apply the concepts of structural dynamics of MDOF systems for analysis of structures.
- Model and analyse the structures to resist earthquake forces by different methods.
- Design the various structural elements resisting earthquake forces as per IS Codes.
- Practice ductile detailing of reinforced concrete and masonry buildings as per codal provisions.

UNIT-I

Earthquake Ground Motion: Engineering seismology - Seismic zoning map of India - Strong motion studies in India - Strong motion characteristics - Evaluation of seismic design parameters. Structural Dynamics: Initiation into structural dynamics - Dynamics of SDOF systems - Theory of seismic pickup - Numerical evaluation of dynamic response - Response spectra - Dynamics of MDOF systems.

UNIT-II

Concepts of Earthquake Resistant Design of RCC Structures: Basic elements of earthquake resistant design - Identification of seismic damages in RCC buildings - Effect of structural irregularities on performance of RCC buildings during earthquakes - Earthquake resistant building architecture.

UNIT-III

Seismic Analysis and Modeling of RCC Structures: Code based procedure for determination of design lateral loads - Infill walls - Seismic analysis procedure as per IS 1893 code - Equivalent static force method - Response spectrum method - Time history analysis - Mathematical modeling of multi-storey RCC buildings.

UNIT-IV

Earthquake Resistant Design of RCC Structures: Ductility considerations - Earthquake resistant design of multi-storey RCC buildings and shear walls based on IS 13920 code - Capacity based design.

UNIT-V

Earthquake Resistant Design of Masonry Structures: Identification of damages and non-damages in masonry buildings - Elastic properties of structural masonry - Lateral load analysis of masonry buildings - Seismic analysis and design of one-storey and two-storey masonry buildings.

Suggested readings:

1) Bruce A Bolt, ""***Earthquakes***", W.H. Freeman and Company, New York, 2004.
2) C.A. Brebbia, "***Earthquake Resistant Engineering Structures***", WIT Press, 2011.
3) Mohiuddin Ali Khan, ***"Earthquake Resistant Structures: Design, Build and Retrofit",*** Elsevier Science & Technology, 2012.
4) Pankaj Agarwal and Manish Shrikhande, ***"Earthquake Resistant Design of Structures",*** Prentice Hall of India, New Delhi, 2009.
5) T. Paulay and M.J.N. Priestley, ***"Seismic Design of Reinforced Concrete and Masonry Buildings"***, John Wiley and Sons, 1992.
6) S.K. Duggal, ***"Earthquake Resistant Design of Structures",*** Oxford University Press, New Delhi, 2007

Course Code	Course Title						Core / Elective
ES323ME	**PRIME MOVERS AND PUMPS**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	-	-	-	**30**	**70**	**3**

Course Objectives

- To acquire fundamental knowledge of fluid mechanics and the governing equations applied to fluid machinery.
- To understand the basic types of hydraulic turbines, their components calculations involved in power output and performance characteristics of turbines.
- To understand the basic differences between positive displacement and roto dynamic pumps, their working principles and performance characteristics of reciprocating and centrifugal pumps.
- To understand the mechanism involved in steam formation, types of steam generators; to understand the basic cycle of steam engines.
- To understand the basic cycles, principles involved in operation of different types of steam turbines and gas turbines.

Course Outcomes

- Get a quick look into fundamental aspects of fluid mechanics with basic knowledge acquired to conduct preliminary calculations applied to fluid machinery.
- Understand the basic types of hydraulic turbines, their components, operation and their rated and off design performance characteristics.
- Understand the working principle of reciprocating pumps and centrifugal pumps, their performance over wide range of operations and about the negative effects of cavitation on pump performance.
- Explain basic principles involved in steam formation, types of steam boilers, principle of steam engines.
- Familiarizes basic knowledge of working of steam turbine, gas turbine and methods of improving their efficiency.

Unit-I

Fluid Mechanics: Newtonian and Non-Newtonian Fluids, viscosity, types of fluid flows, continuity, momentum and energy equations, Bernoulli's equation and its applications, laminar and turbulent flows, Reynolds number and its significance.

Unit-II

Hydraulic Turbines: Classification and working principles of turbines, Pelton, Francis, and Kaplan turbine, function of draft tube and types of draft tubes, unit quantities, performance and characteristic curves.

Unit-III

Pumps: Reciprocating pumps, working of single and double acting types, effect of acceleration head and friction, use of air vessels, work done and power required without and with air vessels

Centrifugal pumps: Classification and working of centrifugal pumps, need for priming, cavitation and its effect on performance

Unit-IV

Generation of steam: Dryness fraction and properties of steam, function of boilers, working principle of Lancashire boiler, Babcock and Wilcox boiler, boiler mounting and accessories.

Steam engines: Rankine and Modified Rankine cycle for steam engines.

Unit-V

Steam turbines: Classification of steam turbines, compounding of steam turbines, pressure compounding, velocity compounding, and pressure-velocity compounding.

Gas turbine: Classification of gas turbine-constant pressure combustion cycle, closed cycle and constant volume combustion gas turbine plants.

Suggested Reading:

1. Ballaney P. L, **Thermal Engineering**, Khanna Publishers, 19th Edn., 1993.
2. Yadav R, **Steam and Gas turbines**, Galgotia Publishers, 6th Edn., 1992.
3. Rajput., **Thermal Engineering**, Laxmi Publications (P) Ltd, New Delhi.
4. Bansal R.K., **Fluid Mechanics and Hydraulic Machines**, Laxmi Publications (P) Ltd, New Delhi.
5. Kumar D.S, **Fluid Mechanics and Fluid Power Engineering**, S.K. Kataria & Sons
6. S.Ramamrutham, **Hydraulic Machines**, Dhanpat Rai and Sons.2004.

Course Code	Course Title						Core / Elective
PC451EE	**DIGITAL ELECTRONICS AND INTEGRATED CIRCUITS LAB**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	-	-	-	2	**25**	**50**	**1**

Course Objectives

- To Train the Students for acquiring practical knowledge in time response and frequency response of series / parallel RC, RL and RLC Circuits.
- To prepare the students for finds out parameters of a given two port network.
- To make the students for understanding the verification of theorems.

Course Outcomes

- Evaluate the time response and frequency response characteristics of R,L,C series and parallel circuits.
- Able to validate the network theorems.
- Able to find various parameters of a two-port network.
- Able to simulate electrical circuits using spice.
- Able to synthesize networks from a given transfer function

LIST OF EXPERIMENTS:

1. Generation of triangular, sine and square wave using IC's.
2. Voltage regulator IC **(Included instead of PLL)**
3. Design of astable multivibrator using 555 timer.
4. Active filters.
5. Instrumentation amplifier Sample and hold circuit.
6. Design of integrator and differentiator using Op-Amp.
7. Multiplexer application for logic realization and parallel to serial Conversions.
8. Synchronous counters.
9. Asynchronous counters.
10. Clippers and clampers using Op-Amps.
11. Monostable operation using IC's.
12. Bootstrap sweep circuit using Op-Amp.
13. Half adder, full adder and subtractor and realization of combinational logic.
14. A / D converters.
15. D / A converters.

Note: At least ten experiments should be conducted in the Semester.

Course Code	Course Title						Core / Elective
PC452EE	**COMPUTER AIDED ELECTRICAL DRAWING LAB.**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	-	-	-	2	**25**	**50**	**1**

Course Objectives

- To understand the terminology of electric circuit and electrical components.
- To be able to familiarize with electrical machines, apparatus and appliances.
- To acquire knowledge on various Electrical Engineering software.

Course Outcomes

- Identify and draw different components of electrical systems
- Draw different control and wiring diagrams
- Draw winding diagrams of electrical machines.

Drawing of the following using Electrical CADD / Corel Draw / MS Word / PPT/Visio

1. Lines, Arcs, Curves, Shapes, Filling of objects, Object editing & Transformation.
2. Electrical, Electronic & Electro – Mechanical symbols.
3. House – wiring diagrams and layout.
4. Simple power and control circuit diagrams.
5. Electrical machine winding diagrams. (A.C & D.C)
6. Transmission tower, Over head lines – ACSR conductors, Single circuit, Double circuit, Bundle conductor.
7. Constructional features of D.C motors, AC motors and Transformers.
8. D.C and A.C motor starter diagrams.
9. Lamps used in illumination
10. Single line diagram of Power System

Suggested Reading:

1. KB. Raina, S.K. Bhattacharya, **Electrical Design, Estimating and Costing**, Wiley Eastern Ltd., 1991.
2. Nagrath, Kothari, **Electrical Machines**, Tata McGraw Hill Publishing Company Ltd., 2000.
3. A.K. Sawhney, **A Course in Electrical Machines Design**, Dhanpat Rai and Sons, 1996.

Course Code	Course Title						Core / Elective
PE501EE	PROGRAMMABLE LOGIC CONTROLLERS (Professional Elective-I)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	0	0	0	30	70	3

Course Objectives

- To be able to understand basics of Programmable logic controllers, basic programming of PLC.
- To make the students to understand the Functions and applications of PLC

Course Outcomes

At the end of the course students will be able to

- Develop PLC programs for industrial applications
- Acquire the knowledge of PLC counter functions and PLC Arithmetic functions and data handling functions.

UNIT-I

PLC Basics: Definition and History of PLC, PLC advantages and disadvantages, Over all PLC Systems, CPUs and Programmer Monitors, PLC input and output models, Printing PLC Information, Programming Procedures, Programming Equipment, Programming Formats, Proper Construction of PLC Diagrams, Devices to which PLC input and output modules are connected, Input on/off switching devices, Input analog devices, Output analog on/off devices and output analog devices.

UNIT-II

Basic PLC Programming: Programming on/off inputs to produce on/off outputs - PLC input instructions, Outputs Operational procedures, Contact and coil input/output programming examples, Relation of digital gate logic contact / coil logic - PLC programming and conversion examples, Creating ladder diagrams from process control descriptions, Sequence listings, Large process ladder diagram constructions.

UNIT-III

Basic PLC Functions: General Characteristics of Registers, Module addressing, holding registers, Input registers, output registers, PLC timer functions, examples of timer functions. Industrial applications, PLC counter functions.

UNIT-IV

Intermediate Functions: PLC Arithmetic functions, PLC additions and subtractions, The PLC repetitive clock, PLC Multiplications, Division and Square Root, PLC trigonometric and log functions, Other PLC arithmetic functions, PLC number comparison functions. PLC basic comparison functions and applications, Numbering systems and number conversion functions, PLC conversion between decimal and BCD-Hexadecimals numbering systems

UNIT-V

Data Handling Functions: The PLC skip and master control relay functions, Jump functions, Jump with non return, Jump with return. PLC data move Systems, The PLC functions and applications. PLC functions working with bits, PLC digital bit functions and applications, PLC sequence functions, PLC matrix functions.

Course Code	Course Title						Core / Elective
PE503EE	FACTS DEVICES (Professional Elective – I)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Power Electronics	3	0	0	0	30	70	3

Course Objectives

- To understand the concepts and Importance of different loads characteristics, Design of Sub-Transmission Lines, Sub-Stations and Feeders.
- To make the students understand about importance of Power Quality and Applications of capacitors in distribution systems.

Course Outcomes

At the end of the course the student will be able to:

- Apply impedance, phase angle and voltage control for real and reactive power flow in ac transmission systems
- Analyze and select a suitable FACTS controller for a given power flow condition

UNIT-I

Flexible AC Transmission Systems (FACTS): FACTS concepts and general system conditions: Power flow in AC systems, Relative importance of controllable parameters, Basic types of FACTS controllers, shunt and series controllers, Current source and Voltage source converters

UNIT-II

Static Shunt Compensators: Objectives of shunt compensation, Methods of controllable VAR generation, Static Var Compensator, its characteristics, TCR, TSC, FC-TCR configurations, STATCOM, basic operating principle, control approaches and characteristics.

UNIT-III

Static Series Compensators: Objectives of series compensator, variable impedance type of series compensators, TCSC, TSSC-operating principles and control schemes, SSSC, Power Angle characteristics, Control range and VAR rating, Capability to provide reactive power compensation, external control .

UNIT-IV

Combined Compensators: Introduction to Unified Power Flow Controller, Basic operating principles, Conventional control capabilities, Independent control of real and reactive power

UNIT-V

Application of FACTS: Improvement of system stability limit-enhancement of system damping-Enhancement of transient stability, Prevention of voltage instability

Suggested Reading

1. Understanding FACTS –Concepts and Technology of Flexible AC Transmission Systemsl Narain G.Honorani, Laszlo Gyugyi

Course Code	Course Title						Core / Elective
MC901EG	GENDER SENSITIZATION						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	0	0	0	30	70	3

Course Objectives

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes

At the end of the course students will be able to

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students and professionals will be better equipped to work and live together as equals. Students will develop a sense of appreciation of women in all walks of life.

UNIT-I

Understanding Gender:

Why Should We Study It? Socialization: Making **Women, Making Men:** Introduction-Preparing for Womanhood-Growing up male-First lessons in caste-Different Masculinities;

Just Relationships: Being Together as Equals: Mary Kom and Onler- Love and acid just do not mix-Love Letters-Mothers and Fathers-Further reading: Rosa Parks-The brave heart.

