GEETHANJALI INSTITUTE OF SCIENCE & TECHNOLOGY: NELLORE
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
B. Tech ECE – RG 22 Regulation

Semester – 7 (Theory-7)							
Sl. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	**C**
1	PEC		**Professional Elective-III**	3	0	0	3
2	PEC		**Professional Elective-IV**	3	0	0	3
3	PEC		**Professional Elective-V**	3	0	0	3
4	OEC		**Open Electives-III**	3	0	0	3
5	OEC		**Open Electives-IV**	3	0	0	3
6	HSC		**Open Elective-V**	3	0	0	3
7	SC	22A0453P	**Skill Advanced Course:** Mobile Application Development	1	0	2	2
8		22A0454	Evaluation of Industry Internship	0	0		3
						Total credits	**23**

S. No.	Course Code	Name of the Professional Electives
1	22A0444T	Mobile Communications
2	22A0445T	Low Power VLSI Design
3	22A0446T	Embedded Real Time Systems
4	22A0447T	Fuzzy sets, logic systems and Applications
5	22A0448T	Advanced Digital Signal Processing
6	22A0449T	Internet of Things
7	22A0450T	CPLD & FPGA Architectures and Applications
8	22A0451T	Digital Image Processing
9	22A0452T	Digital TV Engineering

S. No.	Course Code	Name of the Open Electives
1	22A0529T	Cloud Computing
2	22A0241T	Smart Grid
3	22A0329Tc	Measurements and Mechatronics
4	22A0151T	Disaster Management
5	22A0534a	Cyber Security
6	22A0329Ta	Renewable Energy Sources
7	22A0152T	Construction Management
8	22A0236T	Hybrid Electric Vehicles
9	22A3301T	Artificial Intelligence
10	22A0024T	Entrepreneurship & Innovation
11	22A0023T	Management Science
12	22A0025T	Business Environment
13	22A0026T	Human Resource Management

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Category	**Credits**
Professional Elective Courses (PEC)	9
Humanities and Social Science Course (HSC)	3
Open Elective Courses (OEC)	6
Skill Advanced Course (SC)	2
Industrial/Research Internship	3
Total	23

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MOBILE COMMUNICATIONS

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0444T	3:0:0	3	CIE:30 SEE:70	3 Hours	PEC

Course Objectives:

- To impart knowledge on different wireless standards and their technical specifications.
- To teach different propagation models.
- To present concepts of 3G/4G Wireless Communication systems to solve the relevant Problems.
- To dissimilate different Wireless Technologies such as CDMA, MIMO, and OFDM through performance metrics to find the merits and demerits.

Syllabus	Total hours: 48

Unit –I — **10 Hrs**

Wireless Standards: Introduction to 3G/4G Wireless Communications - Introduction, 2G, 3G, and 4G Wireless standards, Overview of Cellular Service Progression, Problem Solving.

Teletraffic Theory: Introduction to teletraffic theory, Cellular traffic modelling and blocking probability.

Large Scale Path Loss: Introduction to wireless propagation models, Ground reflection model, Okumura model, Hata model, Link budget analysis, Log normal shadowing.

Unit –II — **10 Hrs**

Small Scale Fading and Multipath: Fading in wireless channel, Rayleigh fading, BER in wired and wireless channels. Wireless channel and delay spread, Coherence bandwidth of wireless channel, ISI and Doppler in wireless channel, Doppler spectrum and Jake's model.

Diversity Techniques: Introduction to diversity techniques, MRC for multi-antenna system, BER with diversity, Spatial diversity and diversity order.

Unit –III — **9 Hrs**

Basics of Channel Modeling: Maximum Delay Spread, RMS delay Spread, Power delay profile, Coherence Bandwidth, Doppler Spread, Impact of Doppler spread on Wireless Channel, Coherence Time, Clarke's Model, Simulation Procedure for flat fading and Frequency Selective Fading Channels.

Code Division Multiple Access: Introduction to CDMA, spread spectrum and LFSR. Generation and properties of PN sequences, Correlation of PN sequences and Jammer margin, CDMA advantages and RAKE receiver, Multiuser CDMA downlink, Multiuser CDMA uplink and asynchronous CDMA, CDMA near-far problem.

Unit –IV — **10 Hrs**

3G Overview: Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA.

Multiple Input Multiple Output Systems: Introduction to MIMO, MIMO system model, Zero-forcing receiver, MIMO MMSE receiver, Introduction to SVD, SVD based optimal MIMO transmission and capacity, OSTBCs, V-blast receiver, MIMO beam forming.

Unit –V — **9 Hrs**

Orthogonal Frequency Division Multiplexing: Introduction to OFDM, Multicarrier modulation,

IFFT sampling for OFDM, OFDM schematic, Cyclic prefix, OFDM based parallelization, OFDM examples.

MIMO-OFDM: Introduction to MIMO-OFDM, Impact of carrier frequency offset in OFDM, PAPR in OFDM systems, Introduction to SC-FDMA.

4G & Beyond: Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

Text Books:

1. Aditya K Jagannatham, "Principles of Modern Communication Systems - Theory andPractice," McGraw Hill Education, 2016.
2. T. S. Rappaport, "Wireless Communications - Principles and Practice," Second Edition,Pearson, 2010.
3. Jochen Schiller, ”Mobile Communications”, Second Edition, Pearson Education 2012.
4. Vijay Garg, “Wireless Communications and networking”, First Edition, Elsevier 2007

References:

1. David Tse and PramodViswanath, “Fundamentals of Wireless Communications”, Cambridge University Press.
2. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.
3. EzioBiglieri, “MIMO Wireless Communications”, Cambridge University Press.
4. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE
5. for Mobile Broadband”, Second Edition, Academic Press, 2008.
6. Anurag Kumar, D.Manjunath, Joy kuri, “Wireless Networking”, First Edition, Elsevier 2011.
7. Simon Haykin , Michael Moher, David Koilpillai, “Modern Wireless Communications”, First Edition, Pearson Education 2013

Course Outcomes:

After the completion of the course students will able to:

CO1: Understand various Wireless standards and their technical specifications.

CO2: Compare different propagation models.

CO3: Apply concepts of 3G/4G wireless communication systems to solve problems.

CO4: Analyze performance of various 3G/4G wireless communication systems under AWGN.

CO5: Analyze performance of various 3G/4G wireless communication systems under small-scale Fading channel conditions.

CO6: Compare different wireless technologies through performance metrics

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LOW POWER VLSI DESIGN					
Course Code	**L:T:P**	**Credits**	**Exam. Marks**	**Exam Duration**	**Course Type**
22A0445T	**3:1:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PEC**

Course Objectives:

- To impart knowledge on different abstraction levels in VLSI Design and the impact of power reduction methods at higher levels
- To describe leakage control mechanisms to reduce static power consumption in DSMVLSI regime
- To explain technology independent and technology-dependent techniques for Dynamic power reduction in CMOS circuits
- To introduce variousssoftware power estimation and optimization techniques for low power VLSI system design
- To demonstrate low power circuit and architectural techniques for reducing power consumption in SRAM designs

Syllabus	**Total Hours: 48**
Unit –I	**10 Hrs**

Introduction to Low Power design: Why worry about power – at global and SOC levels, Emerging zero-power applications (WSN), 20 nm scenario, Design-productivity challenge,Impactofimplementationchoices,MotivationforLPD,BasicVLSIDesignFlow,Optimization examples at various levels (System, Sub-system, RTL, Gate, Circuit and Device levels) Sources of power dissipation, MOS transistor leakage components, Static Power dissipation, Dynamic Power dissipation, Circuit Techniques for Low Power Design–Standby leakagecontrol using transistor stacks, Multiple VTH and dynamic VTH techniques, Supply voltage scaling technique.

Unit –II	**10 Hrs**

Power Optimization Techniques–I: Dynamic Power Reduction Approaches, Circuit Parallelization, Voltage Scaling Based Circuit Techniques, Circuit Technology – Independent Power Reduction, Circuit Technology Dependent Power Reduction; Leakage Power Reduction–Leakage Components, Design Time Reduction Techniques, Run-time Stand-by Reduction Techniques, Run-time Active Reduction Techniques Reduction in Cache Memories, LVLP Logic Styles, Current-Mode CMOS Adders using multiple-valued logic.

Unit –III	**10 Hrs**

Power Optimization Techniques – II: Low Power Very Fast Dynamic Logic Circuits, Low Power Arithmetic Operators, Energy Recovery Circuit Design, Adiabatic – Charging Principle and its implementation issues (Ref-2).

Software Design for Low Power: Sources of Software Power Dissipation, Software Power Estimation, Software Power Optimizations, Automated Low-Power Code Generation, Co-design for Low Power.

Unit –IV	**9 Hrs**

Low Voltage Low Power Static Random Access memories: Basics, Race between 6T and 4T memory cells, LVLP SRAM Cell designs- Shared bit-line SRAM cell configuration, Power efficient 7T SRAM cell with current mode read and write, Load less CMOS 4T SRAM cell, The 1T SRAM cell, Pre-charge and Equalization Circuit, Dynamic and static decoders, Voltage Sense amplifier, Output Latch,

Low Power SRAM Techniques: Sources of SRAM Power, Low Power Circuit techniques such as capacitance reduction, Leakage current reduction.

