BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE

(AUTONOMOUS)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Proposed course structure for BR20

I B.Tech. - I Semester

S.No.	Category of course	Course Code	Subjects	L	T	P	C
1	BSC	20BS1T 01	Linear Algebra & Differential Equations	3	0	0	3
2	BSC	20BS1T 05	Applied Physics	3	0	0	3
3	HSC	20HS1T01	English	3	0	0	3
4	ESC	20ES1T 04	Engineering Drawing	1	0	4	3
5	ESC	20ES1T 06	Programming for Problem Solving using C & DS	3	0	0	3
6	HSC	20HS1L01	English Communication Skills Lab	0	0	3	1.5
7	BSC	20BS1L 01	Applied Physics Lab	0	0	3	1.5
8	ESC	20ES1L08	Programming for Problem Solving using C &DS Lab	0	0	3	1.5
9	MC	20HS1M01	Induction Training				0
Total credits							19.5

I B.Tech. - II Semester

S.No.	Category of course	Course Code	Subjects	L	T	P	C
1	BSC	20BS2T02	Integral Transforms and Calculus	3	0	0	3
2	BSC	20BS2T 07	Applied Chemistry	3	0	0	3
3	ESC	20ES2T 07	Programming for Problem Solving Using Python	3	0	0	3
4	ESC	20ES2T 02	Electrical Circuits	3	0	0	3
5	ESC	20ES2L06	Electronic Workshop	1	0	4	3
6	ESC	20ES2L10	Programming for Problem Solving Using Python Lab	0	0	3	1.5
7	BSC	20BS2L03	Applied Chemistry Lab	0	0	3	1.5
8	ESC	20ES2L02	Electrical Circuits Lab	0	0	3	1.5
9	MC	20HS2M02	Indian Constitution				0
Total credits							**19.5**

II B.Tech I Semester

S.No.	Category of course	Course code	Subjects	L	T	P	C
1	BSC	20BS3T03	Probability & Statistics	**3**	**0**	**0**	**3**
2	PCC	20EC3T01	Electronic Circuits -I	**3**	**0**	**0**	**3**
3	PCC	20EC3T02	Digital System Design	**3**	**0**	**0**	**3**
4	PCC	20EE3T01	Control Systems	**3**	**0**	**0**	**3**
5	PCC	20EC3T03	Analog Communications	**3**	**0**	**0**	**3**
6	PCC Lab	20EC3L01	Electronic Circuits -I Lab	**0**	**0**	**3**	**1.5**
7	PCC Lab	20EC3L02	Analog Communications Lab	**0**	**0**	**3**	**1.5**
8	PCC Lab	20EC3L03	Digital System Design Lab	**0**	**0**	**3**	**1.5**
9	SOC	20EC3S01	Arduino Programming	**1**	**0**	**2**	**2**
10	MC	20BS3M03	Environmental Science	**2**	**0**	**0**	**0**
Total credits				**21.5**			

II B.Tech II Semester

S.No.	Category of course	Course code	Subjects	L	T	P	C
1	ESC	20ES4T11	Electromagnetic Waves and Transmission Lines	**3**	**0**	**0**	**3**
2	BSC/PCC	20BS4T04	Numerical Methods and Complex Variables	**3**	**0**	**0**	**3**
3	PCC	20EC4T05	Electronic Circuits -II	**3**	**0**	**0**	**3**
4	PCC	20EC4T06	Digital Communications	**3**	**0**	**0**	**3**
5	HSS	20HS4T02	Managerial Economics & Financial Analysis	**3**	**0**	**0**	**3**
6	ESC/ PCC (Interdisciplinary LAB)	20ES4L13	Oops Through Java Lab	**0**	**0**	**3**	**1.5**
7	PCC Lab	20EC4L05	Electronic Circuits -II Lab	**0**	**0**	**3**	**1.5**
8	PCC Lab	20EC4L06	Digital Communications Lab	**0**	**0**	**3**	**1.5**
9	SOC	20EC4S02	HDL programming	**1**	**0**	**2**	**2**
Total credits							**21.5**
20EC5P01 – Internship (Mandatory) during Summer Vacation (Credits will be awarded in V Semester)							

III B.Tech I Semester

S.No.	Category of course	Course code	Subjects	L	T	P	C
1	PCC	20EC5T07	Linear IC Applications	3	0	0	3
2	PCC	20EC5T08	Antenna and Wave Propagation.	3	0	0	3
3	PCC	20EC5T09	Microprocessors and Embedded Systems	3	0	0	3
4	OEC-1	Open Elective Course-1		3	0	0	3
5	PEC-1	20EC5D01	Information Theory and Coding	3	0	0	3
		20EC5D02	Display Devices				
		20EC5D03	Computer Networks				
		20EC5D04	MOOCs -1(NPTEL/SWAYAM)				
6	PCC Lab	20EC5L07	Linear IC Applications Lab	0	0	3	1.5
7	PCC Lab	20EC5L08	Microprocessors and Embedded Systems Lab	0	0	3	1.5
8	SAC / SSC	20EC5S03	SAC-1	1	0	2	2
9	MC	20HS5M04	Foreign Language (German)	2	0	0	0
10	Summer Internship-1 (2 Months)	20EC5P01	Evaluation of Internship (20EC5P01 Mandatory) Completed after IV semester	0	0	3	1.5
Total credits							**21.5**