UNIT-II

Gender And Biology:

Missing Women: Sex selection and Its Consequences – Declining sex ratio. Demographic Consequences; Gender Spectrum: Beyond the Binary – Two or many – Struggles with discrimination; Our Bodies, Our Health.

UNIT-III

Gender and Labour:

Housework: the Invisible Labour: "My mother doesn't work"- Share the Load"; **Women's Work; Its Politics and Economics:** Fact and fiction-Unrecognized and unaccounted work- Wages and conditions of work.

UNIT-IV

Issues of Violence:

Sexual Harassment: Say No! : Sexual harassment – not eve-teasing-Coping with everyday harassment- "Chupulu"; **Domestic Violence: Speaking Out:** Is home a safe place? When women unite-Rebuilding lives-New forums for justice; **Thinking about Sexual Violence:** Blaming the victim – "I fought for my life". The caste face of violence

UNIT – V

GENDER STUDIES:

Knowledge - Through the Lens of Gender - Point of view - Gender and the structure of knowledge – Unacknowledged women artists of Telangana: **Whose History? Questions for Historians and Others:** Reclaiming a past-Writing other histories-Missing pages from modern Telangana history.

Suggested Reading:

1. A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu, *"Towards a World of Equals: A Bilingual Text book on Gender"* Telugu Akademi, Hyderabad, 1st Edition, 2015.
2. www.halfthesky.cgg.gov.in

Course Code	Course Title						Core / Elective
PC604EE	RENEWABLE ENERGY TECHNOLOGIES						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	0	0	0	30	70	3

Course Objectives

- To understand the concepts and Importance of renewable energy sources such as solar, wind, biomass, tidal power.
- To make the students understand the advantages and disadvantages of different renewable energy sources

Course Outcomes

At the end of the course students will be able to

- Explain the advantages, disadvantages and applications of different conventional and non conventional sources.
- Acquire the knowledge of various components, principle of operation and present scenario of different conventional and non conventional sources.

UNIT-I

Review of Conventional and Non-Conventional energy sources - Need for non-conventional energy sources Types of Non- conventional energy sources - Fuel Cells - Principle of operation with special reference to H2 °2 Cell - Classification and Block diagram of fuel cell systems - Ion exchange membrane cell - Molten carbonate cells - Solid oxide electrolyte cells - Regenerative system- Regenerative Fuel Cell - Advantages and disadvantages of Fuel Cells — Polarization - Conversion efficiency and Applications of Fuel Cells.

UNIT-II

Solar energy - Solar radiation and its measurements - Solar Energy collectors -Solar Energy storage systems - Solar Pond - Application of Solar Pond - Applications of solar energy.

UNIT-III

Wind energy- Principles of wind energy conversion systems - Nature of wind - Power in the Wind-Basic components of WECS -Classification of WECS -Site selection considerations -Advantages and disadvantages of WECS -Wind energy collectors -Wind electric generating and control systems - Applications of Wind energy -Environmental aspects.

UNIT-IV

Energy from the Oceans - Ocean Thermal Electric Conversion (OTEC) methods - Principles of tidal power generation -Advantages and limitations of tidal power generation -Ocean waves - Wave energy conversion devices -Advantages and disadvantages of wave energy - Geo-thermal Energy - Types of Geo-thermal Energy Systems - Applications of Geo-thermal Energy.

UNIT-V

Energy from Biomass - Biomass conversion technologies / processes - Photosynthesis - Photosynthetic efficiency - Biogas generation - Selection of site for Biogas plant - Classification of Biogas plants - Details

of commonly used Biogas plants in India - Advantages and disadvantages of Biogas generation -Thermal gasification of biomass -Biomass gasifiers.

Suggested Reading:

1. Rai G.D, Non-Conventional Sources of Energy, Khandala Publishers, New Delhi, 1999.
2. M.M.El-Wakil, Power Plant Technology. McGraw Hill, 1984.

Course Code	Course Title						Core / Elective
OE 602 CE	**GEO-SPATIAL TECHNIQUES**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- Description about various spatial and non-spatial data types, and data base management techniques
- Development of the concepts and professional skills in utility of geospatial techniques Enhancement of knowledge of geospatial techniques to field problems

Course Outcomes

- The students will be able to understand and apply GIS tools
- Will be able to analyse and process data to apply to the GIS tools.
- Will be able assimilate knowledge on field problems using remote sensing

UNIT I

Introduction: Basic concepts, socioeconomic challenges, fundamentals of geographical information systems (GIS), history of geographical information system, components of geographical information systems. Projections and Coordinate Systems: Map definitions, representations of point, line, polygon, common coordinate system, geographic coordinate system, map projections, transformations map analysis.

UNIT II

Data Acquisition and Data Management: data types, spatial, non-spatial (attribute) data, data structure and database management, data format, vector and raster data representation, object structural model filters and files data in computer, key board entry, manual digitizing, scanner, aerial photographic data, remotely sensed data, digital data, cartographic database, digital elevation data, data compression, data storage and maintenance, data quality and standards, precision, accuracy, error and data uncertainty. Data Processing: Geometric errors and corrections, types of systematic and non-systematic errors, radiometric errors and corrections, internal and external errors.

UNIT III

Data Modeling: Spatial data analysis, data retrieval query, simple analysis, recode overlay, vector data model, raster data model, digital elevation model, cost and path analysis, knowledge based system. GIS Analysis and Functions: Organizing data for analysis, analysis function, maintenance and analysis of spatial data, buffer analysis, overlay analysis, transformations, conflation, edge matching and editing, maintenance and analysis of spatial and non-spatial data

UNIT IV

Applications of GIS: Environmental and natural resource management, soil and water resources, agriculture, land use planning, geology and municipal applications, urban planning and project management, GIS for decision making under uncertainty, software scenario functions, standard GIS packages, introduction to Global Positioning Systems (GPS) and its applications.

UNIT V

Introduction to Remote Sensing: General background of remote sensing technology, objectives and limitations of remote sensing, electro-magnetic radiation, characteristics, interaction with earth surface and atmosphere, remote sensing platforms and sensors, satellite characteristics, digital image processing, IRS series and high resolution satellites, software scenario functions, remote sensing applications to watershed modeling, environmental modeling, urban planning and management.

Suggested Readings:

1. Burrough, P. A., and McDonnell R. A., **'Principles of Geographical Information Systems'**, Oxford University Press, New York, 1998.
2. Choudhury S., Chakrabarti, D., and Choudhury S. **'An Introduction to Geographic Information Technology'**, I.K. International Publishing House (P) Ltd, New Delhi, 2009.
3. Kang-tsung Chang , **"Introduction to Geographical information Systems'**, Tata McGraw-Hill Publishing Company Ltd., Third Edition, New Delhi, 2006.
4. Lilysand T.M., and Kiefer R.W. **'Remote Sensing and Image Interpretation'**, John Wiley and Sons, Fourth Edition, New York, 2002.
5. Tor Bernhardsen, **'Geographical Information System'**, Wiley India (P) Ltd., Third Edition, New Delhi, 2002.
6. Hoffman-Wellenhof, B, et al. **'GPS Theory and Practice'**, Fourth Edition, Springer Wein, New York, 1997.

Course Code	Course Title						Core / Elective
OE 602 CS	**OOPS USING JAVA**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- To introduce fundamental object oriented concepts of Java programming Language, such as classes, inheritance packages and interfaces.
- To introduce concepts of exception handling and multi-threading.
- To use various classes and interfaces in java collection framework and utility classes.
- To understand the concepts of GUI programming using AWT controls.
- To introduce Java I/O streams and serialization

Course Outcomes

- Able to develop java applications using OO concepts and packages.
- Able to write multi-threaded programs with synchronization
- Able to implement real world applications using java collection frame work and I/O classes Able to write Event driven GUI programs using AWT/Swing

UNIT – I

Object Oriented System Development: understanding object oriented development, understanding object oriented concepts, benefits of object oriented development. Java Programming Fundamentals: Introduction, overview of Java, data types, variables and arrays, operators, control statements

UNIT – II

Java Programming Object Oriented Concepts: classes, methods, inheritance, packages and interfaces. Exceptional Handling, Multithreaded Programming

UNIT – III

I/O Basics, Reading Console Input and Output, Reading and Writing Files, Print Writer Class, String Handling Exploring Java. Lang, Collections Overview, Collection Interfaces, Collection Classes, Iterators, Random Access Interface, Maps, Comparators, Arrays, Legacy Classes and Interfaces, String Tokenizer

UNIT – IV

Introducing AWT Working with Graphics: AWT Classes, Working with Graphics Event Handling: Two Event Handling Mechanisms, the Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces. AWT Controls: Control Fundamentals, Labels, Using Buttons, Applying Check Boxes, Check box Group, Choice Controls, Using Lists, Managing Scroll Bars, Using Text Field, Using Text Area, Understanding Layout Managers, Menu bars and Menus, Dialog Boxes, File Dialog, Handling events by Extending AWT Components, Exploring the controls, Menus and Layout Managers.

UNIT – V

Java I/O Classes and Interfaces: Files, Stream and Byte Classes, Character Streams, Serialization.

Suggested Readings:

1. Herbert Schildt, **"The Complete Reference JAVA"**, Tata McGraw Hill, 7thEdition, 2005
2. James M Slack, **"Programming and Problem Solving with JAVA"**, Thomson learning, 2002
3. C.Thomas Wu,**"An Introduction to Object-Oriented Programming with Java"**, Tata McGraw Hill, 5thEdition, 2005.

Course Code	Course Title						Core / Elective
OE 602 EC	**DIGITAL SYSTEM DESIGN USING VERILOG HDL**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	0	0	0	**30**	**70**	3

Course Objectives

- Describe Verilog hardware description languages (HDL).
- Develop Verilog HDL code for combinational digital circuits.
- Develop Verilog HDL code for sequential digital circuits.
- Develop Verilog HDL code for digital circuits using switch level modeling and describes system tasks, functions and compiler directives
- Describes designing with FPGA and CPLD.

Course Outcomes

After completion of this course, students should be able:

- To understand syntax of various commands, data types and operators available with verilog HDL
- To design and simulate combinational circuits in verilog
- To design and simulate sequential and concurrent techniques in verilog
- To write Switch level models of digital circuits
- To implement models on FPGAs and CPLDs

UNIT I

Introduction to Verilog HDL: Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools

Verilog Data Types and Operators: Binary data manipulation, Combinational and Sequential logic design, Structural Models of Combinational Logic, Logic Simulation, Design Verification and Test Methodology, Propagation Delay, Truth Table models using Verilog.

UNIT II

Combinational Logic Circuit Design using Verilog: Combinational circuits building blocks: Multiplexers, Decoders , Encoders , Code converters, Arithmetic comparison circuits, Verilog for combinational circuits , Adders-Half Adder, Full Adder, Ripple-Carry Adder, Carry Lookahead Adder, Subtraction, Multiplication.

UNIT III

Sequential Logic Circuit Design using Verilog: Flip-flops, registers & counters, synchronous sequential circuits: Basic design steps, Mealy State model, Design of FSM using CAD tools, Serial Adder Example, State Minimization, Design of Counter using sequential Circuit approach.

UNIT IV

Switch Level Modeling: Basic Transistor Switches, CMOS Switches, Bidirectional Gates, Time Delays with Switch Primitives, Instantiation with Strengths and Delays, Strength Contention with Trireg Nets.

System Tasks Functions and Compiler Directives: Parameters, Path Delays, Module Parameters. System Tasks and Functions, File Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

UNIT V

Designing with FPGAs and CPLDs: Simple PLDs,ComplexPLDs,Xilinx 3000 Series FPGAs, Designing with FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices (CPLDs), Altera FLEX 10K Series CPLDs.

Suggested Readings:

1) T.R. Padmanabhan, B Bala Tripura Sundari, "**Design Through Verilog HDL**", Wiley 2009.
2) Samir Palnitkar, "**Verilog HDL**", 2nd Edition, Pearson Education, 2009.
3) Stephen Brown, Zvonko Vranesic , "**Fundamentals of Digital Logic with Verilog Design**, TMH, 2nd Edition 2003.

Course Code	Course Title						Core / Elective
OE 602 ME	**MATERIAL HANDLING**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- To know about the working principle of various material handling equipments.
- To understand the Material handling relates to the loading, unloading and movement of all types of materials.
- To understand the estimation of storage space and maintenance of material handling equipments.

Course Outcomes

- Able to understand various conveying systems that available in industry.
- Able to understand various bulk solids handling systems and their design features.
- Able to understand and various modern material handling systems and their integration.
- Able to calculate number of MH systems required, storage space, cost and maintenance.

UNIT – I

Mechanical Handling Systems: Belt Conveyors and Desing, Bucket Elevators, Package conveyors, Chain and Flight Conveyors, Screw Conveyors, Vibratory Conveyors, Cranes and Hoists.