Unit –V	**9 Hrs**

Large LPVLSI System design and Applications: Architecture driven Voltage Scaling, Power optimization using operation reduction and operation substitution, Pre-computation based optimization, Multiple and Dynamic supplyvoltage design, Choice of supply voltages, Varying the clock speed, varying the VDD of RAM structures, Gated Clocking. Leakage current reduction in medical devices.

Text Books:

1. Kiat- Seng Yeo and Kaushik Roy, "Low-Voltage, Low-Power VLSI Subsystems, Tata Mc Graw hill Edition, 2005.
2. Christian Piguet, "Low Power CMOS Circuits Technology, Logic Design and CAD Tools", 1st Indian Reprint, CRC Press, 2010.

References:

1. Kaushik Royand Sharat Prasad, "Low-Power CMOS VLSI Circuit Design", Wiley Pub., 2000.
2. Dimitrios Soudris, Christian Piguetand Coastas Goutis, "Designing CMOS Circuits for Low Power", Kluwer Academic Pub, 2002
3. J.Rabaey, LowPowerDesignEssentials, 1stEdition, SpringerPublications, 2010.

Course Outcomes:

After the completion of the course students will able to:

CO1: Explain technology independent and technology dependent techniques for CMOS circuits.

CO2: Distinguish impact of various power reduction techniques at different levels of VLSI Design.

CO3: Identify sources of power dissipation and apply leakage reduction techniques to reduce static power consumption in CMOS circuits.

CO4: Analyze different power reduction techniques for VLSI systems at Design time, Run-time and Stand-by modes.

CO5: Apply simple software power estimation and optimization techniques for low power VLSI system design.

CO6: Apply low power circuit and architectural techniques such as capacitance reduction, gatedclocking, VDD and Vth scaling, DVS etc in digital systems and SRAM designs.

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EMBEDDED REAL TIME OPERATING SYSTEMS

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0446T	3:0:0	3	CIE:30 SEE:70	3 Hours	PEC

Course Objectives:

- Develop an understanding of the technologies behind the embedded computing systems, capabilities and limitations of the hardware, software components.
- Methods to evaluate design tradeoffs between different technology choices.
- design methodologies

Syllabus	Total Hours: 48
Unit –I	**10 Hrs**

Introduction to Embedded systems: What is an embedded system Vs. General computing system, history, classification, major application areas, and purpose of embedded systems. Core of embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

Unit –II	**10 Hrs**

Micro controllers architecture: Characteristics, quality attributes application specific, domain specific embedded systems. Factors to be considered in selecting a controller, ARM architecture, memory organization, registers banks, special function registers, Instruction set, Thumb instruction set, source current, sinking current, design examples.

Unit –III	**9 Hrs**

RTOS and Scheduling: Operating system basics, types of RTOS, tasks, process and threads, multiprocessing and multitasking, types of multitasking, non-pre-emptive, pre-emptive scheduling.

Unit –IV	**10 Hrs**

Task communication of RTOS: Shared memory, pipes, memory mapped objects, message queue, mailbox, signalling, RPC and sockets, task communication/synchronization issues, racing, deadlock. Priority Inversion semaphore, mutex, critical section objects, events, device, device drivers, how to clause an RTOS, Integration and testing of embedded hardware and firm ware.

Unit –V	**9 Hrs**

Simulators and emulators: Simulators and emulators, Debuggers, Embedded Product Development life cycle (EDLC), Trends in embedded Industry, in-circuit emulators (ICE).

Textbooks:

1. Introduction to embedded systems Shibu. K.V, TMH, 2009.
2. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

References:

1. Ayala &Gadre: The 8051 Microcontroller & Embedded Systems using Assembly and C, CENGAGE
2. Embedded Software Primer, David Simon, Pearson.

3. The 8051 Microcontroller and Embedded Systems, Mohammed Mazidi, Pearson,

Course Outcomes:

After the completion of the course students will able to:

CO1: Understand the basics of an embedded system and RTOS

CO2: Understand the architecture of Microcontroller and quality attributes.

CO3: Analyze the various types of Scheduling algorithms in Embedded systems RTOS.

CO4: Analyze the different types of task communication protocol to design the RTOS based embedded systems.

CO5: Describe the problems related to the RTOS for design of embedded systems.

CO6: Analyze the various tools to available to test the designed embedded system.

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FUZZY SETS, LOGIC SYSTEMS AND APPLICATIONS

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0447T	3:0:0	3	CIE:30 SEE:70	3 Hours	PEC

Course Objectives:

- To provide the student with the basic understanding of fuzzy sets and logic system fundamentals.
- To understand the features of Membership functions.
- To develop the fundamental concepts such as fuzzy sets, operations and relations.
- To understand the differences between crisp and fuzzy set relations.
- To introduce fuzzy arithmetic concepts.
- To discuss fuzzy inference applications.

Syllabus	Total Hours: 48
Unit –I	**10 Hrs**
Introduction: Fuzzy sets, logic and system & Applications, introduction to real life applications of Fuzzy systems, Fuzzy sets and Fuzzy logic Toolbox in MATLAB, Membership Functions, Nomenclature terms and set theoretic operation used in Fuzzy sets- Membership functions, Nomenclature use in Fuzzy sets theory, Theoretic operation used in Fuzzy sets.	
Unit –II	**10 Hrs**
Set Theoretic operation in Fuzzy sets, Properties of Fuzzy sets- Law of Contradiction, Law of Excluded middle, Idempotency, Involution, Commutativity, Associativity, Distributivity, Absorption, Absorption of complement and Demorgan's laws. Distance between Fuzzy sets, Arithmetic operation on Fuzzy numbers- Addition, Subtraction, Multiplication and Division, complement of Fuzzy sets, T-Norm operation and S-Norm operation for Fuzzy sets.	
Unit –III	**10 Hrs**
Parameterized T-norm and S-norm operations, Crisp Relation, Fuzzy Relation, Operations on Crisp and Fuzzy relations, Projection of Fuzzy relation set, cylindrical Extension of Fuzzy sets and properties of Crisp and Fuzzy relation, Extension Principle.	
Unit –IV	**9 Hrs**
Composition of Fuzzy relations and its properties, Fuzzy tolerances equivalence relations, Linguistic, hedges, negation/complement conventions, concentration, dilation, and some examples on composite linguistic terms.	
Unit –V	**9 Hrs**
Contrast intensification of Fuzzy set Orthogonality of Fuzzy set, Fuzzy rules Fuzzy Reasoning and Fuzzy inference systems, Mamdani Fuzzy model, Example on Mamdani Fuzzy model for Single Antecedent with three rules and for Two Antecedents with four rules, Larson Fuzzy model, Tsukamoto Fuzzy model, TSK Fuzzy model	

Textbooks:

1. Ross, T. J. (2005), "Fuzzy logic with engineering applications," John Wiley & Sons.

2. J.-S. R. Jang, C.-T. Sun, and E. Mizutani, "Neuro-Fuzzy and Soft Computing" Prentice Hall.

References:

1. A First Course in Fuzzy Logic, Fourth Edition, by Hung T. Nguyen , Carol Walker , Elbert A. Walker ,CRC press.
2. Fuzzy Logic, Systems and Engineering Applications by Hubert Parks , Murphy & Moore Publishing March 8, 2022.

Course Outcomes:

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

CO1: Understand the fundamentals of fuzzy sets and logic systems.

CO2: Understand the features of Membership functions.

CO3: Analyze the fundamental concepts such as fuzzy sets, operations and relations.

CO4: Understand the differences between crisp and fuzzy set relations.

CO5: Understand the Arithmetic operations on Fuzzy numbers.

CO6: Analyze different fuzzy inference applications.

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ADVANCED DIGITAL SIGNAL PROCESSING

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0448T	3:0:0	3	CIE:30 SEE:70	3 Hours	PEC

Course Objectives:

- To understand the sampling rate conversion and summarize multirate DSP.
- To describe the various linear filtering techniques and its applications to DSP.
- To apply and estimate parametric and non-parametric power spectrum estimation.
- To acquire the knowledge on applications of multi rate digital signal processing.

Syllabus	Total Hours:48
Unit –I	**10 Hrs**

Multirate Digital Signal Processing: Introduction, Decimation by a Factor D, Interpolation by a Factor I, Sampling Rate Conversion by a Rational Factor I/D, Filter Design and Implementation for Sampling-Rate Conversion, Direct-Form FIR Filter Structures, Polyphase Filter Structures, Time-Variant Filter Structures, Multistage Implementation of Sampling-Rate Conversion, Sampling-Rate Conversion of Band pass Signals, Decimation and Interpolation by Frequency Conversion, Modulation-Free Method for Decimation and Interpolation, Sampling-Rate Conversion by an Arbitrary Factor, First-Order Approximation, Second-Order Approximation (Linear Interpolation).