SAC-1: 1. Cloud Foundations 2. Industrial Robotics 3. CAD

MOOCs -1_ 1.Basics of Software defined Radios 2.Fabrication Techniques for MEMS based sensors

III B.Tech II Semester

S.No.	Category of course	Course Code	Subjects	L	T	P	C
1	PCC	20EC6T10	VLSI Design	**3**	**0**	**0**	**3**
2	PCC	20EC6T11	Digital Signal Processing	**3**	**0**	**0**	**3**
3	PCC	20EC6T12	Microwave and Optical Communication	**3**	**0**	**0**	**3**
4	OEC-2	Open Elective Course-2		**3**	**0**	**0**	**3**
5	PEC-2	20EC6D06	MOOCs-2 (NPTEL/SWAYAM)	**3**	**0**	**0**	**3**
		20EC6D07	Bio-Medical Instrumentation				
		20EC6D08	Digital Image Processing				
		20EC6D09	System On Chip Design				
6	PCC Lab	20EC6L09	VLSI Lab	**0**	**0**	**3**	**1.5**
7	PCC Lab	20EC6L10	Digital Signal Processing Lab	**0**	**0**	**3**	**1.5**
8	PCC Lab	20EC6L11	MWOC LAB	**0**	**0**	**3**	**1.5**
9	SAC / SSC	20EC6S04	SAC / SSC -2	**1**	**0**	**2**	**2**
10	MC	20HS6M05	Universal Human Values	**2**	**0**	**0**	**0**
Total credits							**21.5**

SAC / SSC -2: 1. IOT 2. Drone Technology and 3. Network Routing Protocols

MOOCs -2_1.Electronic Systems for Cancer Diagnosis, 2.Fundamentals of Nano and quantum photonics

IV B.Tech I Semester

S.No.	Category of course	Course Code	Subjects	L	T	P	C
1	PEC-3	20EC7D10	Radar Engineering	3	0	0	3
		20EC7D11	Electronic Measurements and Instrumentation				
		20EC7D12	System Design through Verilog				
		20EC7D13	MOOCs-3 (NPTEL/SWAYAM)				
2	PEC-4	20EC7D14	Cellular Mobile Communications	3	0	0	3
		20EC7D15	Analog IC Design				
		20EC7D16	Network Security & Cryptography				
		20EC7D17	Satellite Communications				
3	PEC-5	20EC7D18	Wireless Sensor Networks	3	0	0	3
		20EC7D19	DSP Processors & Architectures				
		20EC7D20	Digital IC Design				
		20EC7D21	FPGA Architectures				
4	OEC-3	Open Elective Course-3		3	0	0	3
5	OEC-4	Open Elective Course-4		3	0	0	3
6	HSSE	20HS7E01	Resource Management	3	0	0	3
		20HS7E02	Industrial Management				
		20HS7E03	Management Science				
		20HS7E04	IPR & Patents				
7	SAC / SSC	20HS7S01	English for employability	1	0	2	2
8	Industrial / Research internship	20EC7P02		0	0	6	3
Total credits							23

MOOCs-3:1. Digital Speech Processing, 2.Pattern recognition and Application

IV B.Tech II Semester

S.No.	Category of course	Course Code	Subjects	L	T	P	C
1	Major Project	20EC8P03	Project work, Seminar and Internship in industry.	**0**	**0**	**24**	**12**
Total credits							**12**

Open Elective Course -1

Category of course	Course Code	Subjects
OEC-1	20EC5E01	Principles of Communications (Not for ECE Students)
	20EE5E01	Digital Control Systems
	20ME5E01	Industrial Robotics and Automation
	20CS5E01	Computer Organization
	20CS5E02	Object Oriented Programming
	20ML5E01	Artificial Intelligence
	20CE5E01	Interior Space Design

Open Elective Course -2

Category of course	Course Code	Subjects
OEC-2	20EC6E02	Microcontrollers and Applications (Not for ECE Students)
	20EE6E02	Artificial Neural Networks and Fuzzy Logic
	20ME6E02	Operations Research
	20AD6E01	.Net Technologies
	20CS6E03	Mean Stack Development
	20CE5E02	Green Buildings