UNIT – II

Pneumatic and Hydraulic Conveying Systems: Modes of Conveying and High pressure conveying systems, Low Velocity Conveying System. Components of Pneumatic Conveying Systems: General Requirements, Fans and Blowers, Boots-Type Blowers, Sliding-Vane Rotary Compressors, Screw Compressors, Reciprocating Compressors, Vacuum Pumps.

UNIT – III

Solids Handling: Particle and Bulk Properties- Adhesion, Cohesion and Moisture Content. Gravity Flowof Bulk Solids: Static and Dynamic Pressure Distribution in Bulk Solids. Modes of Flow: Mass Flow, Funnel Flow and Expanded Flow from Hoppers, Bins and Silos.

Unit IV

Modern Material Handling Systems: Constructional features of (i) AGV (ii) automated storage and retrieval systems. Sensors used in AGVs and ASRS.Bar code systems and RFID systems: Fundamentals and their integration with computer-based information systems.

UNIT – V

Total MH Throughput: Calculation for no. of MH systems; storage space estimation based on number of aisles. Maintenance of MH equipment, spare parts management, cost of materials handling, cost per unit load computations

Suggested Readings:

1. Dr. Mahesh Varma, "**Construction Equipment and its Planning & Application**", Metropolitan Book Co. (P) Ltd., New Delhi, India, 1997.
2. James M. Apple, **"Material Handling Systems Design"**, the Ronald Press Company, New York, USA, 1972.
3. Woodcock CR. and Mason J.S., **"Bulk Solids Handling: An Introduction to Practice Technology"**, Leonard Hill USA, Chapman and Hall, New York.
4. M P Groover etal, **"Industrial Robotics"**, Me Graw Hill, 1999.

Course Code	Course Title						Core / Elective
OE 632 AE	**AUTOMOTIVE SAFETY AND ERGONOMICS**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives:

It is intended to make the students to

- Understand the basics of vehicle collision and its effects
- Understand the various safety concepts used in passenger cars.
- Gain knowledge about various safeties and its equipment.
- Understand the concepts of vehicle ergonomics.
- Gain knowledge about various automotive comforts features.

Course Outcomes:

After the completion of this unit, the student is able to

- Break down the importance of safety in Automobiles
- Describe the various safeties equipment used in Automobiles
- Explain about Vehicle ergonomics and Comforts in Automobiles

UNIT-I

Introduction: Design of the Body for safety, Energy equations, Engine location, Effects of Deceleration inside passenger compartment, Deceleration on impact with stationary and movable obstacle, Concept of Crumble zone and Safety sandwich construction, Active and passive safety, Characteristics of vehicle structures, Optimization of vehicle structures for crash worthiness, Types of crash / roll over tests, Regulatory requirements for crash testing, instrumentation, High speed photography, image analysis.

UNIT-II

Safety Concepts: Active safety- driving safety, Conditional safety, Perceptibility safety and Operating safety, Passive safety: Exterior safety, Interior safety, Deformation behaviour of vehicle body, Speed and acceleration characteristics of passenger compartment on impact, pedestrian safety, human impact tolerance, determination of injury thresholds, severity index, study of comparative tolerance, Study of crash dummies.

UNIT-III

Safety equipments: Seat belt, automatic seat belt fastening system, Collapsible steering column, tilt-able steering wheel, Air bags, electronic systems for activating air bags, Frontal design for safety, collision warning system, Causes of rear end collision, frontal object detection, rear vehicle object detection system, Object detection system with braking system interactions. Anti-lock braking system ESP and EBD systems

UNIT- IV

Vehicle Ergonomics: Introduction to human body - anthropometrics and its application to vehicle ergonomics, Cockpit design, Driver comfort – seating, visibility, Man-machine system-psychological factors – stress, attention, Passenger comfort - ingress and egress, spaciousness,

Ventilation, temperature control, Dust and fume prevention and vibration, Interior features and conveniences, Use of modern technology for the same

UNIT-V

Comfort and Convenience System: Cabin comfort - in-car air conditioning – overall energy efficiency, Air management, central and Unitary systems, air flow circuits, air cleaning, ventilation, air space diffusion, Compact heat exchanger design, controls and instrumentation, Steering and mirror adjustment, central locking system, Garage door opening system, tire pressure control system, rain sensor system, environment information system, Automotive lamps, types, design, construction, performance, Light signalling devices- stop lamp, Rear position lamp, Direction indicator, Reverse lamp, reflex reflector, position lamp, gas discharge lamp, LED, Adoptive front lighting system (AFLS) and Daylight running lamps (DRL).

Suggested Readings:

1. Prasad, Priya and BelwafaJamel, "Vehicles Crashworthiness and Occupant Protection", American Iron and Steel Institute, USA.
2. JullianHappian-Smith "An Introduction to Modern Vehicle Design" SAE, 2002
3. Bosch - "Automotive Handbook" - 5th edition - SAE publication - 2000.
4. "Recent development in Automotive Safety Technology", SAE International Publication. Editor: Daniel J Helt, 2013.
5. Keitz H.A.E. "Light Calculations and Measurements", Macmillan 1971.

Course Code	Course Title						Core/Elective
MC 951 SP	**YOGA PRACTICE**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	**20**	**30**	**3U**

Course Objectives:

- Enhances body flexibility
- Achieves mental balance
- Elevates Mind and Body co-ordination
- Precise time management
- Improves positive thinking at the expense of negative thinking

Course Outcomes:

Student will be able to:

- Students will become more focused towards becoming excellent citizens with more and more discipline in their day-to-day life.
- An all-round development-physical, mental and spiritual health-takes place.
- Self-discipline and discipline with respect society enormously increases.
- University environment becomes more peaceful and harmonious.

UNIT-I

Introduction: Yoga definition – Health definition from WHO-Yoga versus Health-Basis of Yoga-yoga is beyond science-Zist of 18 chapters of Bhagavadgita- 4 types of yoga: Karma, Bhakti, Gnyana and Raja yoga–Internal and External yoga-Elements of Ashtanga yoga (Yama, Niyama, Asana, Pranayama, Prathyahara, Dharana, Dhyana and Samadhi)-Panchakoshas and their purification through Asana, Pranayama and Dhyana.

UNIT-II

Surya Namaskaras (Sun Salutations): Definition of sun salutations-7 chakras (Mooladhaar, Swadhishtaan, Manipura, Anahata, Vishuddhi, Agnya and Sahasrar)- Various manthras (Om Mitraya, Om Ravaye, Om Suryaya, Om Bhanave, Om Marichaye, Om Khagaye, Om Pushne, Om Hiranya Garbhaye, Om Adhityaya, Om Savitre, Om Arkhaya and Om Bhaskaraya) and their meaning while performing sun salutations-Physiology-7systems of human anatomy-Significance of performing sun salutations.

UNIT-III

Asan as (Postures): Pathanjali's definition of asana-Sthiram Sukham Asanam-3rdlimbofAshtangayoga-Looseningorwarmingupexercises- Sequence of perform in as an as (Standing, Sitting, Prone, Supine and Inverted)-Nomenclature of as an as (animals, trees, rishis etc)-As an as versus Chakras-As an as versus systems-As an as versus physical health-Activation of Annamaya kosha

UNIT-IV

Pranayama (Breathing Techniques): Definition of Pranayama as per Shankaracharya-4th limb of Ashtanga yoga-Various techniques of breathing-Pranayama techniques versus seasons-Band has and their significance in Pranayama-Mudras and their significance in Pranayama-Restrictions of applying band has with reference to health disorders-Pranayama versus concentration-

Pranayama is the bridge between mind and body-Pranayam versus mental health-Activation of Pranamaya kosha through Pranayama.

UNIT-V

Dhyana (Meditation): Definition of meditation-7th limb of Ashtanga yoga- Types of mind (Conscious and Sub-Conscious)-various types of dhyana. Meditation versus spiritual health-Dharana and Dhyana-Extention of Dhyana to Samadhi-Dhyana and mental stress-Activation of Mano mayakosha through dhyana- Silencing the mind

Suggested Readings:

1. Light on Yoga by BKS lyengar
2. Yoga education for children Vol-1 by Swami Satyananda Saraswati
3. Light on Pranayama by BKS lyengar
4. Asana Pranayama Mudra and Bandha by Swami Satyananda Saraswati
5. Hatha Yoga Pradipika by Swami Mukhtibodhananda
6. Yoga education for children Vol-11 by Swami Niranjan an and a Saraswati
7. Dynamics of yoga by Swami Satyananda Saraswati

Course Code	Course Title						Core/Elective
MC 952 SP	**NATIONAL SERVICE SCHEME (NSS)**						**Elective**
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	**25**	**50**	**3U**

Course Objectives:

- To help in Character Molding of students for the benefit of society
- To create awareness among students on various career options in different fields
- To remold the students behavior with assertive skills and positive attitudes
- To aid students in developing skills like communication, personality, writing and soft skills
- To educate students towards importance of national integration, participating in electoral process etc. by making them to participate in observing important days.

Course Outcomes:

Student will be able to:

- Students will become more focused towards becoming excellent citizens with more and more discipline in their day-to-day life.
- An all-round development-physical, mental and spiritual health-takes place.
- Self-discipline and discipline with respect society enormously increases.
- University environment becomes more peaceful and harmonious.

List of Activities:

1. Orientation programme about the role of NSS in societal development
2. Swachh Bharath Programme
3. Guest lecture's from eminent personalities on personality development
4. Plantation of saplings/Haritha Haram Programme 5.BloodDonation / Blood Grouping Camp
5. Imparting computer education to schoolchildren
6. Creating Awareness among students on the importance of Digital transactions
7. Stress management techniques
8. Health Checkup Activities
9. Observation of Important days like voters day, World Water Day etc.
10. Road Safety Awareness Programs
11. Energy Conservation Activities
12. Conducting Programme' son effective communication skills
13. Awareness programme's on national integration
14. Orientation on Improving Entrepreneurial Skills
15. Developing Effective Leadership skills
16. Job opportunity awareness programs in various defence, public sector undertakings
17. Skill Development Programmes
18. Creating awareness among students on the Importance of Yoga and other physical activities
19. Creatingawarenessamongstudentsonvariousgovernmentsponsoredsocialwelfare schemes for the people

Note: At least Ten Activities should be conducted in the Semester. Each event conducted under Swachh Barath, Plantation and important days like voters day, world water day may be treated as a separate activity.

Course Code	Course Title						Core/Elective
MC 953 SP	**SPORTS**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	**20**	**30**	**3U**

Course Objectives:

- To develop an understanding of the importance of sport in the pursuit of a healthy and active lifestyle at the College and beyond.
- To develop an appreciation of the concepts of fair play, honest competition and good sportsmanship.
- To develop leadership skills and foster qualities of co-operation, tolerance, consideration, trust and responsibility when faced with group and team problem-solving tasks.
- To develop the capacity to maintain interest in a sport or sports and to persevere in order to achieve success.
- To prepare each student to be able to participate fully in the competitive, recreational and leisure opportunities offered outside the school environment.

Course Outcomes:

Student will be able to:

- Students' sports activities are an essential aspect of university education, one of the most efficient means to develop one's character and personal qualities, promote the fair game principles, and form an active life position.
- Over the past year, sports have become much more popular among our students. Let us remember the most memorable events related to sports and physical training.
- Special attention was paid to team sports. Our male and female games and sports have achieved remarkable progress at a number of competitions.
- Our teams in the main sports took part in regional and national competitions. Special thanks to our team in track and field athletics, which has been revitalized this year at ICT and which has won Javelin competition.
- Staff of our faculties and students of Sports, Physical Development, & Healthy Lifestyle of Faculty congratulates everyone on the upcoming New Year and wishes you robust health and new victories in whatever you conceive.

I. Requirements:

i) Track Pant (students should bring)
ii)Shoes
iii) Volley Ball, Foot Ball and Badminton (Shuttle)
iv) Ground, Court, indoor stadium and swimming pool

II. Evaluation Process:

Total Marks 50
i) 20marks for internal exam (continuous evaluation) a) 8 marks for viva
b) 12marks for sports & fitness

ii) 30marksforendexam a) 10marks for viva
b) 20marks for sports & fitness

Course Code	Course Title						Core/Elective
SI 671 EE	**SUMMER INTERNSHIP**						**Core**
Prerequisite	**L**	**T**	**D**	**P**	**CIE**	**SEE**	**Credits**
-	**0**	**0**	**0**	**2**	**50**	**0**	**2***

Course Objectives: To prepare the students

- To give an experience to the students in solving real life practical problems with all its constraints.
- To give an opportunity to integrate different aspects of learning with reference to real life problems.
- To enhance the confidence of the students while communicating with industry engineers and give an opportunity for useful interaction with them and familiarize with work culture and ethics of the industry.

Course Outcomes: On successful completion of this course student will be

- Able to design/develop a small and simple product in hardware or software.
- Able to complete the task or realize a prespecified target, with limited scope, rather than taking up a complex task and leave it.
- Able to learn to find alternate viable solutions for a given problem and evaluate these alternatives with reference to prespecified criteria.
- Able to implement the selected solution and document the same.