Unit –II	10 Hrs

Linear Prediction and Optimum Linear Filters: Innovations Representation of a Stationary Random Process, Relationships Between the Filter Parameters and the Autocorrelation Sequence, Forward Linear Prediction, Backward Linear Prediction, The Optimum Reflection Coefficients for the Lattice Forward and Backward Predictors, Relationship of an AR Process to Linear Prediction, The Levinson-Durbin Algorithm, AR Lattice Structure, ARMA Processes and Lattice-Ladder Filters, Wiener Filters for Filtering and Prediction, FIR Wiener Filter, IIR Wiener Filter, Noncausal Wiener Filter.

Unit –III	9 Hrs

Nonparametric Methods for Power Spectrum Estimation: Estimation of Spectra from Finite-Duration Observations of Signals, Estimation of the Autocorrelation and Power Spectrum of Random Signals, Use of the DFT in Power Spectrum Estimation, Bartlett Method, Welch Method, Blackman and Tukey Method, Performance Characteristics of Nonparametric Power Spectrum Estimators.

Unit –IV	10 Hrs

Parametric Methods for Power Spectrum Estimation: Relationships Between the Autocorrelation and the Model Parameters, The Yule-Walker Method for the AR Model Parameters, The Burg Method for the AR Model Parameters, Unconstrained Least-Squares Method for the AR Model Parameters, Sequential Estimation Methods for the AR Model Parameters, Selection of AR Model Order, MA Model for Power Spectrum Estimation, ARMA Model for Power Spectrum Estimation.

Unit –V	9 Hrs

Applications of Digital Signal Processing: Dual Tone Multi-Frequency Signal Detection, Spectral Analysis of Sinusoidal Signals, Spectral Analysis of Non stationary Signals, Spectral Analysis of Random Signals, Musial Sound Processing, Discrete-Time Analytic Signal Generation, Sub band

Coding of Speech and Audio Signals, Over Sampling A/D Converter, Over Sampling D/A Converter.

Text Books:

1. J G Proakis, D G Manolokis, "Digital Signal Processing Principles, Algorithms and Applications" 3rd Edition, Prentice Hall.
2. Sanjit K Mitra, "Digital Signal Processing – A Computer Based Approach", 2nd Edition, Tata Mc graw Hill Publications.

References:

1. A V Oppenhiem, R W Schafer, "Discrete-Time Signal Processing", Pearson Education.
2. S. M .Kay, "Modern spectral Estimation Techniques" PHI, 1997.

Course Outcomes:

After the completion of the course students will able to:

CO1: Understand the sampling rate conversion, interpolation and decimation for signal processing applications also need of optimum linear filtering and its applications.

CO2: Apply and explore the real-time applications to multirate DSP systems.

CO3: Analyze the parametric and non-parametric methods for power spectrum estimation.

CO4: Describe the applications of DSP to real-time requirements.

CO5: Solve the linear equations and analyze the optimum filters to estimate the signals corrupted by noise.

CO6: Differentiate parametric and non-parametric methods for power spectrum estimation.

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INTERNET OF THINGS

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0449T	3:0:0	3	CIE:30 SEE:70	3 Hours	PEC

Course Objectives:

- To understand Smart Objects and IoT Architectures.
- To learn about various IOT-related protocols.
- To build simple IoT Systems using Arduino and Raspberry Pi
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

Syllabus	Total hours:48
Unit –I	**10 Hrs**

Fundamentals of IoT: Definition & Characteristics of IoT, Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects Logical Design of IoT – IoT, Functional Blocks, Security.

Unit –II	10 Hrs

Communication Protocols for IoT: Working principles of sensors – IOT deployment for Raspberry Pi /Arduino/Equivalent platform – Reading from Sensors, Communication: Connecting microcontroller with mobile devices – communication through Bluetooth, WIFI and USB - Contiki OS- Cooja Simulator. Communication modules – Bluetooth – Zigbee – WIFI – GPS- IOT Protocols (IPv6, 6LoWPAN, RPL, CoAP etc..), MQTT, Wired Communication, Power Sources

Unit –III	10 Hrs

Design and development : Design Methodology – Embedded computing logic – Microcontroller, System on Chips – IoT system building blocks – Arduino – Board details, IDE programming – Raspberry Pi – Interfaces and Raspberry Pi with Python Programming.

Unit –IV	9 Hrs

Data acquisition and supporting services : Data Acquisition with Python and Tkinter: Basics- CSV file, Storing Arduino data with CSV file, Connecting to the Cloud: Smart IoT Systems - Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning , Smart Motion Detector and Upload Image to gmail.com

Unit –V	9 Hrs

Applications of IoT: Applications of IoT, Business models for IoT, Green energy buildings and infrastructure, Smart farming, Smart retailing and Smart fleet management, Recent trends, Internet of Medical Things (IoMT), Proposed Model, Result and Discussion, Applications for smart cities.

Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

2. Qusay F. Hassan, Internet of Things A to Z, IEEE Press

References:

1. Vermesan, Ovidiu, and Peter Friess, eds. Internet of things-from research and innovation to market deployment, 1st edition, Aalborg: River publishers, 2014.
2. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, Internet of Things with Raspberry Pi and Arduino, CRC Press, 2019.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols, Wiley, 2012 (for Unit 2).

E-learning resources:

1. https://www.guru99.com/iot-tutorial.html
2. https://developer.ibm.com/technologies/iot/tutorials/

Course Outcomes:

After the completion of the course students will able to:

CO1: Explain the concept of IoT.

CO2: Analyze various protocols for IoT.

CO3: Design a PoC of an IoT system using Rasperry Pi/Arduino

CO4: Apply data acquisition and use cloud offerings related to IoT.

CO5: Analyze applications of IoT in real time scenario.

CO6: Apply the knowledge of IOT in various areas of engineering field.

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CPLD & FPGA ARCHITECTURES AND APPLICATIONS					
Course Code	**L:T:P**	**Credits**	**Exam. Marks**	**Exam Duration**	**Course Type**
22A0450T	**3:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**PEC**

Course Objectives:

- To understand the concepts of Programmable Logic Devices & Complex Programmable Logic Devices
- To give exposure to understand the concept of Field Programmable Gate Arrays design.
- To give exposure to understand the concept of Field Programmable Gate Arrays Case Studies.
- The Students aims to practical experience by designing of Finite State Machines
- To provide students with the understanding of the different FSM Architecture & System level Design.

Syllabus	**Total Hours: 48**
Unit –I:: Introduction to Complex Programmable Logic Devices	**10 Hrs**

Programmable Logic: ROM, PLA, PAL, PLD, FPGA – Features

Complex Programmable Logic Devices: ALTERA CPLDs and ALTERA FLEX 10k Series CPLD, Speed Performance.

Unit –II:: Field Programmable Gate Arrays	**10 Hrs**

Xilinx logic Cell array, CLB, I/O Block Programmable interconnect, Technology Mapping for FPGA: Library based, LUT based, Multiplexer based Technology Mapping.

Unit –III:: FPGA Case Studies	**10 Hrs**

Case Studies: programming Technologies, Xilinx XC3000, XC4000, Actel FPGAs, Alteras FPGAs, Plus Logic FPGA, AMD FPGA, Quick Logic FPGA, Algotronix FPGA, Cross point solutions FPGA, FPGA Design Flow.

Unit –IV:: Finite State Machines (FSM)	**9 Hrs**

Finite State Machines (FSM): Finite State Machine– State Transition Table, State Assignments for FPGAs. Problem of the Initial State Assignment for One Hot Encoding.

Realization of State Machine: Derivation of SM Charts. Realization of State Machine Chart, Alternative Realization of State Machine Chart using Microprogramming. Linked State Machines. One–Hot State Machine, Petri nets for State Machines – Basic Concepts, Properties. Extended Petri nets for Parallel Controllers.

Unit –V:: FSM Architectures & Systems Level Design	**9 Hrs**

FSM Architectures: Architectures Centered Around Non- Registered PLDs. State Machine Designs Centered Around A Shift Register.

Systems Level Design: One–Hot Design Method. Use of ASMs in One–Hot Design. Application of One–Hot Method. System Level Design: Controller, Data Path and Functional Partition.

Text Books:

1. P.K.Chan & S. Mourad, Digital Design Using Field Programmable Gate Array, Prentice Hall (Pte), 1994.
2. J. Old Field, R.Dorf, Field Programmable Gate Arrays, John Wiley & Sons, Newyork, 1995.

References:

1. Fundamentals of logic Design, 5/e, Charles H Roth.Jr.
2. S. Brown, R. Francis, J. Rose, Z. Vransic, Field Programmable Gate Array, Kluwer Pubin

Course Outcomes:

After the completion of the course students will able to:

CO1: Acquire qualitative knowledge about the PLD's & CPLD's.

CO2: Understand the concept of Field Programmable Gate Arrays design.

CO3: Apply the basic FPGA Case Studies in different Module design.

CO4: Understand the different Modules of Finite State Machine.

CO5: Understand the Architecture of Finite State Machine.

CO6: Acquire qualitative knowledge about realization of Finite State Machine.

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DIGITAL IMAGE PROCESSING
(Common to ECE and CSE)

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0451T	3:0:0	3	CIE:30 SEE:70	3 Hours	PEC

Course Objectives:

This course is designed to enable the students to familiarize themselves with basic concepts of digital image processing and different image transforms and learn various image processing techniques like image enhancement, restoration, segmentation and compression

Syllabus		Total Hours: 48
Unit –I	Basics to Image Processing	**10 Hrs**

Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

Image Transforms: Need for image transforms, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2- D Discrete Fourier transform, Importance of Phase, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, SVD and Radon Transform, Comparison of different image transforms.

Unit-II	Intensity Transformations and Filtering	10 Hrs

Intensity Transformations and Spatial Filtering: Background, some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, Combining spatial enhancement methods.

Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

Unit-III	Image Restoration and Reconstruction	10 Hrs

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter ,image reconstruction from projections.

Unit-IV	Image compression	9 Hrs

Image compression: Fundamentals and Basic compression methods, Lossy and Lossless compression techniques (Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding).

Wavelets and Multi resolution Processing: Image pyramids, sub band coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions, Wavelet coding.

Unit-V	Image segmentation	9 Hrs

Image segmentation: Fundamentals, point, line, edge detection, thresholding, and region –based segmentation.

Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

Textbooks:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.

Reference Books:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009Hwei Hsu, "Schaum's Outline of Signals and Systems", 4thEdition, TMH, 2019.

Course Outcomes (CO):

After the completion of the course students will able to:

CO1: Understand various image transform techniques.

CO2: Understand image manipulations and different digital image processing techniques.

CO3: Understand basic operations like – Enhancement, segmentation, compression, Image transforms.

CO4: Classify Image transforms and restoration techniques on image.

CO5: Analyze pseudo and full color image processing techniques.

CO6: Apply various morphological operators on images.

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DIGITAL TV ENGINEERING

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0452T	3:0:0	3	CIE:30 SEE:70	3 Hours	PEC

Course Objectives:

- To teach knowledge on Digital television standards
- To impart information on the channel coding for digital TV
- To teach different transmitters for digital television& its control.
- To provide the awareness of the transmission lines, testing & measurement of power for Digital TV

Syllabus	Total Hours: 48
Unit –I	**10 Hrs**

Digital Television Transmission Standards: ATSC terrestrial transmission standard, vestigial side band modulation, DVB- T transmission standard, ISDB-T transmission standard, channel allocations, antenna height and power, MPEG-2 Performance Objectives for Digital Television: System noise, external noise sources, transmission errors, error vector magnitude, eye pattern, interference, co-channel interference, adjacent channel interference, analog to digital TV, transmitter requirements

Unit –II	10 Hrs

Channel Coding and Modulation for Digital Television: Data synchronization, randomization/ scrambling, forward error correction, interleaving, inner code, frame sync insertion, quadrature modulation,8VSB, bandwidth, error rate, COFDM, flexibility, bandwidth.

Unit –III	9 Hrs

Transmitters for Digital Television: Pre-correction and equalization, up conversion, precise frequency control, RF amplifiers, solid-state transmitters, RF amplifier modules, power supplies, cooling, automatic gain or level control, ac distribution, transmitter control, tube transmitters, performance equality.

Unit –IV	10 Hrs

Transmission Line for Digital Television: Fundamental parameters, efficiency, effect of VSWR, system AERP, rigid coaxial transmission lines, dissipation, attenuation, and power handling, higher-order modes, peak power rating, frequency response, standard lengths, corrugated coaxial cables, wind load, waveguide, bandwidth, waveguide attenuation, power rating, frequency response, size trade-offs, wave guide or coax Pressurization

Unit –V	9 Hrs

Test and Measurement for Digital Television: Power measurements, average power measurement, calorimetry, power meters, peak power measurement, measurement uncertainty, testing digital television transmitters.

Text Books:

1. Gerald w. Collins, Fundamentals of Digital Television Transmission, JohnWiley, 2001.
2. R.R. Gulati, Modern Television Practice, Principles, Technology and servicing, 2nd Ed., New Age International Publishers, 2001.

References:

1. John Arnold, Michael Frater, Mark Pickering, Digital Television Technology and Standards,

JohnWiley, 2007.

e-resources:

1. https://www.youtube.com/watch?v=_nGnRvyHMEI HYPERLINK
2. "https://www.youtube.com/watch?v=_nGnRvyHMEI&list=RDCMUCdlnqMpRrMcClK2fT6z8EEw&index=2"& HYPERLINK
3. "https://www.youtube.com/watch?v=_nGnRvyHMEI&list=RDCMUCdlnqMpRrMcClK2fT6z8EEw&index=2"list=RDCMUCdlnqMpRrMcClK2fT HYPERLINK
4. "https://www.youtube.com/watch?v=_nGnRvyHMEI&list=RDCMUCdlnqMpRrMcClK2fT6z8EEw&index=2"6z8EEw HYPERLINK
5. "https://www.youtube.com/watch?v=_nGnRvyHMEI&list=RDCMUCdlnqMpRrMcClK2fT6z8EEw&index=2"& HYPERLINK
6. "https://www.youtube.com/watch?v=_nGnRvyHMEI&list=RDCMUCdlnqMpRrMcClK2fT6z8EEw&index=2"index=2
7. https://www.rfwireless-world.com/Tutorials/digital-television-DTV-basics.html

Course Outcomes:

After the completion of the course students will able to:

CO1: Compare Digital TV transmission standards and performance parameters

CO2: Analyze channel coding, errors, interferences

CO3: Analyze various modulation techniques for Digital TV

CO4: Make use of RF amplifiers, modules and systems for Digital TV

CO5: Apply Transmission line principles for Digital TV

CO6: Understand the measurement parameters for a Digital TV Transmitter

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CLOUD COMPUTING
(Common to CE,EEE,ME and ECE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0529T	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC

Course Objectives:

This course will enable students to:

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization and familiar with the lead players in cloud.
- To understand the features of cloud simulator and apply different cloud programming model
- To design of cloud Services and explore the trusted cloud Computing system

Syllabus		Total Hours:48
Unit -I	**Basics of Cloud Computing**	**10Hrs**

Introduction to Cloud: Introduction to Cloud, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Elasticity in Cloud, On-demand Provisioning.

Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization, and Cloud computing.

Unit -II	**Cloud Architecture, Models and Security**	**9Hrs**

Cloud Computing Architecture: Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds.

Cloud Deployment Model: Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud.

Unit -III	**Cloud Technologies and Advancements**	**10Hrs**

Apache Hadoop, Map Reduce, Hadoop Cluster setup, Virtual Box, Google App Engine, Programming Environment for Google App Engine – Open Stack

Unit -IV	**VM ware Simulator**	**9Hrs**

VM Ware: Basics of VM Ware, Advantages of VMware virtualization, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

Unit -V	**Cloud Applications**	**10Hrs**

Cloud Applications: Scientific Applications – Health Care, Geoscience.

Business And Consumer Applications - CRM and ERP, Social Networking, Media Applications, and Multiplayer Online Gaming.

Text Books:

1. Mastering Cloud Computing by RajkumarBuyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013.
2. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud” O'Reilly
3. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter,

TATA McGraw- Hill , New Delhi – 2010.

Reference Books:

1. Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
2. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
3. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O 'Reilly, SPD, rp2011.
5. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press. Cloud computing A Hands-On Approach by ArshdeepBahga and Vijay Madisetti.

Web Resources:

1. https://nptel.ac.in/courses
2. https://freevideolectures.com/university/iitm

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the basic concepts about cloud computing vision and its developments and gain the Knowledge of virtualization technology.

CO2: Analyze the concepts of cloud services and the deployment models.

CO3: Choose among various cloud technologies for implementing applications (GAE, Open stack, etc)

CO4: Construct the virtual machines by using VMware simulator.

CO5: Build scientific applications by using Cloud environment.

CO6: Develop Business and Consumer Applications.

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SMART GRID (Common to all Except EEE)					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
22A0241T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**OEC**

Course Objectives:

- Overview of the technologies required for the smart grid
- Switching techniques and different means for data communication
- Standards for information exchange and smart metering
- Methods used for information security on smart grid
- Smart metering and protocols for smart metering
- Power quality management with upgraded technologies.

Syllabus		**Total Hours: 48**
Unit-I	**Introduction to Smart Grid**	**10 Hrs**

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Concept of Resilient &Self-Healing Grid, Present development & International policies in Smart Grid, Diverse perspectives from experts and global Smart Grid initiatives

Unit-II	**Smart Grid Technologies**	**8 Hrs**

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation and service restoration, Outage management, High Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

Unit –III	**Smart Meters**	**10 Hrs**

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU), Intelligent Electronic Devices(IED) & their application for monitoring & protection.