Summer Internship is introduced as part of the curricula for encouraging students to work on problems of interest to industries. A batch of two or three students will be attached to a person from an Industry / R & D Organization / National Laboratory for a period of 4 weeks. This will be during the summer vacation following the completion of the VI semester course. One faculty member will act as an internal guide for each batch to monitor the progress and interacts with the Industry guide.

After the completion of the project, students will submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the department. Award of sessional marks are based on the performance of the student at the work place and awarded by industry guide and internal guide (25 Marks) followed by presentation before the committee constituted by the department (25 Marks). One faculty member will coordinate the overall activity of Summer Internship.

Note: * Students have to undergo summer internship of four weeks duration at the end of semester VI and credits will be awarded after evaluation in VII semester.

EIE

Course Code	Course Title						Core/Elective
ES 154 CS	COMPUTER PROGRAMMING LAB (Common to all branches)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	0	0	0	2	25	50	1

Course Objectives:

- To be able to understand the fundamentals of programming in C Language
- To be able to write, compile and debug programs in C
- To be able to formulate problems and implement in C.
- To be able to effectively choose programming components to solve computing problems in real-world.

List of Exercises:

1. Finding the maximum and minimum of given set of numbers
2. Finding Roots of a Quadratic Equation
3. Sin x and Cos x values using series expansion
4. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
5. Generating a Pascal triangle and Pyramid of numbers
6. Recursion: Factorial, Fibonacci, GCD
7. Matrix addition and multiplication using arrays
8. Bubble Sort, Selection Sort
9. Programs on Linear Search and Binary Search using recursive and non-recursive procedures.
10. Functions for string manipulations
11. Finding the No. of characters, words and lines of given text file
12. File Handling programs.

Course Code	Course Title						Core/Elective
ES 105 CS	COMPUTER PROGRAMMING AND PROBLEM SOLVING (Common to all branches)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	0	0	0	30	70	3

Course Objectives:

- To acquire problem solving skills
- To be able to develop flowcharts
- To understand structured programming concepts
- To be able to write programs in C Language

UNIT – I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. **Number Systems**: Binary, Octal, Decimal, Hexadecimal

Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements

Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT-II

Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Goto statements

Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. **Recursion**- Recursive Functions.. **Storage Classes:** Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

UNIT – III

Preprocessors : Preprocessor Commands

Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

UNIT - IV

Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, Lvalue and Rvalue, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.

Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT - V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types.

Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Reading:

1. B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C*" , Cengage Learning, 2013
2. Kernighan BW and Ritchie DM, "*The C Programming Language*", 2nd Edition, Prentice Hall of India, 2006.
3. PradipDey, Manas Ghosh, *Programming in C*, Second edition, Oxford University Press, 2015.
4. Rajaraman V, "*The Fundamentals of Computer*", 4th Edition, Prentice-Hall of India, 2006.
5. George S.Tselikis Nikolaos D.Tselikas ,"*C From Theory to Practice*",*First Edition CRC Press,* 2016

Course Code	Course Title						Core/Elective
HS 204 EG	Business Communication and Presentation Skills (Common to all branches)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	0	0	0	30	70	3

Course Objectives:

- To communicate clearly, accurately and appropriately
- To learn different models of interpersonal communication
- To work in teams effectively and learn how to be effective in using time
- To comprehend the difference between technical and general writing
- To write reports, scientific papers, letters, Statement of Purpose, Resume
- To learn how to plan and prepare to face interviews effectively

UNIT – I

Business Communication: Importance of business communication; ABC of technical communication – Accuracy, Brevity, Clarity; Channels of communication: Downward communication, Upward communication, Diagonal communication, Horizontal communication; Organisational GDs

UNIT – II

Interpersonal Communication and Personality Development: Models of interpersonal development, Johari window, Knapp's model, styles of communication; Team work; Persuasion techniques; Mobile Etiquette, e-mail Etiquette; Time Management

UNIT – III

Technical Written Communication: Differences between Technical Writing and General Writing; Report Writing: Types of Reports, Structure/Format, Language Style, Writing Technical Reports; Writing Scientific Papers

UNIT – IV

Career Oriented Written Communication: Writing SOPs; Job Application: Language style and Format; Résumé writing: design and style; Cover Letter; Business Letters: Letters of enquiry and responses, Letters of complaint, Letters of adjustment, Sales letters; Agenda and minutes of the meeting

UNIT – V

Interview Skills and Group Discussions: Interviews: Purpose, Planning, Preparation, Language and style, Sample interview questions and answers; Group discussions: Types of GDs, Features of good GDs, Preparing for a group discussion

Suggested Readings:

1. E. Suresh Kumar, *Engineering English,* Orient Blackswan, 2014.
2. E. Suresh Kumar et al., *Communication Skills and Soft Skills.* Pearson, 2011.
3. E. Suresh Kumar et al., *English for Success.* Cambridge University Press India Private Ltd, 2010.
4. Sanjay Kumar and Pushp Lata. *Communication Skills. OUP, 2011.*
5. Kavita Tyagi and Padma Misra. *Professional Communication.* PHI, 2011.
6. Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice. OUP, 2011.*

Course Code	Course Title						Core/Elective
HS 253 EG	Communication Skills Lab (Common to all branches)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	0	0	0	2	25	50	1

Course Objectives:

- To learn the appropriate use of language
- To learn to use the appropriate body language
- To participate in group discussions and debates
- To improve their public speaking skills
- To improve their presentation and participation skills
- To learn how interviews are conducted and faced

Notes:a) While teaching the following items, emphasis may be laid on intensive practice in the language lab. Lecturing may be avoided as far as possible.

b) Lab Mannual Recommended.

1. **Role play**: Use of dialogues in a variety of situations and settings
2. **Presentation Skills**: Making effective presentations, Expressions which can be used in presentations, Use of non-verbal communication, Coping with stage fright, Handling questions and answer session
3. **Public Speaking**: Planning, Preparation, Techniques of delivery, Handling stage fear/fright
4. **Group Discussion**: Initiating, continuing and concluding a GD, Giving feedback; Practising case studies and Topic based GDs

3. **MS Excel :** Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions- like sum, average, standard deviation, and charts.

4. **Internet** and **HTML:**

   a) Telnet/Secure Shell (Remote login to university computers)

   b) Electronic Mail (Communicating with email software)

   c) File Transfer Protocols (transferring files between networked computers)

   d) World Wide Web (Interface, Navigation, Search Tools)

   e) Publishing Web Pages (Using HTML editors to create personal web sites)

   f) Create the web-page (With title, text, frames, hyperlinks to some sites, pictures, lists, tables, fonts and colors) without using any web authoring tools.

5. **Documentation Using LATEX:** Introduction to Linux Commands, Introduction to LateX, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar tool, Page Formatting, Single/Multi column, Pictures/Objects, Drawing, Hyperlinks, Header/Footer, and Tables.

Suggestion Reading:

1. Peter Norton, "*Introduction to Computers*" , 6th Edition, McGraw Hill Publishers,
2. Leslie Lamport, "*Latex: A Document Preparation System*", 2nd Edition, Pearson Education India, 1994.
3. Stefan Kottwitz, "*LaTeX Beginner's Guide*", Shroff/Packt Publishers, First Edition, 2012.

Course Code	Course Title						Core / Elective
ES323ME	**PRIME MOVERS AND PUMPS**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	3	-	-	-	**30**	**70**	**3**

Course Objectives

- To acquire fundamental knowledge of fluid mechanics and the governing equations applied to fluid machinery.
- To understand the basic types of hydraulic turbines, their components calculations involved in power output and performance characteristics of turbines.
- To understand the basic differences between positive displacement and roto dynamic pumps, their working principles and performance characteristics of reciprocating and centrifugal pumps.
- To understand the mechanism involved in steam formation, types of steam generators; to understand the basic cycle of steam engines.
- To understand the basic cycles, principles involved in operation of different types of steam turbines and gas turbines.

Course Outcomes

- Get a quick look into fundamental aspects of fluid mechanics with basic knowledge acquired to conduct preliminary calculations applied to fluid machinery.
- Understand the basic types of hydraulic turbines, their components, operation and their rated and off design performance characteristics.
- Understand the working principle of reciprocating pumps and centrifugal pumps, their performance over wide range of operations and about the negative effects of cavitation on pump performance.
- Explain basic principles involved in steam formation, types of steam boilers, principle of steam engines.
- Familiarizes basic knowledge of working of steam turbine, gas turbine and methods of improving their efficiency.

Unit-I

Fluid Mechanics: Newtonian and Non-Newtonian Fluids, viscosity, types of fluid flows, continuity, momentum and energy equations, Bernoulli's equation and its applications, laminar and turbulent flows, Reynolds number and its significance.

Unit-II

Hydraulic Turbines: Classification and working principles of turbines, Pelton, Francis, and Kaplan turbine, function of draft tube and types of draft tubes, unit quantities, performance and characteristic curves.

Unit-III

Pumps: Reciprocating pumps, working of single and double acting types, effect of acceleration head and friction, use of air vessels, work done and power required without and with air vessels

Centrifugal pumps: Classification and working of centrifugal pumps, need for priming, cavitation and its effect on performance

Unit-IV

Generation of steam: Dryness fraction and properties of steam, function of boilers, working principle of Lancashire boiler, Babcock and Wilcox boiler, boiler mounting and accessories.

Steam engines: Rankine and Modified Rankine cycle for steam engines.

Unit-V

Steam turbines: Classification of steam turbines, compounding of steam turbines, pressure compounding, velocity compounding, and pressure-velocity compounding.

Gas turbine: Classification of gas turbine-constant pressure combustion cycle, closed cycle and constant volume combustion gas turbine plants.

Suggested Reading:

1. Ballaney P. L, **Thermal Engineering**, Khanna Publishers, 19th Edn., 1993.
2. Yadav R, **Steam and Gas turbines**, Galgotia Publishers, 6th Edn., 1992.
3. Rajput., **Thermal Engineering**, Laxmi Publications (P) Ltd, New Delhi.
4. Bansal R.K., **Fluid Mechanics and Hydraulic Machines**, Laxmi Publications (P) Ltd, New Delhi.
5. Kumar D.S, **Fluid Mechanics and Fluid Power Engineering**, S.K. Kataria & Sons
6. S.Ramamrutham, **Hydraulic Machines**, Dhanpat Rai and Sons.2004.

Course Code	Course Title						Core / Elective
PC451EE	**DIGITAL ELECTRONICS AND INTEGRATED CIRCUITS LAB**						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	-	-	-	2	**25**	**50**	**1**

Course Objectives

- To Train the Students for acquiring practical knowledge in time response and frequency response of series / parallel RC, RL and RLC Circuits.
- To prepare the students for finds out parameters of a given two port network.
- To make the students for understanding the verification of theorems.

Course Outcomes

- Evaluate the time response and frequency response characteristics of R,L,C series and parallel circuits.
- Able to validate the network theorems.
- Able to find various parameters of a two-port network.
- Able to simulate electrical circuits using spice.
- Able to synthesize networks from a given transfer function

LIST OF EXPERIMENTS:

1. Generation of triangular, sine and square wave using IC's.
2. Voltage regulator IC **(Included instead of PLL)**
3. Design of astable multivibrator using 555 timer.
4. Active filters.
5. Instrumentation amplifier Sample and hold circuit.
6. Design of integrator and differentiator using Op-Amp.
7. Multiplexer application for logic realization and parallel to serial Conversions.
8. Synchronous counters.
9. Asynchronous counters.
10. Clippers and clampers using Op-Amps.
11. Monostable operation using IC's.
12. Bootstrap sweep circuit using Op-Amp.
13. Half adder, full adder and subtractor and realization of combinational logic.
14. A / D converters.
15. D / A converters.

Note: At least ten experiments should be conducted in the Semester.

Course Code	Course Title						Core / Elective
PC453EE	COMPUTER AIDED INSTRUMENTATION DRAWING						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
NIL	0	0	0	2	25	50	1

Course Objectives

- To understand the terminology of electrical circuit with components and Process Instrumentation (P&ID) diagram.
- To be able to familiarize with P and ID symbols.
- To acquire knowledge on various Electrical and Instrumentation Engineering Software's.

Course Outcomes

- Identify and draw different components of electrical and Instrumentation systems
- Draw different control and wiring diagrams
- Draw PI diagrams of process instrumentation system.

Drawing of the following using Electrical CADD / Corel Draw / MS Word / PPT/Visio

LIST OF EXPERIMENTS:

1. Lines, Arcs, Curves, Shapes, Filling of objects, Object editing & Transformation.
2. Electrical, Electronic & Electro – mechanical symbols.
3. House – wiring diagrams and layout.
4. Simple power and control circuit diagrams.
5. P& ID symbols (seven main groups are: equipment, piping, vessels, heat exchangers, pumps, instruments, and valves)
6. A typical Flow control system
7. A typical Pressure control system.
8. A typical Temperature control system.
9. A typical Level control system
10. Instrument Line Symbols for: Instrument and device connections at process measurement points/ Connections to instrument power supplies/ Signals between measurement and control instruments and functions.