Unit -IV	**Power Quality Management in Smart Grid**	**10 Hrs**

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

Unit –V	**High Performance Computing**	**10 Hrs**

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN),Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

Textbooks:

1. Smart Grid, JanakaEkanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Wiley Publications, 2012, Reprint 2015.
2. 2. Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Press., 2012,

Reprint 2016.

Reference Books:

1. The Smart Grid – Enabling Energy efficiency and demand response, Clark W. Gellings, P.E., CRC Press, Taylor & Francis group, First Indian Reprint. 2015.
2. Smart Grid – Applications, Communications, and Security Edited by Lars Torsten Berger, Krzysztof Iniewski, WILEY, 2012, Reprint 2015.
3. Practical Electrical Network Automation and Communication Systems, Cobus Strauss, ELSVIER, 2003

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the concepts and design of Smart grid.

CO2: Understand the various communication technologies in smart grid.

CO3: Understand the various measurement technologies in smart grid.

CO4: Understand the analysis and stability of smart grid.

CO5: Learn the renewable energy resources and storages integrated with smart grid.

CO6: Familiarize the high performance computing for Smart Grid applications

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MEASUREMENTS AND MECHATRONICS					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
22A0329Tc	**2: 1:0 :3**	**3**	**CIE:30 SEE:70**	**3 Hours**	**OEC**

Course Objectives:

- To instruct the principles of interchangeable manufacture.
- To introduce basic principles of mechanical measurements.
- To impart knowledge on mechatronics systems.

Syllabus		**Total Hours: 48**
UNIT-I	**Limits & Fits**	**10 Hrs**

Introduction, terminology pertaining to limits and fits – unilateral and bilateral tolerance system, hole and shaft basis systems – Interchangeability, deterministic & statistical tolerance, selective assembly. International Standard system of limits and fits

Limit Gauges: Taylor's principle – Classification and design of limit gauges.

UNIT-II	**Linear and Angular Measurements**	**10 Hrs**

Line and end standards, slip gauges and length bars. bevel protractor – angle slip gauges – spirit levels and auto collimator.

Interferometry Applied to Measurement: NPL flatness interferometer and NPL gauge interferometer.

Surface Roughness Measurement: Differences between surface roughness and surface waviness- Numerical assessment of surface finish – CLA, R.M.S, Rz values, Methods of measurement of surface finish – Profilograph, Talysurf

UNIT-III	**Mechanical Measurements**	**9 Hrs**

Introduction to measurement: Elements of generalized measurement system

Displacement Measurement- Linear Variable Differential Transformer (LVDT), encoders, potentiometers.

Temperature Measurement - Pyrometers, Resistance Temperature Detector (RTD)

Strain Measurement-Electrical strain gauge – gauge factor – method of usage of resistance strain gauge

UNIT-IV	**Mechatronics Systems**	**9 Hrs**

Mechatronics systems- Elements of mechatronics system, mechatronics design process, system - measurement systems, control systems, programmable logic controllers, case studies of mechatronic systems

UNIT-V	**Actuating Systems:**	**10Hrs**

Hydraulic and pneumatic actuating systems - fluid systems, hydraulic systems, and pneumatic systems, components, control valves. mechanical actuating systems and electrical actuating systems – basic principles and elements.

Textbooks:

1. R.K. Jain, "Engineering Metrology", Khanna Publishers.
2. BeckWith, Marangoni, Linehard, " Mechanical Measurements", 6th edition,PHI / PE.
3. W. Bolton , "Mechatronics – Electronic Control Systems in Mechanical and

4. Electrical Engg.", 4th Edition, Pearson, 2012.

Reference Books:

1. 1. IC Guptha,"Engineering Metrology ",Danpath Rai Publications.
2. Doeblin Earnest. O. Adaptation by Manik and Dhanesh,"Measurement Systems: Application and Design", Tata Mc Graw Hill Publications.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Design the limit gauges for interchangeable manufacture.

CO2: Apply the basic principles of mechanical measurements for engineering practice.

CO3: Illustrate the role of mechatronics systems in manufacturing.

CO4: Explain principles of mechanical, hydraulic, pneumatic and electrical actuating systems.

CO5: Understand the components of a typical mechatronic system.

CO6: Understand the Design Aspects of a Mechatronic system.

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DISASTER MANGEMENT (Common to ME, CSE,AI&ML, CS, DS, ECE,EEE)					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
22A0151T	**3:1:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**OEC**

Course Objectives:

- Develop an understanding of why and how the modern disaster manager is involved with pre-disaster and post-disaster activities.
- Develop an awareness of the chronological phases of natural disaster response and refugee relief operations.
- Describe the three planning strategies useful in mitigation.
- Describe public awareness and economic incentive possibilities.
- Understand the tools of post-disaster management

Syllabus		**Total Hours:48**
Unit-I	**Natural Hazards and Disaster Management**	**9 Hrs**
Introduction of DM – Inter disciplinary -nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: floods, draughts – Earthquakes – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast – landslides		
Unit-II	**Man Made Disaster**	**9 Hrs**
Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrotirism - threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.		
Unit -III	**Risk and Vulnerability**	**10 Hrs**
Building codes and land use planning – social vulnerability – environmental vulnerability – Macroeconomic management and sustainable development, climate change risk rendition – financial management of disaster – related losses.		
Unit -IV	**Role of Technology in Disaster Managements**	**10 Hrs**
Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations roads and bridges- mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training- transformable indigenous knowledge in disaster reduction.		
Unit -V	**Education and Community Preparedness**	**10 Hrs**
Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.		

Textbooks:

1. Rajib shah & R R Krishnamurthy "Disaster Management" – Global Challenges and Local Solutions' Universities press. (2009),
2. Tushar Bhattacharya, "Disaster Science & Management" Tata McGraw Hill Education

Pvt. Ltd., New Delhi

Reference Books:

1. Harsh. K . Gupta "Disaster Management edited", Universities press, 2003.

E-resources:

1. https://www.youtube.com/watch?v=DExlZTfKZAM&list=PLC4PaTsQiLcbejXqJR7S59Ohk2OK1rgEG

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Know about the natural hazards and its management

CO2: Know about the fire hazards and solid waste management

CO3: Understand about the emerging infectious diseases and aids their management

CO4: Know about the regulations of building codes and land use planning related to risk and vulnerability.

CO5: Impart the education related to risk reduction in schools and communities.

CO6: Describe public awareness and economic incentive possibilities.

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CYBER SECURITY
(Common to CE,EEE,ME and ECE)

Course Code	L:T:P:S	Credits	Exam Marks	Exam Duration	Course Type
22A0534a	3:0:0:0	3	CIE: 30 SEE:70	3 Hours	OEC

Course Objectives:

This course will enable students to:

- The Cyber security Course will provide the students with foundational Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.
- Evaluate the trends and patterns that will determine the future state of cyber security.

Syllabus		Total Hours:48
Unit -I	**Introduction to Cybercrime**	**9 Hrs**

Introduction to Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens

Unit -II	**Cyber Offenses**	**10 Hrs**

How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Backdoors-Steganography-SQL Injection.

Unit -III	**Cybercrime Mobile and Wireless Devices**	**9 Hrs**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile.

Unit -IV	**Tools and Methods Used in Cybercrime**	**10Hrs**

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, DoS and DDoS Attacks, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft (ID Theft).

Unit -V	**Cyber Crimes and Security**	**10Hrs**

Cyber Security –Organizational implications-cost of cybercrimes and IPR issues Web threats for organizations: the evils and Perils-Social media marketing Security and privacy Implications-Protecting people privacy in the organizations Forensic best practices for organizations. Cases.

Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning

Reference Books:

1. Information Security, Mark Rhodes, Ousley, MGH.

E-resources:

1. https://www.tutorialspoint.com/fundamentals_of_science_and_technology/cyber_crime_and_cyber_security.htm
2. https://www.javatpoint.com/cyber-security-tutorial
3. https://www.youtube.com/watch?v=lpa8uy4DyMo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand Cyber Security architecture principles

CO2: Identifying System and application security threats and vulnerabilities

CO3: Identifying different classes of attacks

CO4: Cyber Security incidents to apply appropriate response

CO5: Describing risk management processes and practices

CO6: Demonstrate the role security management in cyber security defense

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RENEWABLE ENERGY SOURCES					
Course Code	**L:T:P:S**	**Credits**	**Exam Marks**	**Exam Duration**	**Course Type**
22A0329Ta	**2: 1:0 :3**	**3**	**CIE: 30 SEE:70**	**3 Hours**	**OEC**

Course Objectives:

This course will enable students to:

- To impart knowledge on non-conventional sources of energy and techniques used in exploiting solar, wind, tidal and geothermal sources of energy and Biomass.
- To introduce direct energy conversion systems such as thermo electric, MHD and Fuel Cells.

Syllabus		**Total Hours:47**
UNIT-I	**Energy Sources and Their Availability**	**10Hrs**

Energy Sources and Their Availability: Conventional and non-conventional energy sources. Need of Renewable Energy Sources (RES), classification of RES, role and potential of RES in India.