Suggested Reading:

1. KB. Raina, S.K. Bhattacharya, **Electrical Design, Estimating and Costing**, Wiley Eastern Ltd., 1991.
2. Nagrath, Kothari, **Electrical Machines**, Tata McGraw Hill Publishing Company Ltd., 2000.
3. A.K. Sawhney, A **Course in Electrical Machines Design**, Dhanpat Rai and Sons, 1996.
4. B. G. Lipták, **Instrument Engineers Handbook: Process measurement and Analysis Volume 1**, CRC Publication, 2003

Course Code	Course Title						Core / Elective
PE 504EE	BUILDING AUTOMATION SYSTEM (Professional Elective-I)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
-	3	-	0	0	30	70	3

Course Objectives

- To understand the basic blocks of Building Management System.
- To design various sub systems (or modular system) of building automation
- To integrate all the sub systems

Course Outcomes

At the end of the course students will be able to

- Understand basic blocks and systems for building automation
- Design different systems for building automation and integrate those systems

UNIT-I

Introduction: Concept and application of Building Management System (BMS) and Automation, requirements and design considerations and its effect on functional efficiency of building automation system, architecture and components of BMS.

UNIT-II

HVAC systems: Different components of HVAC system like heating, cooling system, chillers, AHUs, compressors and filter units and their types. Design issues in consideration with respect to efficiency and economics, concept of district cooling and heating.

UNIT-III

Access control & security system: Concept of automation in access control system for safety, physical security system with components, RFID enabled access control with components, computer system access control: DAC, MAC, and RBAC.

UNIT-IV

Fire & Alarm (FA) system: Different fire sensors, smoke detectors and their types, CO and CO_2 sensors, fire control panels, design considerations for the FA system, concept of IP enabled fire & alarm system, design aspects and components of FA system.

EPBX System & BMS subsystem integration: Design consideration of EPBX system and its components, integration of all the above systems to design BMS.

UNIT-V

CCTV & Energy Management System: Components of CCTV system like cameras, types of lenses, typical types of cables, controlling system, concept of energy management system, occupancy sensors, fans & lighting controller.

Suggested Reading:

1. Jim Sinopoli,"Smart Buildings", Butterworth-Heinemann imprint of Elsevier,2nd ed., 2010.
2. E. Albert Ting Pat So, WaiLok Chan, Intelligent Building Systems, Kluwer Academic Published, 3rd 2012.
3. Reinhold A. Carlson, Robert A. Di Giandomenico, "Understanding Building Automation Systems", Published by R.S. Means Company, 1991.
4. Morawski, E, Fire Alarm Guide for Property Managers, Publisher: Kessinger Publishing,2007.

Course Code	Course Title						Core / Elective
PE 505EE	PRINCIPLE OF COMMUNICATION ENGINEERING (Professional Elective-I)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
-	3	-	0	0	30	70	3

Course Objectives

- To introduce the principles of analog communication systems involving different modulation and demodulation schemes
- To introduce the principles of digital communication systems involving different modulation and demodulation schemes

Course Outcomes

At the end of the course students will be able to

- Develop an understanding of need for modulation and generation & detection of Analog modulation techniques
- Explore AM and FM Super heterodyne receiver working principle
- Discuss the techniques for generation and detection of pulse Analog modulation techniques
- To understand the basic operation involved in PCM like sampling, quantization & encoding and are able to calculate and derive entropy and channel capacity
- To compare different communication system with various modulation techniques in the presence of noise by analytically

UNIT-I

INTRODUCTION TO COMMUNICATIONS SYSTEMS: Information, Communication process, primary communication resources, communication networks & channels, modulation process, Analog and Digital types of communication, Digital communication problem, transmitter, Channel Noise, receiver modulation, description, need for modulation, bandwidth requirement, sine wave and Fourier series review, frequency spectra of non-sinusoidal waves.

UNIT-II

NOISE : Atmospheric noise, extra terrestrial noise, industrial noise, thermal agitation noise, short noise, transit time noise, miscellaneous noise.

NOISE CALCULATIONS: Addition of noise due to several sources, addition of noise due to several amplifiers in cascade, noise in reactive circuits, noise figure signal-to-noise ratio. Definition of noise figure, calculation of noise figure (using equivalent noise resistance, measurement, and noise temperature).

UNIT-III

AMPLITUDE MODULATION : Frequency spectrum of the AM wave, representation of AM, power relations in ·the AM wave, generation of AM , basic requirements, comparison of levels grid, modulated class C amplifier, plate modulated class C amplifier, modulated transistor amplifiers.

UNIT-IV

FREQUENCY MODULATION: Description of systems, mathematical representation of FM, frequency spectrum of the FM wave, phase modulation, intersystem comparisons, effects of noise on carrier-noise triangle, pre emphasis and de emphasis, other forms of interference, comparison of wideband and narrowband FM, stereophonic FM multiplex system.

UNIT-V

PULSE MODULATION: Introduction to sampling process, PAM, other forms of PM. Bandwidth, noise trade off, quantization process, PCM, TDM, digital multiplexer, delta modulation, linear prediction, differential PCM, adaptive differential PCM.

Suggested Reading:

1. Haykins. S, "Communication System", 4th Edition, John Wiley Inc. 2000.
2. Kennedy, G. "Electronic Communication System" McGraw – Hill 4th Edition, 2003.
3. Singh R.P and Spare S.D. "Analog and Digital Communication Systems". McGraw – Hill Publishing Company Ltd. 3rd Edition, 2003.
4. Manoj Duhan, "Communication System", IK International Publishing House, 2012.

Course Code	Course Title						Core/Elective
MC901EG	**GENDER SENSITIZATION**						**Core**
Prerequisite	**Contact Hours per week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
-	**3**	**--**	**--**	**--**	**30**	**70**	**0**

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT I:

Understanding Gender

Gender: Why Should We Study It? Socialization: Making Women, Making Men Introduction Preparing for Womanhood Growing up Male First lessons in Caste Different Masculinities

Just Relationships: Being Together as Equals

Mary Kom and Onler Love and Acid just do not Mix. Love Letters. Mothers and Fathers Rosa Parks-The Brave Heart.

UNIT – II

Gender and Biology

MissingWomen:

Sex Selection and Its Consequences Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary Two or Many? Struggles with Discrimination Our Bodies Our Health

UNIT – III

Gender and Labour

Housework: The Invisible Labour "My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics Fact and Fiction. Unrecognized and Unaccounted work Wages and Conditions of Work

UNIT – IV

Issues of Violence

Sexual Harassment: Say No! Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment "Chupulu"

Domestic Violence: Speaking Out

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives New Forums for Justice.

Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life", the Caste Face of Violence

UNIT – V

Gender Studies

Knowledge through Lens of Gender

Point Of View – Gender and the structure of knowledge – Unacknowledged women artists of Telangana; Whose History Questions For Historians and Others: Reclaiming a past – Writing other histories – Missing Pages from modern Telangana History

Suggested Reading

1. A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu " Towards a World of Equals" A Bilingual Textbook on Gender by Telugu Akademi, Hyderabad,Telangana., 1ST Edition,2015.

Course Code	Course Title						Core / Elective
PE604EE	INSTRUMENTATION IN AEROSPACE AND NAVIGATION (Professional Electives-II)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	0	0	0	30	70	3

Course Objectives

- To expose the students to the field of aerospace engineering
- To impart basic knowledge of its navigation instrumentation

Course Outcomes

At the end of the course students will be able to

- To understand the basics of aerospace and navigation
- To know the technical aspects of this subject
- To know about various troubles in aircrafts

UNIT-I

Introduction To Aviation: History of aviation and space flight anatomy of airplane and space vehicle with emphasis on control surfaces. Airfoil nomenclature, basics of aerodynamics to illustrate lift and drag, types of drag, finite wings, swept wings, flaps Airplane performance, thrust, power, rate of climb, absolute and service ceiling, range and endurance.

UNIT-II

Aircraft Instrumentation: Basic of engine instruments, capacitive fuel content, gauges, standard atmosphere, altimeters, aneroid, radio altimeters. Aircraft compass, remote indicating magnetic compass, rate of climb indicator, pilot static system, air speed indicator, mach meters, integrated flight instruments, flight testing and recording of flight tests.

UNIT-III

Radio Navigation Aids: Automatic direction finder distance measuring equipments, instrument landing system visual Omni range, radar, optical instruments, engine instruments and control, pressure measurements, thermal meter control, tachometer, accelerometer, smoke and fire detection, propeller controls, twin blade control, cabin pressure and temperature.

UNIT-IV

Satellite and space vehicle instrumentations: Satellite and space vehicle instrumentation, propulsion controls, sun sensors, horizon sensors, star tracker, stabilization controls.

UNIT-V

Electrical Troubles: Hydraulic systems trouble, landing gear troubles, cabin conditioning troubles, indication of unsafe canopy, Boeing condition, radio troubles, separate generator, system troubles, trouble indicator light, advantages of instrument flag, black box and its use.

Suggested Readings:

1. John D Anderson JR, "Introduction to flight", Mc Graw hill
2. Pallett E.G.H, " Aircraft instrumentation and integrated systems", Longman scientific and Technical,1992
3. Nagaraja N.S, "Elements of electronic navigation", Mc Graw Hill , New Delhi 1975

Course Code	Course Title						Core / Elective
PE605EE	PIPING AND INSTRUMENTATION DIAGRAMS (Professional Electives-II)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
-	3	-	0	0	30	70	3

Course Objectives

- Identify ISA symbols and interpret basic flow sheets layout principles.
- Exhibit comprehension of instrumentation/flow diagram relationships and flow sheet/plotplans/piping/interrelationship.
- Prepare flow sheets (process and mechanical) diagrams and P&IDs.
- To provide knowledge on risk, hazard and their assessment techniques in Industry
- To provide knowledge on Safety in Instrumentation & Control Systems

Course Outcomes:

At the end of the course the students will be able to

- Understanding of P&I Diagrams, standards involved and its preparation.
- Awareness on the different fittings used for instruments installation and various softwares used for the preparation of P&IDs.
- Understanding of Process safety, Safety Management Systems and instrumentation system design for hazardous applications.

UNIT–I

Introduction: P&I Diagram objectives. Industry codes and standards. Government regulations. **Engineering drawings:** Block flow diagram (BFD), process flow diagram (PFD), PFD symbols, piping and instrumentation diagrams, P&ID symbols. Line numbering, valve numbering, equipment identification.

UNIT–II

Interpreting P&ID equipment: Valves, Vessels, Pumps, Heat exchangers, Compressors, Equipment labeling and identification, KKS numbering system, Smart P&IDs, softwares used in preparation of P&IDs. Binary logic diagrams and Analog Loop diagrams for simple applications.

UNIT-III

Piping and Instrumentation diagram: Scope, references, definition and terminology, symbol and abbreviation units general (definition, representation, drafting, equipment location index, drawing number, arrangement)

Minimum information to be shown on P&I diagrams: General, equipment indication, instrumentation and piping.

UNIT–IV

Design criteria for preparation of P&I diagrams: Assembly piping of pumps, steam out, drain and vent for vessels, bypass for safety/relief valve, block and bypass valves for control valves, line numbering, philosophy of instrumentation installation, utility connection, unit battery limit installation, sample connection, steam trap assembly. Criteria for utility flow diagrams (abbreviations, graphical symbols and identifications).

UNIT – V

Preparation of P&I Diagrams: General, establishment of P&ID preparation steps, handling of licensed process, revision of P&I diagram, approval of P&I diagram.

Suggested Reading:

1. Instrumentation and Control System Documentation, ISA Publisher. Authors: Frederick
2. Meier and Clifford Meier, 2nd Edition, ISBN-13: 978-193600751 ISBN-10: 1936007517
3. The management of control system: Justification and Technical Auditing, N.E. Bhttiha, ISA.
4. Mannan S., "Lee's Loss Prevention in the Process Industries", Vol.I, 3rdEd., Butterworth Heinemann, 2004.
5. Mannan S., "Lee's Loss Prevention in the Process Industries",Vol.II & III, 3 rd Ed., Butterworth Heinemann, 2005.
6. Practical Industrial Safety, Risk Assessment and Shutdown Systems, By Dave Macdonald, Elsevier, 2004.
7. Engineering standard for piping & Instrumentation diagram IPS-E-PR-230, OCT-1996

Course Code	Course Title						Core / Elective
PE606EE	INSTRUMENTATION AND CONTROL IN PETROCHEMICAL INDUSTRY (Professional Electives-II)						Core
Prerequisite	Contact Hours per Week				CIE	SEE	
	L	T	D	P			Credits
-	3	-	0	0	30	70	3

Course Objectives

- To provide a window of applications of instrumentation and automation in Petrochemical Industries.
- Additionally students know about the various methods in Petrochemical Industries and its control methods.

Course Outcomes

At the end of the course the students will be able to

- An understanding on various petrochemical process, important parameter to be monitored and controlled, various parameters to be analyzed and monitored.
- Various instruments involved in and its controlling process.
- An ability to design and conduct experiments, as well as to analyze and interpret data.

UNIT–I

Brief survey of petroleum: Petroleum formation, petroleum exploration, petroleum production, petroleum refining and its methods, refining capacity and consumption in India, constituents of crude oil, recovery techniques , oil and gas separation , processing wet gases.

UNIT–II

P & I diagram of petroleum refinery: Atmospheric distillation process, vacuum distillation process, Thermal cracking, catalytic cracking, catalytic reforming, and utility plants, Air, N_2, and cooling water.

UNIT–III

Basics of field instruments: Parameters to be measured in Petrochemical industry, distillation column control, selection of instruments, basics of intrinsic safety of instruments, area classification.

UNIT–IV

Control for petroleum refinery: Control of furnace, reboiler control, reflux control, control of catalytic crackers, control of heat exchanger, control of cooling tower.

UNIT–V

Safety consideration: Basics of PLC, and Safety interlocks in furnace, separator, pump, and compressor. Basics of SIL, and introduction to standards.

Suggested Reading:

1. Waddams A.L, .Chemical from petroleum, Butter and Janner Ltd., 1968.
2. Balchan.J.G. and Mumme K.I., Process Control Structures and Applications, Van Nostrand Reinhold Company, New York, 1988.
3. Liptak B.G., Instrument Engineers' Handbook, Fourth Edition, CRC PRESS, 2003.

Course Code	Course Title						Core / Elective
OE 602 CE	**GEO-SPATIAL TECHNIQUES**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- Description about various spatial and non-spatial data types, and data base management techniques
- Development of the concepts and professional skills in utility of geospatial techniques Enhancement of knowledge of geospatial techniques to field problems

Course Outcomes

- The students will be able to understand and apply GIS tools
- Will be able to analyse and process data to apply to the GIS tools.
- Will be able assimilate knowledge on field problems using remote sensing

UNIT I

Introduction: Basic concepts, socioeconomic challenges, fundamentals of geographical information systems (GIS), history of geographical information system, components of geographical information systems. Projections and Coordinate Systems: Map definitions, representations of point, line, polygon, common coordinate system, geographic coordinate system, map projections, transformations map analysis.

UNIT II

Data Acquisition and Data Management: data types, spatial, non-spatial (attribute) data, data structure and database management, data format, vector and raster data representation, object structural model filters and files data in computer, key board entry, manual digitizing, scanner, aerial photographic data, remotely sensed data, digital data, cartographic database, digital elevation data, data compression, data storage and maintenance, data quality and standards, precision, accuracy, error and data uncertainty. Data Processing: Geometric errors and corrections, types of systematic and non-systematic errors, radiometric errors and corrections, internal and external errors.

UNIT III

Data Modeling: Spatial data analysis, data retrieval query, simple analysis, recode overlay, vector data model, raster data model, digital elevation model, cost and path analysis, knowledge based system. GIS Analysis and Functions: Organizing data for analysis, analysis function, maintenance and analysis of spatial data, buffer analysis, overlay analysis, transformations, conflation, edge matching and editing, maintenance and analysis of spatial and non-spatial data

UNIT IV

Applications of GIS: Environmental and natural resource management, soil and water resources, agriculture, land use planning, geology and municipal applications, urban planning and project management, GIS for decision making under uncertainty, software scenario functions, standard GIS packages, introduction to Global Positioning Systems (GPS) and its applications.

UNIT V

Introduction to Remote Sensing: General background of remote sensing technology, objectives and limitations of remote sensing, electro-magnetic radiation, characteristics, interaction with earth surface and atmosphere, remote sensing platforms and sensors, satellite characteristics, digital image processing, IRS series and high resolution satellites, software scenario functions, remote sensing applications to watershed modeling, environmental modeling, urban planning and management.

Suggested readings:

1) Burrough, P. A., and McDonnell R. A., **'Principles of Geographical Information Systems'**, Oxford University Press, New York, 1998.
2) Choudhury S., Chakrabarti, D., and Choudhury S. **'An Introduction to Geographic Information Technology'**, I.K. International Publishing House (P) Ltd, New Delhi, 2009.
3) Kang-tsung Chang , **"Introduction to Geographical information Systems'**, Tata McGraw-Hill Publishing Company Ltd., Third Edition, New Delhi, 2006.
4) Lilysand T.M., and Kiefer R.W. **'Remote Sensing and Image Interpretation'**, John Wiley and Sons, Fourth Edition, New York, 2002.
5) Tor Bernhardsen, **'Geographical Information System'**, Wiley India (P) Ltd., Third Edition, New Delhi, 2002.
6) Hoffman-Wellenhof, B, et al. **'GPS Theory and Practice'**, Fourth Edition, Springer Wein, New York, 1997.

Course Code	Course Title						Core / Elective
OE 602 CS	**OOPS USING JAVA**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- To introduce fundamental object oriented concepts of Java programming Language, such as classes, inheritance packages and interfaces.
- To introduce concepts of exception handling and multi-threading.
- To use various classes and interfaces in java collection framework and utility classes.
- To understand the concepts of GUI programming using AWT controls.
- To introduce Java I/O streams and serialization

Course Outcomes

- Able to develop java applications using OO concepts and packages.
- Able to write multi-threaded programs with synchronization
- Able to implement real world applications using java collection frame work and I/O classes Able to write Event driven GUI programs using AWT/Swing

UNIT – I

Object Oriented System Development: understanding object oriented development, understanding object oriented concepts, benefits of object oriented development. Java Programming Fundamentals: Introduction, overview of Java, data types, variables and arrays, operators, control statements

UNIT – II

Java Programming Object Oriented Concepts: classes, methods, inheritance, packages and interfaces. Exceptional Handling, Multithreaded Programming

UNIT – III

I/O Basics, Reading Console Input and Output, Reading and Writing Files, Print Writer Class, String Handling Exploring Java. Lang, Collections Overview, Collection Interfaces, Collection Classes, Iterators, Random Access Interface, Maps, Comparators, Arrays, Legacy Classes and Interfaces, String Tokenizer

UNIT – IV

Introducing AWT Working with Graphics: AWT Classes, Working with Graphics Event Handling: Two Event Handling Mechanisms, the Delegation Event Model, Event Classes, Source of Events, Event Listener Interfaces. AWT Controls: Control Fundamentals, Labels, Using Buttons, Applying Check Boxes, Check box Group, Choice Controls, Using Lists, Managing Scroll Bars, Using Text Field, Using Text Area, Understanding Layout Managers, Menu bars and Menus, Dialog Boxes, File Dialog, Handling events by Extending AWT Components, Exploring the controls, Menus and Layout Managers.

UNIT – V

Java I/O Classes and Interfaces: Files, Stream and Byte Classes, Character Streams, Serialization.

Suggested readings:

1) Herbert Schildt, **"The Complete Reference JAVA"**, Tata McGraw Hill, 7thEdition, 2005
2) James M Slack, **"Programming and Problem Solving with JAVA"**, Thomson learning, 2002
3) C.Thomas Wu,**"An Introduction to Object-Oriented Programming with Java"**, Tata McGraw Hill, 5thEdition, 2005.

Course Code	Course Title						Core/Elective
OE601IT	**DATABASE SYSTEMS**						**Elective**
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	**30**	**70**	**3**

Course Objectives:

- To introduce E-R Model and Normalization
- To learn formal and commercial query languages of RDBMS
- To understand the process of database application development
- To study different database architectures
- To introduce security issues in databases

Course Outcomes:

Student will be able to:

- Understand the mathematical foundations of Database design
- Model a set of requirements using the Entity Relationship (E-R)Model , transform an E-R model into a relational model ,and refine the relational model using theory of Normalization
- Understand the process of developing database application using SQL
- Understand the security mechanisms in RDBMS

UNIT 1

Design: Conceptual design (E-R modeling), the relational model, normalization

UNIT II

Queries: algebra and logic (relational algebra and calculus), relational query languages and queries (namely SQL),select, project, join, union, intersection, except, recursion, aggregation, data manipulation

UNIT III

Applications: application development, database application interfaces (e.g., JDBC), internet applications,proper database application paradigms, transactions, transaction management, concurrency control, crash recovery

UNIT IV

Distributed DB, Architecture, Query processing and Optimization in Distributed DB, Introduction to NoSQL Databases, Graph databases, Columnar Databases

UNIT V

Introduction to Database Security Issues, Security mechanism, Database Users and Schemas, Privileges

Suggested Books

1. Jim Melton and Alan R. Simon.SQL 1999: Understanding Relational Language Components.First Edition, 1999.Morgan Kaufmann Publishers.
2. Don Chamberlin.Using the New DB2: IBM's Object-Relational Database System.First Edition, 1996.Morgan Kaufmann Publishers.
3. Database System Concepts Sixth Edition, by Abraham Silberschatz , Henry F Korth, S Sudarshan,Mc Graw-Hill Education
4. Fundamentals of Database Systems , Elmasri, Navathe, Sixth Edition , Addison- Wesley

Course Code	Course Title						Core / Elective
OE 602 EC	**DIGITAL SYSTEM DESIGN USING VERILOG HDL**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	0	0	0	**30**	**70**	3

Course Objectives

- Describe Verilog hardware description languages (HDL).
- Develop Verilog HDL code for combinational digital circuits.
- Develop Verilog HDL code for sequential digital circuits.
- Develop Verilog HDL code for digital circuits using switch level modeling and describes system tasks, functions and compiler directives
- Describes designing with FPGA and CPLD.

Course Outcomes

After completion of this course, students should be able:

- To understand syntax of various commands, data types and operators available with verilog HDL
- To design and simulate combinational circuits in verilog
- To design and simulate sequential and concurrent techniques in verilog
- To write Switch level models of digital circuits
- To implement models on FPGAs and CPLDs

UNIT I

Introduction to Verilog HDL: Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools

Verilog Data Types and Operators: Binary data manipulation, Combinational and Sequential logic design, Structural Models of Combinational Logic, Logic Simulation, Design Verification and Test Methodology, Propagation Delay, Truth Table models using Verilog.

UNIT II

Combinational Logic Circuit Design using Verilog: Combinational circuits building blocks: Multiplexers, Decoders , Encoders , Code converters, Arithmetic comparison circuits, Verilog for combinational circuits , Adders-Half Adder, Full Adder, Ripple-Carry Adder, Carry Lookahead Adder, Subtraction, Multiplication.

UNIT III

Sequential Logic Circuit Design using Verilog: Flip-flops, registers & counters, synchronous sequential circuits: Basic design steps, Mealy State model, Design of FSM using CAD tools, Serial Adder Example, State Minimization, Design of Counter using sequential Circuit approach.

UNIT IV

Switch Level Modeling: Basic Transistor Switches, CMOS Switches, Bidirectional Gates, Time Delays with Switch Primitives, Instantiation with Strengths and Delays, Strength Contention with Trireg Nets.

System Tasks Functions and Compiler Directives: Parameters, Path Delays, Module Parameters. System Tasks and Functions, File Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

UNIT V

Designing with FPGAs and CPLDs: Simple PLDs,ComplexPLDs,Xilinx 3000 Series FPGAs, Designing with FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices (CPLDs), Altera FLEX 10K Series CPLDs.

Suggested readings:

1) T.R. Padmanabhan, B Bala Tripura Sundari, "**Design Through Verilog HDL**", Wiley 2009.
2) Samir Palnitkar, "**Verilog HDL**", 2nd Edition, Pearson Education, 2009.
3) Stephen Brown, Zvonko Vranesic , "**Fundamentals of Digital Logic with Verilog Design**, TMH, 2nd Edition 2003.

Course Code	Course Title						Core / Elective
OE 602 ME	**MATERIAL HANDLING**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives

- To know about the working principle of various material handling equipments.
- To understand the Material handling relates to the loading, unloading and movement of all types of materials.
- To understand the estimation of storage space and maintenance of material handling equipments.

Course Outcomes

- Able to understand various conveying systems that available in industry.
- Able to understand various bulk solids handling systems and their design features.
- Able to understand and various modern material handling systems and their integration.
- Able to calculate number of MH systems required, storage space, cost and maintenance.

UNIT – I

Mechanical Handling Systems: Belt Conveyors and Desing, Bucket Elevators, Package conveyors, Chain and Flight Conveyors, Screw Conveyors, Vibratory Conveyors, Cranes and Hoists.

UNIT – II

Pneumatic and Hydraulic Conveying Systems: Modes of Conveying and High pressure conveying systems, Low Velocity Conveying System. Components of Pneumatic Conveying Systems: General Requirements, Fans and Blowers, Boots-Type Blowers, Sliding-Vane Rotary Compressors, Screw Compressors, Reciprocating Compressors, Vacuum Pumps.

UNIT – III

Solids Handling: Particle and Bulk Properties- Adhesion, Cohesion and Moisture Content. Gravity Flowof Bulk Solids: Static and Dynamic Pressure Distribution in Bulk Solids. Modes of Flow: Mass Flow, Funnel Flow and Expanded Flow from Hoppers, Bins and Silos.