Solar Radiation: Structure of the sun, solar constant, environmental impact of solar radiation, radiation at the earth surfaces, solar radiation measuring instruments, solar radiation Geometry, extraterrestrial and terrestrial solar radiation, spectral distribution of extraterrestrial radiation, solar radiation on tilted surfaces and empirical equations for estimating solar radiation.

UNIT-II	**Solar Collectors**	**9Hrs**

Solar Collectors: Principles of the conversion of solar radiation into heat, classifications of solar collectors- flat plate collectors and concentrating collectors, collector materials, performance analysis of a flat plate collector.

Solar Energy Storage and applications: Different storage methods-sensible and latent heat, solar ponds, solar water heating, space heating /cooling, solar electric conversion, solar distillation, solar pumping, solar furnace, solar cooking and solar green house.

UNIT-III	**Wind Energy**	**10Hrs**

Wind Energy: Principles of wind energy conversion, site selection consideration, basic components, types of wind machines – horizontal axis and vertical axis, applications, Betz coefficient.

Biomass Energy Conversion Systems: Biomass conversion technologies, photosynthesis, biogas generation, factors affecting bio-digestion, classification of biogas plants, advantages and disadvantages, bio mass gasification

Geothermal Thermal Energy: Resources, types of wells, methods of harnessing the energy.

UNIT-IV	**Ocean Thermal Energy**	**9Hrs**

Ocean Thermal Energy: Methods of Ocean thermal electric power generation open cycle systems, closed cycle systems

Tidal Power System: Working principle, components of tidal power plant, single basin and double basin tidal energy system advantages and limitations.

Wave Energy: Wave energy conversion Devices-wave energy conversion by floats, high level reservoir wave machine and dolphin type wave power machine. Advantages and disadvantages.

UNIT-V	**Direct Energy Conversion**	**9Hrs**

Direct Energy Conversion: Need for DEC, limitations, principles of DEC. thermoelectric Power – See-beck, Peltier, Joule -Thomson effects, Thermo-electric Power generators

MHD Power Generation: Principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion.

Fuel Cell: Working principle, classification – efficiency – VI characteristics

Text Books:

1. SP Sukhatme, "Solar Energy: Principles of thermal collection and storage" Tata McGraw Hill
2. Tiwari and Ghosal, "Renewable Energy Resources: Basic Principles and Applications", narosa
3. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons

Reference Books:

1. B.H.Khan, "Non – conventional Energy Resources", Tata McGraw Hill education Pvt. Ltd.
2. 2. Twidell& Weir, "Renewable Energy Sources ". Routledge (Taylor &Francis Group)

Course Outcomes(CO):

Upon successful completion of the course, the students will be able to:

CO1: Classify various types of renewable sources of energy and illustrate the principles of solar radiation.

CO2: Evaluate solar flat plate collector efficiency and illustrate various solar energy storage methods and applications.

CO3: Describe the techniques of exploiting wind, biomass and geothermal energies in power generation.

CO4: Illustrate the methods of tapping ocean thermal, tidal and wave energies in power generation.

CO5: Describe the working of various direct energy conversion systems and their applications. Cyber Security incidents to apply appropriate response

CO6: Describing risk management processes and practices

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CONSTRUCTION MANAGEMENT
(Common to ME, CSE,AI&ML, CS, DS, ECE,EEE)

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
22A0152T	3:1:0:0	3	CIE:30 SEE:70	3 Hours	OEC

Course Objectives:

- To make the student familiar with various construction activities, preparing construction schedule and maintaining documents and records of those activities
- To teach the students about various terms and technologies involved in earthwork of construction activities
- To make the students familiar with concepts involved in project management like bar charts and milestone charts
- To teach the students the concepts of time estimates involved in CPM and PERT , float and slack, critical path calculations

Syllabus		Total Hours:48
Unit-I	**Fundamentals of Construction Technology**	**9 Hrs**

Definitions and Discussion – Construction Activities –Construction Processes -Construction Works – Construction Estimating – Construction Schedule – Productivity and Mechanized Construction – Construction Documents – Construction Records – Quality – Safety – Codes and Regulations.

Unit-II	Earth Work	9 Hrs

Classification of Soils – Project Site – Development – Setting Out - Mechanized Excavation – Groundwater Control – Trenchless (No-dig) Technology – Grading – Dredging.Rock Excavation – Basic Mechanics of Breakage – Blasting Theory – Drillability of Rocks – Kinds of Drilling – Selection of the Drilling Method and Equipment – Explosives – Blasting Patterns and Firing Sequence – Smooth Blasting – Environmental Effect of Blasting

Unit -III	Project Management , Bar Charts and Milestone Charts	10 Hrs

Project planning – Scheduling – Controlling – Role of decision in project management – Techniques for analyzing alternatives Operation research – Methods of planning and programming problems – Development of bar chart – Illustrative examples – Shortcomings of bar charts and remedial measures – Milestone charts

Unit -IV	Elements of Network and Development of Network	10 Hrs

Introduction – Event – Activity – Dummy – Network rules – Graphical guidelines for network – Common partial situations in network – Numbering the events – Cycles Problems.

Unit -V	PERT and CPM	10 Hrs

Time estimates – Frequency distribution – Mean, variance and standard deviation-Expected time Problems -Earliest expected time – Formulation for TE - Latest allowable occurrence time – Formulation for TL - Combined tabular computations for TE and TL problems. Introduction - Slack

– Critical path-Illustrative examples Problems.

Textbooks:

1. Construction project management by Jha ,Pearsonpublications, New Delhi 2nd Edition 2015
2. Construction Technology by SubirK.Sarkar and SubhajitSaraswati – Oxford Higher EducationUniv.Press, Delhi 2008 edition
3. 3. Project Planning and Control with PERT and CPM by Dr.B.C.Punmia, K.K.Khandelwal, Lakshmi Publications New Delhi 2022 editionDelhi

Reference Books:

1. Optimal design of water distribution networks P.R.Bhave, Narosa Publishing house 2003.
2. Total Project management, the Indian context- by: P.K.JOY- Mac Millan Publishers India Limited.

E-resources:

1. https://nptel.ac.in/courses/105104161

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Identify the various construction activities like preparing construction schedule an maintaining documents and records of those activities

CO2: Understand the concepts and techniques involved in earthwork activities

CO3: Understand about the emerging infectious diseases and aids their management

CO4: Understand the steps involved in developing a project scheduling and management and the application of bar charts and milestone charts.

CO5: Understand the various elements of a network diagram like event, activity and dummy.

CO6: Understand the concepts of calculation of time estimates of CPM and PERT

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HYBRID ELECTRIC VEHICLES (Common to all Except EEE)					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
22A0236T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**OEC**

Course Objectives:

- Understand to provide good foundation on hybrid and electrical vehicles.
- Understand To address the underlying concepts and methods behind power transmission in hybrid and electrical vehicles
- Familiarize energy storage systems for electrical and hybrid transportation
- Design and develop basic schemes of electric vehicles and hybrid electric vehicles.

Syllabus		**Total Hours: 50**
Unit-I	**Electric Vehicle Propulsion and Energy Sources**	**10 Hrs**

Introduction to electric vehicles, vehicle mechanics - kinetics and dynamics, roadway fundamentals propulsion system design - force velocity characteristics, calculation of tractive power and energy required, electric vehicle power source - battery capacity, state of charge and discharge, specific energy, specific power, Ragone plot. battery modeling - run time battery model, first principle model, battery management system- soc measurement, battery cell balancing. Traction batteries - nickel metal hydride battery, Li-Ion, Lipolymer battery.

Unit-II	**Electric Vehicle Power Plant And Drives**	**10 Hrs**

Introduction electric vehicle power plants. Induction machines, permanent magnet machines, switch reluctance machines. Power electronic converters-DC/DC converters - buck boost converter, isolated DC/DC converter. Two quadrant chopper and switching modes. AC drives PWM, current control method. Switch reluctance machine drives - voltage control, current control.

Unit -III	**Hybrid and Electric Drive Trains**	**9 Hrs**

Introduction hybrid electric vehicles, history and social importance, impact of modern drive trains in energy supplies. Hybrid traction and electric traction. Hybrid and electric drive train topologies. Power flow control and energy efficiency analysis, configuration and control of DC motor drives and induction motor drives, permanent magnet motor drives, switch reluctance motor drives, drive system efficiency.

Unit -IV	**Electric and Hybrid Vehicles - Case Studies**	**11 Hrs**

Parallel hybrid, series hybrid -charge sustaining, charge depleting. Hybrid vehicle case study – Toyota Prius, Honda Insight, Chevrolet Volt. 42 V system for traction applications. Lightly hybridized vehicles and low voltage systems. Electric vehicle case study - GM EV1, Nissan Leaf, Mitsubishi Miev. Hybrid electric heavy duty vehicles, fuel cell heavy duty vehicles.