Unit IV

Modern Material Handling Systems: Constructional features of (i) AGV (ii) automated storage and retrieval systems. Sensors used in AGVs and ASRS.Bar code systems and RFID systems: Fundamentals and their integration with computer-based information systems.

UNIT – V

Total MH Throughput: Calculation for no. of MH systems; storage space estimation based on number of aisles. Maintenance of MH equipment, spare parts management, cost of materials handling, cost per unit load computations

Suggested Readings:

1. Dr. Mahesh Varma, "**Construction Equipment and its Planning & Application**", Metropolitan Book Co. (P) Ltd., New Delhi, India, 1997.
2. James M. Apple, **"Material Handling Systems Design"**, the Ronald Press Company, New York, USA, 1972.
3. Woodcock CR. and Mason J.S., **"Bulk Solids Handling: An Introduction to Practice Technology"**, Leonard Hill USA, Chapman and Hall, New York.
4. M P Groover etal, **"Industrial Robotics"**, Me Graw Hill, 1999.

Course Code	Course Title						Core / Elective
OE 632 AE	**AUTOMOTIVE SAFETY AND ERGONOMICS**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	**3**	**0**	**0**	**0**	**30**	**70**	**3**

Course Objectives:

It is intended to make the students to

- Understand the basics of vehicle collision and its effects
- Understand the various safety concepts used in passenger cars.
- Gain knowledge about various safeties and its equipment.
- Understand the concepts of vehicle ergonomics.
- Gain knowledge about various automotive comforts features.

Course Outcomes:

After the completion of this unit, the student is able to

- Break down the importance of safety in Automobiles
- Describe the various safeties equipment used in Automobiles
- Explain about Vehicle ergonomics and Comforts in Automobiles

UNIT-I

Introduction: Design of the Body for safety, Energy equations, Engine location, Effects of Deceleration inside passenger compartment, Deceleration on impact with stationary and movable obstacle, Concept of Crumble zone and Safety sandwich construction, Active and passive safety, Characteristics of vehicle structures, Optimization of vehicle structures for crash worthiness, Types of crash / roll over tests, Regulatory requirements for crash testing, instrumentation, High speed photography, image analysis.

UNIT-II

Safety Concepts: Active safety- driving safety, Conditional safety, Perceptibility safety and Operating safety, Passive safety: Exterior safety, Interior safety, Deformation behaviour of vehicle body, Speed and acceleration characteristics of passenger compartment on impact, pedestrian safety, human impact tolerance, determination of injury thresholds, severity index, study of comparative tolerance, Study of crash dummies.

UNIT-III

Safety equipments: Seat belt, automatic seat belt fastening system, Collapsible steering column, tilt-able steering wheel, Air bags, electronic systems for activating air bags, Frontal design for safety, collision warning system, Causes of rear end collision, frontal object detection, rear vehicle object detection system, Object detection system with braking system interactions. Anti-lock braking system ESP and EBD systems

UNIT- IV

Vehicle Ergonomics: Introduction to human body - anthropometrics and its application to vehicle ergonomics, Cockpit design, Driver comfort – seating, visibility, Man-machine system-psychological factors – stress, attention, Passenger comfort - ingress and egress, spaciousness,

Ventilation, temperature control, Dust and fume prevention and vibration, Interior features and conveniences, Use of modern technology for the same

UNIT-V

Comfort and Convenience System: Cabin comfort - in-car air conditioning – overall energy efficiency, Air management, central and Unitary systems, air flow circuits, air cleaning, ventilation, air space diffusion, Compact heat exchanger design, controls and instrumentation, Steering and mirror adjustment, central locking system, Garage door opening system, tire pressure control system, rain sensor system, environment information system, Automotive lamps, types, design, construction, performance, Light signalling devices- stop lamp, Rear position lamp, Direction indicator, Reverse lamp, reflex reflector, position lamp, gas discharge lamp, LED, Adoptive front lighting system (AFLS) and Daylight running lamps (DRL).

Suggested Readings:

1. Prasad, Priya and BelwafaJamel, "Vehicles Crashworthiness and Occupant Protection", American Iron and Steel Institute, USA.
2. JullianHappian-Smith "An Introduction to Modern Vehicle Design" SAE, 2002
3. Bosch - "Automotive Handbook" - 5th edition - SAE publication - 2000.
4. "Recent development in Automotive Safety Technology", SAE International Publication. Editor: Daniel J Helt, 2013.
5. Keitz H.A.E. "Light Calculations and Measurements", Macmillan 1971.

Course Code	Course Title						Core/Elective
MC 951 SP	**YOGA PRACTICE**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	**20**	**30**	**3U**

Course Objectives:

- Enhances body flexibility
- Achieves mental balance
- Elevates Mind and Body co-ordination
- Precise time management
- Improves positive thinking at the expense of negative thinking

Course Outcomes:

Student will be able to:

- Students will become more focused towards becoming excellent citizens with more and more discipline in their day-to-day life.
- An all-round development-physical, mental and spiritual health-takes place.
- Self-discipline and discipline with respect society enormously increases.
- University environment becomes more peaceful and harmonious.

UNIT-I

Introduction: Yoga definition – Health definition from WHO-Yoga versus Health-Basis of Yoga-yoga is beyond science-Zist of 18 chapters of Bhagavadgita- 4 types of yoga: Karma, Bhakti, Gnyana and Raja yoga–Internal and External yoga-Elements of Ashtanga yoga (Yama, Niyama, Asana, Pranayama, Prathyahara, Dharana, Dhyana and Samadhi)-Panchakoshas and their purification through Asana, Pranayama and Dhyana.

UNIT-II

Surya Namaskaras (Sun Salutations): Definition of sun salutations-7 chakras (Mooladhaar, Swadhishtaan, Manipura, Anahata, Vishuddhi, Agnya and Sahasrar)- Various manthras (Om Mitraya, Om Ravaye, Om Suryaya, Om Bhanave, Om Marichaye, Om Khagaye, Om Pushne, Om Hiranya Garbhaye, Om Adhityaya, Om Savitre, Om Arkhaya and Om Bhaskaraya) and their meaning while performing sun salutations-Physiology-7systems of human anatomy-Significance of performing sun salutations.

UNIT-III

Asan as (Postures): Pathanjali's definition of asana-Sthiram Sukham Asanam-3rdlimbofAshtangayoga-Looseningorwarmingupexercises- Sequence of perform in as an as (Standing, Sitting, Prone, Supine and Inverted)-Nomenclature of as an as (animals, trees, rishis etc)-As an as versus Chakras-As an as versus systems-As an as versus physical health-Activation of Annamaya kosha

UNIT-IV

Pranayama (Breathing Techniques): Definition of Pranayama as per Shankaracharya-4th limb of Ashtanga yoga-Various techniques of breathing-Pranayama techniques versus seasons-Band has and their significance in Pranayama-Mudras and their significance in Pranayama-Restrictions of applying band has with reference to health disorders-Pranayama versus concentration-

Pranayama is the bridge between mind and body-Pranayam versus mental health-Activation of Pranamaya kosha through Pranayama.

UNIT-V

Dhyana (Meditation): Definition of meditation-7th limb of Ashtanga yoga- Types of mind (Conscious and Sub-Conscious)-various types of dhyana. Meditation versus spiritual health-Dharana and Dhyana-Extention of Dhyana to Samadhi-Dhyana and mental stress-Activation of Mano mayakosha through dhyana- Silencing the mind

Suggested Readings:

1. Light on Yoga by BKS lyengar
2. Yoga education for children Vol-1 by Swami Satyananda Saraswati
3. Light on Pranayama by BKS lyengar
4. Asana Pranayama Mudra and Bandha by Swami Satyananda Saraswati
5. Hatha Yoga Pradipika by Swami Mukhtibodhananda
6. Yoga education for children Vol-11 by Swami Niranjan an and a Saraswati
7. Dynamics of yoga by Swami Satyananda Saraswati

Course Code	Course Title						Core/Elective
MC 952 SP	**NATIONAL SERVICE SCHEME (NSS)**						**Elective**
Prerequisite	Contact hours per week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	**25**	**50**	**3U**

Course Objectives:

- To help in Character Molding of students for the benefit of society
- To create awareness among students on various career options in different fields
- To remold the students behavior with assertive skills and positive attitudes
- To aid students in developing skills like communication, personality, writing and soft skills
- To educate students towards importance of national integration, participating in electoral process etc. by making them to participate in observing important days.

Course Outcomes:

Student will be able to:

- Students will become more focused towards becoming excellent citizens with more and more discipline in their day-to-day life.
- An all-round development-physical, mental and spiritual health-takes place.
- Self-discipline and discipline with respect society enormously increases.
- University environment becomes more peaceful and harmonious.

List of Activities:

1. Orientation programme about the role of NSS in societal development
2. Swachh Bharath Programme
3. Guest lecture's from eminent personalities on personality development
4. Plantation of saplings/Haritha Haram Programme 5.BloodDonation / Blood Grouping Camp
5. Imparting computer education to schoolchildren
6. Creating Awareness among students on the importance of Digital transactions
7. Stress management techniques
8. Health Checkup Activities
9. Observation of Important days like voters day, World Water Day etc.
10. Road Safety Awareness Programs
11. Energy Conservation Activities
12. Conducting Programme' son effective communication skills
13. Awareness programme's on national integration
14. Orientation on Improving Entrepreneurial Skills
15. Developing Effective Leadership skills
16. Job opportunity awareness programs in various defence, public sector undertakings
17. Skill Development Programmes
18. Creating awareness among students on the Importance of Yoga and other physical activities
19. Creatingawarenessamongstudentsonvariousgovernmentsponsoredsocialwelfare schemes for the people

Note: At least Ten Activities should be conducted in the Semester. Each event conducted under Swachh Barath, Plantation and important days like voters day, world water day may be treated as a separate activity.

Course Code	Course Title						Core/Elective
MC 953 SP	**SPORTS**						**Elective**
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	**20**	**30**	**3U**

Course Objectives:

- To develop an understanding of the importance of sport in the pursuit of a healthy and active lifestyle at the College and beyond.
- To develop an appreciation of the concepts of fair play, honest competition and good sportsmanship.
- To develop leadership skills and foster qualities of co-operation, tolerance, consideration, trust and responsibility when faced with group and team problem-solving tasks.
- To develop the capacity to maintain interest in a sport or sports and to persevere in order to achieve success.
- To prepare each student to be able to participate fully in the competitive, recreational and leisure opportunities offered outside the school environment.

Course Outcomes:

Student will be able to:

- Students' sports activities are an essential aspect of university education, one of the most efficient means to develop one's character and personal qualities, promote the fair game principles, and form an active life position.
- Over the past year, sports have become much more popular among our students. Let us remember the most memorable events related to sports and physical training.
- Special attention was paid to team sports. Our male and female games and sports have achieved remarkable progress at a number of competitions.
- Our teams in the main sports took part in regional and national competitions. Special thanks to our team in track and field athletics, which has been revitalized this year at ICT and which has won Javelin competition.
- Staff of our faculties and students of Sports, Physical Development, & Healthy Lifestyle of Faculty congratulates everyone on the upcoming New Year and wishes you robust health and new victories in whatever you conceive.

I. Requirements:

i) Track Pant (students should bring)
ii)Shoes
iii) Volley Ball, Foot Ball and Badminton (Shuttle)
iv) Ground, Court, indoor stadium and swimming pool

II. Evaluation Process:

Total Marks 50
i) 20marks for internal exam (continuous evaluation) a) 8 marks for viva
b) 12marks for sports & fitness

ii) 30marksforendexam a) 10marks for viva
b) 20marks for sports & fitness

Course Code	Course Title						Core/Elective
SI 671 EE	**SUMMER INTERNSHIP**						**Core**
Prerequisite	**L**	**T**	**D**	**P**	**CIE**	**SEE**	**Credits**
-	**0**	**0**	**0**	**2**	**50**	**0**	**2***

Course Objectives: To prepare the students

- To give an experience to the students in solving real life practical problems with all its constraints.
- To give an opportunity to integrate different aspects of learning with reference to real life problems.
- To enhance the confidence of the students while communicating with industry engineers and give an opportunity for useful interaction with them and familiarize with work culture and ethics of the industry.

Course Outcomes: On successful completion of this course student will be

- Able to design/develop a small and simple product in hardware or software.
- Able to complete the task or realize a prespecified target, with limited scope, rather than taking up a complex task and leave it.
- Able to learn to find alternate viable solutions for a given problem and evaluate these alternatives with reference to prespecified criteria.
- Able to implement the selected solution and document the same.

Summer Internship is introduced as part of the curricula for encouraging students to work on problems of interest to industries. A batch of two or three students will be attached to a person from an Industry / R & D Organization / National Laboratory for a period of 4 weeks. This will be during the summer vacation following the completion of the VI semester course. One faculty member will act as an internal guide for each batch to monitor the progress and interacts with the Industry guide.

After the completion of the project, students will submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the department. Award of sessional marks are based on the performance of the student at the work place and awarded by industry guide and internal guide (25 Marks) followed by presentation before the committee constituted by the department (25 Marks). One faculty member will coordinate the overall activity of Summer Internship.

Note: * Students have to undergo summer internship of four weeks duration at the end of semester VI and credits will be awarded after evaluation in VII semester.

M.E

EE3003 Electric and Hybrid Electrical Vehicles

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Unit I

Introduction to Electric Vehicles: Sustainable Transportation - EV System - EV Advantages - Vehicle Mechanics - Performance of EVs - Electric Vehicle drivetrain - EV Transmission Configurations and components-Tractive Effort in Normal Driving - Energy Consumption - EV Market - Types of Electric Vehicle in Use Today - Electric Vehicles for the Future.

Unit II

Electric Vehicle Modelling - Consideration of Rolling Resistance - Transmission Efficiency - Consideration of Vehicle Mass - Tractive Effort - Modelling Vehicle Acceleration - Modelling Electric Vehicle Range -Aerodynamic Considerations - Ideal GearboxSteady State Model - EV Motor Sizing - General Issues in Design.

Unit III

Introduction to electric vehicle batteries - electric vehicle battery efficiency - electric vehicle battery capacity - electric vehicle battery charging - electric vehicle battery fast charging - electric vehicle battery discharging - electric vehicle battery performance – testing.

Unit IV

Hybrid Electric Vehicles - HEV Fundamentals -Architectures of HEVs- Interdisciplinary Nature of HEVs - State of the Art of HEVs - Advantages and Disadvantages - Challenges and Key Technology of HEVs - Concept of Hybridization of the Automobile-Plug-in Hybrid Electric Vehicles - Design and Control Principles of Plug-In Hybrid Electric Vehicles - Fuel Cell Hybrid Electric Drive Train Design - HEV Applications for Military Vehicles.

Unit V

Advanced topics - Battery Charger Topologies, ChargingPower Levels, and Infrastructure for Plug-InElectric and Hybrid Vehicles - The Impact of Plug-in Hybrid Electric Vehicles onDistribution Networks – Sizing Ultracapacitorsfor Hybrid Electric Vehicles.

Suggested Reading:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles – Fundamentals, Theory and Design – MehrdadEhsani, UiminGao and Ali Emadi - Second Edition - CRC Press, 2010.
2. Electric Vehicle Technology Explained - James Larminie, John Lowry - John Wiley & Sons Ltd, - 2003.

3. Electric Vehicle Battery Systems - SandeepDhameja – Newnes - New Delhi – 2002.
4. Hybrid electric Vehicles Principles and applications With practical perspectives -Chris Mi, Dearborn - M. AbulMasrur, David WenzhongGao - A John Wiley & Sons, Ltd., - 2011.
5. Electric & Hybrid Vehicles – Design Fundamentals -IqbalHussain, SecondEdition, CRC Press, 2011.
6. Research Papers:
   i) The Impact of Plug-in Hybrid Electric Vehicles on Distribution Networks: a Review and Outlook - Robert C. Green II, Lingfeng Wang and MansoorAlam - 2010 IEEE.
   ii) Sizing Ultracapacitors For Hybrid Electric Vehicles - H. Douglas P Pillay -2005 IEEE.
   iii) Review of Battery Charger Topologies, Charging Power Levels, and Infrastructure for Plug-In Electric and Hybrid Vehicles - Murat Yilmaz, and Philip T. Krein, - IEEE transactions on power electronics, vol. 28, no. 5, may 2013.

(Common Electives for IDC, PS & PES)

EE3001 Power Electronic Applications to Power Systems

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

UNIT - I

Facts concepts: Reactive power control in electrical power transmission, principles of conventional reactive power compensators. Introduction to FACTS, flow of power in AC parallel paths, meshed systems, basic types of FACTS controllers, definitions of FACTS controllers, brief description of FACTS controllers.

UNIT - II

Static shunt and series compensators:

Shunt compensation - objectives of shunt compensation, methods of controllable VAR generation, static VAR compensators - SVC, STATCOM, SVC and STATCOM comparison. Series compensation - objectives of series compensation, thyristor switched series capacitors (TCSC), static series synchronous compensator (SSSC), power angle characteristics, and basic operating control schemes.

UNIT -III

Combined compensators: Unified power flow controller (UPFC) - Introduction, operating principle, independent real and reactive power flow controller and control structure. Interline power flow controller (IPFC), Introduction to Active power filtering, Concepts relating to Reactive power compensation and harmonic current compensation using Active power filters.

UNIT IV

Hvdc transmission: HVDC Transmission system: Introduction, comparison of AC and DC systems, applications of DC transmission, types of DClinks, Layout of HVDC Converter station and various equipments. HVDC Converters, analysis of bridge converters with and without overlap, inverter operation, equivalent circuit representation of rectifier and inverter configurations

UNIT V

Control of HVDC system: Principles of control, desired features of control, converter control characteristics, power reversal, Ignition angle control, current and extinction angle control. Harmonics-introduction, generation, ac filters and dc filters. Introduction to multiterminal DC systems and applications, comparison of series and parallel MTDC systems.

Suggested Reading:

1. Song, Y.H. and Allan T. Johns, 'Flexible AC Transmission Systems (FACTS)', Institution of Electrical Engineers Press, London, 1999.
2. Hingorani ,L.Gyugyi, 'Concepts and Technology of Flexible AC Transmission System', IEEE Press New York, 2000 ISBN –078033 4588.
3. Padiyar, K.R., 'HVDC transmission systems', Wiley Eastern Ltd., 2010.
4. Mohan Mathur R. and Rajiv K.Varma , 'Thyristor - based FACTS controllers for Electrical
transmission systems', IEEE press, Wiley Inter science , 2002.
5. Padiyar K.R., 'FACTS controllers for Transmission and Distribution systems' New Age International Publishers, 1st Edition, 2007.
6. Enrique Acha, Claudio R.Fuerte-Esqivel, Hugo Ambriz-Perez, Cesar Angeles-Camacho 'FACTS –Modeling and simulation in Power Networks' John Wiley & Sons, 2002.

EE3112 **Microcontroller Applications to Power Electronics (Elective to IDC & PES)**

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

UNIT-I

Review of microcontrollers and digital signal processors, architecture,peripheral modules.; Typical processors for control implementation: memory organization, CPU details, addressing modes, interrupt structure, hardware multiplier, pipelining.; Fixed- and floating-point data representations , Assemblers, linkers and loaders. Binary file formats for processor executable files. Typical structure of timer-interrupt driven programs.;

UNIT-II

Implementing digital processor based control systems for power electronics: Reference frame transformations, PLL implementations, machine models, harmonic and reactive power compensation, space vector PWM.;Numerical integration methods.; Multitasking concepts for power electronics implementations: The need for multitasking, various multitasking methods.

UNIT-III

Use of microcontrollers for pulse generation in power converters - Overview of Zero-Crossing Detectors - typical firing/gate-drive circuits –firing / gate pulses for typical single phaseand three-phase power converters - PIC16F876 Micro-controller – device overview –pin diagrams.

UNIT-IV

PIC16F876 micro-controller memory organization – Special Function Registers - I/O ports –Timers – Capture/ Compare/ PWM modules (CCP).
Analog to Digital Converter module – Instruction set - instruction description - introductionto PIC microcontroller programming- oscillator selection-reset - interrupts -watch dogtimer.

UNIT-V

Introduction to MPLAB IDE and PICSTART plus – Device Programming using MPLAB andPICSTART plus – generation of firing / gating pulses for typical power converters.Example of DSP system A to D signal conversion - DSP Support tools-code composer studio - compiler, assembler and linker

Suggested Reading:

1. PIC16F87X Datasheet 28/40 – pin 8 bit CMOS flash Microcontrollers, Microchip technology
Inc., 2001. and MPLAB IDE Quick start guide, Microchip technology Inc., 2007.
2. John B. Peatman, 'Design with PIC Microcontrollers', Prentice Hall, 2003.
3. MykePredko, 'Programming and customizing the PIC Microcontroller' Tata McGraw-Hill,
3rd Edition, 2008.
4. K Ogata, "Discrete-Time Control Systems", second edition, Pearson Education Asia.
5. N. Mohan, "Power Electronics", third edition, John Wiley and Sons.

EE3305 Advanced Topics in Power Electronics (Core PES)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

Unit-I

Introduction to switches - Advanced Silicon devices - Silicon HV thyristors, MCT, BRT &EST. SiC devices - diodes, thyristors, JFETs & IGBTs. Gallium nitrate devices - Diodes, MOSFETs.

Unit -II

Pulse Width Modulated Rectifiers: Properties of ideal rectifier, realization of near ideal rectifier, control of the current waveform, single phase and three-phase converter systems incorporating ideal rectifiers and design examples. Non-linear phenomena in switched mode power converters: Bifurcation and Chaos.

Unit-III

Control of DC-DC converters- State space modeling of Buck, Boost, Buck-Boost, Cuk Fly back, Forward, Push-Pull, Half & Full-bridge converters. Closed loop voltage regulations using state feedback controllers.

Soft-switching DC - DC Converters: zero-voltage-switching converters, zero-current switching converters, Multi-resonant converters and Load resonant converters.

Unit-IV

Advance converter topologies - Multi level converters - Cascaded H-Bridge, Diode clamped, NPC, Flying capacitor. Modular Multi-level converters(MMC), Multi-Input DC-DC Converters, Multi pulse PWM current source converters, Interleaved converters, Z-Source converters.

Unit-V

Control Design Techniques for Power Electronic Systems- Modeling of systems, Digital Controller Design, Optimal and Robust controller Design.

Suggested Reading:

1. Andrzej M Trzynadlowski, 'Introduction to Modern Power Electronics, John Wiley and sons. Inc, New York, 1998

2. L. Umanand, 'Power Electronics Essentials &Applications', Wiley publishing Company, 1st Edition, 2014

3 B. JayantBalinga, 'Advanced High Voltage Power Device Concepts', Springer New York 2011. ISBN 978-1-4614-0268-8

4. BIN Wu, ' High Power Converters and AC Drives', IEEE press Wiley Interscience, a John wiley& sons Incpublication 2006

EE3304 Power Electronic Converters for Renewable Energy (Elective IDC& Core PES)

Instruction	:	3 Periods / Week
Duration of Univ. Examination	:	3 Hours
SEE	:	70 Marks
CIE	:	30Marks

UNIT I

Introduction to renewable sources: world energy scenario, Wind, solar, hydro, geothermal, availability and power extraction.
Introduction to solar energy: Photovoltaic effect, basics of power generation, P-V &I-V characteristics, effect of insolation, temperature, diurnal variation, shading, Modules, connections, ratings, Power extraction (MPP) tracking and MPPT schemes;standalone systems, grid interface, storage, AC-DC loads.

UNIT II

DC-DC converters for solar PV:buck/boost/buck-boost /flyback /forward/cuk, bidirectional converters, Interleaved and multi-input converters.

UNIT III

Grid connected Inverters: 1ph, 3ph inverters with & w/o x'mer, Heric, H6, Multilevel Neutral point clamp, Modular multilevel, CSI; Control schemes: unipolar, bipolar, PLL and synchronization, power balancing / bypass, Parallel power processing; Grid connection issues: leakage current, Islanding, harmonics, active/reactive power feeding, unbalance.

UNIT IV

Introduction to wind energy: P-V, I-V characteristic, wind power system: turbine-generator-inverter, mechanical control, ratings; Power extraction (MPP) and MPPT schemes. Generators for wind: DC generator with DC to AC converters; Induction generator with & w/o converter.

UNIT V

Synchronous generator with back to back controlled/ uncontrolled converter; Doubly fed induction generator with rotor side converter topologies; permanent magnet based generators. Battery: Types, charging discharging. Introduction to AC and DC microgrids.

Suggested Reading:

[1] SudiptaChakraborty, Marcelo G. Simes, and William E. Kramer. Power Electronics for Renewable and Distributed Energy Systems: A Sourcebook of Topologies, Control and Integration. Springer Science & Business, 2013.

[2] Nicola Femia, Giovanni Petrone, Giovanni Spagnuolo, Massimo Vitelli, Power Electronics and control for maximum Energy Harvesting in Photovoltaic Systems,CRC Press,2013.
[3] Chetan Singh Solanki, Solar Photovoltaics: fundamentals, Technologies and Applications, Prentice Hall of India, 2011.
[4] N. Mohan, T.M. Undeland& W.P. Robbins, Power Electronics: Converter, Applications & Design, John Wiley & Sons, 1989
[5] Muhammad H. Rashid, Power Electronics: Circuits, Devices, and Applications, Pearson Education India, 2004
[6] E. Guba, P. Sanchis, A. Ursa, J. Lpez, and L. Marroyo, Ground currents in single-phase transformerless photovoltaic systems, Progress in Photovoltaics: Research and Applications, vol. 15, no. 7, 2007.
[7] Remus Teodorescu, Marco Liserre, Pedro Rodriguez, Grid Converters for Photovoltaic and Wind Power Systems, John Wiley and Sons, Ltd., 2011.
[8] Ali Keyhani, Design of Smart Power Grid Renewable Energy Systems, Wiley-IEEE Press, 2011.