Unit -V	**Electric and Hybrid Vehicle Design**	**10 Hrs**

Introduction to hybrid vehicle design. Matching the electric machine and the internal combustion engine. Sizing of propulsion motor, power electronics, drive system. Selection of energy storage technology, communications, supporting subsystem. Energy management strategies in hybrid and

electric vehicles - energy management strategies- classification, comparison, implementation.

Textbooks:

1. Iqbal Hussein, "Electric and Hybrid Vehicles: Design Fundamentals", 2nd edition, CRC Press, 2003.
2. Amir Khajepour, M. Saber Fallah, Avesta Goodarzi, "Electric and Hybrid Vehicles: Technologies, Modeling and Control - A Mechatronic Approach", illustrated edition, John Wiley & Sons, 2014.
3. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004.

Reference Books:

1. James Larminie, John Lowry, "Electric Vehicle Technology", Explained, Wiley, 2003.
2. John G. Hayes, G. Abas Goodarzi, "Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles", 1st edition, WileyBlackwell, 2018.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the working of hybrid and electric vehicles

CO2: Apply a suitable drive scheme for developing an hybrid and electric vehicles depending on resources

CO3: Develop the electric propulsion unit and its control for application of electric vehicles.

CO4: Understand the proper energy storage systems for vehicle applications

CO5: Design and develop basic schemes of electric vehicles

CO6: Design and develop basic schemes of Hybrid electric vehicles

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ARTIFICIAL INTELLIGENCE					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
22A3301T	**3:0:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**OEC**

Course Objectives:

This course will enable students to:

- To understand the importance of the task environment in determining the appropriate agent design.
- To teach the concepts of state space representation, heuristic search together with the time and Space complexities.
- To describe the various types of learning methods and natural language processing.
- To provide basic knowledge on natural language for communication and perception.
- To understand the basic knowledge on robotics and philosophical foundations of AI.

Syllabus		**Total Hours: 45**
Unit-I	**Introduction to Artificial Intelligence**	**9 Hrs**

Introduction: AI Definition, Foundations of Artificial Intelligence, History of Artificial Intelligence. Intelligent Agents: Agents and Environments, Good Behavior Concept of Rationality, Nature of Environments, The Structure of Agents. Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform-cost search, DFS: Informed (Heuristic) Search strategies: Greedy BFS, A* search.

Unit-II	**Problem Solving beyond classical search and Learning**	**9 Hrs**

Local search algorithms and optimization problems**:** Hill-climbing, simulated annealing; Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with partial observations, Online Search Agents and Unknown Environment.

Unit -III	**Reinforcement Learning and Natural Language Processing**	**9 Hrs**

Introduction, Passive Reinforcement Learning, Active reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of Reinforcement Learning**,** Language Models, Text Classification, Information Retrieval, Information Extraction.

Unit -IV	**Natural Language for communication and Perception**	**9 Hrs**

Phrase structure grammars, Syntactic analysis, Augmented grammars and semantic Interpretation, Machine translation, Speech Recognition. Image formation, Early Image Processing Operations, Object recognition by appearance, Reconstructing the 3D World, Object recognition from structural information, Using Vision**.**

Unit -V	**Robotics and Philosophical foundations**	**9 Hrs**

Introduction, Robotic Hardware, Robotic Perception, Planning to move, Planning uncertain movements, Moving, Robotic software architectures, and application domains.Week AI, Strong AI, Ethics and Risks of AI, Agent Components and Agent architectures, Are we going in the right direction, What if AI does succeed.

Textbooks:

1. Stuart Russell and Peter Norvig, Artificial Intelligence A Modern Approach, 3rdEdition, Pearson Education.
2. Elaine Rich, Kevin Knight & Shivashankar B Nair, “Artificial Intelligence”, 3rd - Edition,

McGraw Hill Education.

Reference Books:

1. Patrick Henny Winston, Artificial Intelligence, 3rdEdition, Pearson Education.
2. Patterson, Introduction to Artificial Intelligence and Expert Systems, 1st Edition Pearson India.
3. George F Lugar, Artificial intelligence, structures and Strategies for Complex problem solving,6thed, PEA, 2008 .
4. Poole, D. and Mackworth, Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press. 2010
5. Padhy, N.P , Artificial Intelligence and Intelligent Systems,. 2009, Oxford University Press.

E-resources:

1. https://www.tutorialspoint.com/artificial_intelligence/index.htm
2. https://www.javatpoint.com/artificial-intelligence-ai
3. https://www.youtube.com/watch?v=JMUxmLyrhSk

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the role of agents, environments and relationship among them.
CO2: Examine various problem-solving approaches in searching and learning.
CO3: Demonstrate the use of Reinforcement learning and natural language processing.
CO4: Understand the natural language for communication and object perception.
CO5: Demonstrate the role of Robot in various applications**.**
CO6: List out philosophical issues in AI.

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ENTREPRENEURSHIP & INNOVATION					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
22A0024T	**3:1:0:0**	**3**	**CIE:30** **SEE:70**	**3 Hours**	**HSC**

Course Objectives:

- To make the student understand about Entrepreneurship
- To enable the student in knowing various sources of generating new ideas in setting up of New enterprise
- To facilitate the student in knowing various sources of finance in starting up of a business
- To impart knowledge about various government sources which provide financial assistance to entrepreneurs/women entrepreneurs
- To encourage the student in creating and designing business plans

Syllabus		**Total Hours:48**
Unit -I	**Introduction to Entrepreneurship**	**10Hrs**

Entrepreneurship-Concept, knowledge and skills requirement-Characteristics of successful entrepreneurs-Entrepreneurship process- Factors impacting emergence of entrepreneurship-Differences between Entrepreneur and Intrapreneur- Understanding individual entrepreneurial mindset and personality-Recent trends in Entrepreneurship.

Unit -II	**Starting Up New Venture**	**10Hrs**

Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas- Opportunity recognition- Feasibility study-Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report – Presenting business plan to investors.

Unit -III	**Sources of Finanace**	**9 Hrs**

Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India- NBFC's in India – their way of financing in India for small and medium business -Entrepreneurship development programs in India – The entrepreneurial journey- Institutions in aid of entrepreneurship development

Unit -IV	**Women Entrepreneurship**	**9 Hrs**

Women Entrepreneurship- Entrepreneurship Development and Government-Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available – Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India-Issues & Challenges-Entrepreneurial motivations.

Unit -V	**Introduction to Incubation & Innovation**	**10 Hrs**

Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation – Types, Advantages and Disadvantages of incubation. Innovation Meaning & Definition - Forms of innovation - Innovation, features and characteristics - Factors initiating

innovations - Innovation process and its stages.

Text books:

1. D F Kurat koand TV Rao, "Entrepreneurship"- A South- Asian Perspective Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit:login.cengage.com)
2. Nandan H, "Fundamentals of Entrepreneurship" ,PHI, 2013

Reference Books:

1. Vasant Desai, "Small Scale Industries and Entrepreneurship", HimalayaPublishing2012.
2. RajeevRoy"Entrepreneurship", 2nd Edition, Oxford, 2012.
3. B.JanakiramandM.Rizwana"EntrepreneurshipDevelopment: Text&Cases", ExcelBooks, 2011.
4. Stuart Read, Effectual "Entrepreneurship", Routledge, 2013.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the concept of Entrepreneurship and challenges in the world of competition.

CO2: Apply the Knowledge in generating ideas for New Ventures.

CO3: Analyze various sources of finance and subsidies to entrepreneur/ women Entrepreneurs.

CO4: Evaluate the role of central government and state government in promoting entrepreneurship.

CO5: Analyze the process of business incubation/incubators.

CO6: Create and design business plan structure through incubations.

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MANAGEMENT SCIENCE					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
22A0023T	**3:1:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**HSC**

Course Objectives:

- To provide fundamental knowledge on Management, Administration, Organization & its concepts.
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training& Development, job evaluation and Merit rating concepts.
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management.
- To make the students aware of the contemporary issues in management.

Syllabus		**Total Hours:48**
Unit -I	**Introduction to Management**	**10Hrs**

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles -Eltan Mayo's Human relations - Systems Theory - Organisational Designs - Line organization - Line&StaffOrganization-FunctionalOrganization-MatrixOrganization-Projectorganization-CommitteeformofOrganization-SocialresponsibilitiesofManagement.

Unit -II	**Operations Management**	**10Hrs**

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production),Work Study- Statistical Quality Control-Deming's contribution to Quality. Material Management - Objectives - Inventory-Functions - Types, T Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure and Stores Management - Marketing Management - Concept - Meaning-Nature-FunctionsofMarketing-MarketingMix-ChannelsofDistribution-AdvertisementandSalesPromotion-MarketingStrategiesbasedonProductLifeCycle.

Unit -III	**Human Resources Management**	**10Hrs**

HRM - Definition and Meaning – Nature - Managerial and Operative functions - Evolution of HRM - Job Analysis - Human Resource Planning(HRP)- Employee Recruitment-Sources of Recruitment-Employee Selection -Process and Tests in Employee Selection -EmployeeTrainingandDevelopment-On-the-job&Off-the-jobtrainingmethods-PerformanceAppraisal Concept- Methods of Performance Appraisal – Placement- Employee Induction –Wage and Salary Administration.

Unit -IV	**Strategic & Project Management**	**10Hrs**

Definition &Meaning-Setting of Vision -Mission -Goals –Corporate Planning Process-Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - ProjectManagement-NetworkAnalysis-ProgrammeEvaluationandReviewTechnique(PERT) - Critical Path Method (CPM)Identifying Critical Path - Probability of Completing theprojectwithingiventime-

ProjectCost-Analysis-ProjectCrashing(Simpleproblems).

Unit -V	Contemporary Issues in Management	8Hrs

The concept of ManagementInformationSystem(MIS)-MaterialsRequirementPlanning(MRP)-Customer Relations Management(CRM)-Total Quality Management (TQM)-Six Sigma Concept-Supply Chain Management (SCM)-Enterprise Resource Planning (ERP)- Performance Management-Business Process Outsourcing (BPO) –Business Process Re-engineering and Bench Marking-Balanced Score Card-Knowledge Management.

Textbooks:

1. A.RAryasri,"ManagementScience",TMH,2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education,NewDelhi,2012.

Reference Books:

1. Koontz&Weihrich,"EssentialsofManagement",6th edition,TMH,2005.
2. ThomasN.Duening&JohnM.Ivancevich,"ManagementPrinciplesandGuidelines",Biztantra.
3. KanishkaBedi,"ProductionandOperationsManagement",OxfordUniversityPress,2004.
4. SamuelC.Certo,"ModernManagement",9th edition,PHI,2005

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand the concepts & principles of management and designs of organization in a practical world

CO2: Apply the knowledge of Work –study principles& Quality Control techniques in industry

CO3: Analyze the concepts of HRM in Recruitment, Selection and Training&Development

CO4: Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time& cost of project

CO5: Analyze the business through SWOT

CO6: Create Modern technology in management science.

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BUSINESS ENVIRONMENT					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
22A0025T	**3:1:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**HSC**

Course Objectives:

- To make the student understand about the business environment.
- To enable them in knowing the importance of fiscal and monitory policy.
- To facilitate them in understanding the export policy of the country.
- Impart knowledge about the functioning and role of WTO.
- Encourage the student in knowing the structure of stock market.

Syllabus		**Total Hours:48**
Unit -I	**An Overview of Business Environment**	**10Hrs**

Overview of Business Environment – Types of Environments - Internal & External –Micro and Macro environment- Competitive structure of industries - Environmental analysis - Scopeofbusiness-Characteristicsofbusiness-Process&limitationsofenvironmentalanalysis.

Unit -II	**Fiscal policy & Monetary Policy**	**10 Hrs**

FISCALPOLICY-PublicRevenues-PublicExpenditure-PublicdebtDevelopmentactivities financed by public expenditure - Evaluation of recent fiscal policy of Government of India - Highlights of Budget - MONETARY POLICY - Demand and Supply of Money – RBI - Objectivesofmonetaryandcreditpolicy-Recenttrends-RoleofFinanceCommission.

Unit -III	**India's Trade Policy & Balance of payments**	**10Hrs**

INDIA'S TRADE POLICY - Magnitude and direction of Indian International Trade – Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank - BALANCE OFPAYMENTS–Structure&Majorcomponents-CausesforDisequilibriuminBalanceofPayments-Correctionmeasures–WTO - Nature and Scope - Organization and Structure – Role and functions of WTO in promoting world trade

Unit -IV	**Money markets and capital markets**	**10Hrs**

Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets -Reforms and recent development– SEBI - Stock Exchanges - Investor protection and role of SEBI.

Unit -V	**Introduction to Inflation**	**8hrs**

Inflation – Meaning & Definition – Causes – Effects – Types – Advantages &Disadvantages
Deflation – Meaning & Definition - Causes & Effects.

Textbooks:

1. Francis Cherunilam (2009), "International Business":Text and Cases, Prentice Hall of India.
2. K. Aswathappa, "Essentials of Business Environment": Texts and Cases & Exercises 13th Revised Edition. HPH2016.

Reference Books:

1. K.V. Sivayya, V.B.M Das (2009), Indian Industrial Economy, Sultan Chand Publishers, NewDelhi, India.
2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari .S.N (2009),International Business, Wiley India.
4. E. Bhattacharya(2009),InternationalBusiness,ExcelPublications,NewDelhi.

Course Outcomes(CO):

On completion of this course, student will be able to:

CO1: Understand various types of business environment.

CO2: Evaluate fiscal and monitory policy

CO3: Analyze India's Trade Policy

CO4: Understand the role of WTO

CO5: Apply the knowledge of Money markets in future investment

CO6: Develop a personal synthesis and approach for identifying business opportunities

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HUMAN RESOURCE MANAGEMENT					
Course Code	**L:T:P:S**	**Credits**	**Exam marks**	**Exam Duration**	**Course Type**
22A0026T	**3:0:0:0**	**3**	**CIE:30 SEE:70**	**3 Hours**	**HSC**

Course Objectives:

- To make the student understand about human resource management.
- To enable the students about job analysis, job specification and job enrichment.
- To enable the students knowing about HR planning and retention.
- To impact knowledge about recruitment, selection and performance appraisal.
- To create knowledge on training and development, compensation management.

Syllabus		**Total Hours:48**
Unit - I	**Human Resource Management-Introduction**	**9 Hrs**

Introduction- Objectives – Scope & Features of HRM – Importance & - Functions of HRM- Challenges of HRM. Personnel Management Vs HRM – Role of HR manager - Strategic Human Resource Management.

Unit - II	**Job Analysis and Job Design**	**9 Hrs**

Job Analysis Process –Techniques of Data Collection - Contents of Job Description & Job Specification - Job design - Factors affecting Job design - Job enrichment Vs Job enlargement.

Unit - III	**Human Resource Planning and Employee Retention**	**10 Hrs**

Objectives and Need of HR planning, Process of HR Planning and factors affect the HR Planning -HR Information System - Employee retention - Importance of retention - strategies of retention.

Unit - IV	**HR Acquisition and Managing Employee Performance**	**10 Hrs**

Recruitment - Objectives and Sources of recruitment - Selection - Objectives - Selection Procedure - Placement - Performance Appraisal –Objectives & Importance, performance Appraisal Methods – Constraints.

Unit - V	**HR Development and Compensation Management**	**9 Hrs**

Training and Development– Objectives, Need and Methods of Training –career planning and career development - Compensation Management - Job evaluation – welfare provisions and fringe benefits - Quality Circles and Total Quality Management.

Textbooks:

1. Gary Dessler, Biju Varkkey, Human Resource Management, 4e, Pearson 2017.
2. Robert L. Mathis, John H. Jackson, Manas Ranjan Tripathy, Human ResourceManagement,

Cengage Learning 2016.

Reference Books:

1. Aswathappa, Human Resource Management, 4th Edition, TMH 2006.
2. Subbarao, Personnel and Human Resource Management –Text and cases,Himalaya, 2009
3. R.Wayne Mondy, Robert M.Noe, Human Resource Management, Pearson
4. Noea.Raymond, John Hollenbeck, Barry Gerhart and Patrick Wright, HumanResource Management, Tata McGraw Hill.
5. Muller, Human Resource Management a case study approach, Jaico Publishers,2008
6. VSP Rao, Human Resource Management, Text and Cases, Excel Books 2006.

Course Outcomes (CO):

On completion of this course, student will be able to:

CO1: Understand the basic concept of Human Resource Management

CO2: Explain the job analysis and job design methods

CO3: Understand the demand and supply of HR & concept of employee retention

CO4: Understand the sources of Recruitment, Selection process and Performance appraisal methods

CO5: Examine the Training and Development methods and compensation managementprocess.

CO6: Familiarize the students with the contemporary issues in Management

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MOBILE APPLICATION DEVELOPMENT

Course Code	L:T:P	Credits	Exam. Marks	Exam Duration	Course Type
22A0453P	1:0:0	2	CIE:30 SEE:70	3 Hours	SC

Course Objectives:

- To facilitate students to understand android SDK.
- To help students to gain a basic understanding of Android application development.
- To build the working knowledge of Android Studio development tool.

Syllabus	Total Hours: 48
Unit –I	**10 Hrs**
Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.	
Unit –II	**10 Hrs**
Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.	
Unit –III	**10 Hrs**
Android User Interface Design Essentials: User Interface Screen elements, Designing User Inter faces with Layouts, Drawing and Working with Animation.	
Unit –IV	**9 Hrs**
Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.	
Unit –V	**9 Hrs**
Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.	

Text Books:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)

References:

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

E-learning resources:

1. https://developer.android.com/

Course Outcomes:

After the completion of the course students will able to:

CO1: Identify various concepts of mobile programming that make it unique from programming for other platforms.
CO2: Create and Run Android project using SDK.
CO3: Develop first level Android applications that can accept information from the users.
CO4: Design Android application screen with various elements for improving users experience.
CO5: Utilize various Android API's for improving users experience.
CO6: Understand simple GUI applications, use built-in widgets and components, work with the database to store data locally.