Open Elective Course -3

Category of course	Course Code	Subjects
OEC-3	20EC7E03	Embedded and Real Time Systems
	20CE7E03	Disaster Management
	20EE7E03	Electrical Distribution Systems
	20CS7E04	Nature Inspired Computing Techniques
	20ME7E03	Finite Element Methods

Open Elective Course -4

Category of course	Course Code	Subjects
OEC-4	20EC7E04	Smart Sensors (Not for ECE Students)
	20CE7E04	Project Management
	20ME7E04	3D Printing Technologies
	20CS7E05	Secure Coding Technologies
	20EE7E04	Power Quality

II Year - I Semester				
20EC3T01 – ELECTRONIC CIRCUITS -I	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are to understand

1. Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
2. To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
3. Acquire knowledge about the principle of working and operation of BJT, FET and their characteristics, biasing.
4. Small signal equivalent circuit analysis of BJT and FET transistor amplifiers and compare different configurations.
5. Acquire knowledge about wave shaping circuits.

COURSE OUTCOMES:

After going through this course, the student will be able to

1. Explore the PN Junction diode different modes of operation and Use of special diodes in electronic circuits.
2. Analyze the rectifiers and filters.
3. Explore the modes of operation of BJT, FET transistors and their biasing.
4. Analysis of BJT, FET using small signal models.
5. Understand the basic working and design of wave shaping circuits.

UNIT-I [10Hrs]

JUNCTION DIODE CHARACTERISTICS: PN-junction diode, Open circuited p-n junction, Biased p-n junction, current components in PN junction Diode, diode current equation, V-I Characteristics and temperature dependence ,Diode resistance, Diode capacitance, energy band diagram of PN junction Diode, Diode as a switch, Piecewise linear diode characteristics

SPECIAL SEMICONDUCTOR DIODES: Break down mechanisms, Construction, Operation and characteristics of Zener diode, Varactor diode, Photo diode, LED, LASER, Solar cell, Tunnel diode, SCR, UJT.

UNIT-II [8Hrs]

RECTIFIERS: Basic Rectifier setup, circuits-operation, input and output waveforms, characteristics of half wave, full wave and bridge rectifier.

FILTERS: Inductor filter, Capacitor filter, L- section filter, Π- section filter, Multiple L- section and multiple Π section filter, comparison of various filter circuits.

UNIT III [16Hrs]

TRANSISTOR CHARACTERISTICS

Junction transistor, transistor current components, transistor equation, transistor configurations and characteristics, punch through/ reach through, typical transistor junction voltages.JFET Classification, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

TRANSISTOR BIASING AND THERMAL STABILIZATION

Transistor as a switch ,Transistor as an Amplifier**,** Need for biasing, operating point, load line analysis, BJT biasing methods, concept of stability, fixed bias, collector to base bias, self bias, Stability factors (S,S',S''), Bias compensation, Thermal runaway, Thermal stability**,** FET Biasing.

UNIT IV [6Hrs]

SMALL SIGNAL TRANSISTOR AMPLIFIER MODELS

BJT: Two port network, Transistor hybrid model, determination of h- parameters, Generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal models, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers. High frequency Model of BJT & FET.

UNIT -V [10Hrs]

LINEAR WAVE SHAPING: High pass and low pass circuits, Response to sine, step, pulse, and square inputs, High pass as a differentiator, Low pass as an Integrator.

NON-LINEAR WAVE SHAPING: Diode clippers, Clipping at two independent levels, Transistor clippers, Emitter coupled clipper. Clamping operation, Clamping circuits using diode with different inputs, Clamping circuit theorem

TEXT BOOKS

1. Electronic Devices and Circuits- J.Millman and C.C.Halkias, Tata Mc Graw Hill- Second Edition.
2. Electronic Devices and Circuits-K. Lal Kishore, BS Publications, FourthEdition,2016.
3. Electronics devices & circuit theory- Robert L.Boylestad and Loui Nashelsky, Pearson/ Prentice hall, tenth edition,2009
4. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.

REFERENCES

1. Integrated Electronics-J. Millman, C. Halkias,Tata Mc-Graw Hill, SecondEdition,2009
2. Electronic Devices and Integrated Circuits – B.P. Singh,Rekha , Pearson publications,
3. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

URLs:

1. https://nptel.ac.in/courses/117/103/117103063/
2. https://nptel.ac.in/courses/108/108/108108122/

II Year - I Semester				
20EE3T01 – CONTROL SYSTEMS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT – I:

Mathematical Modelling of Control Systems

Classification of control systems, Open Loop and closed loop control systems and their differences, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems - Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-II:

Time Response Analysis

Standard test signals - Time response of first and second order systems - Time domain specifications - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III:

Stability and Rootlocus Technique

The concept of stability – Routh's stability criterion –limitations of Routh's stability –Root locus concept - construction of root loci (Simple problems)

UNIT–IV:

Frequency Response Analysis

Introduction to Frequency domain specifications-Bode diagrams- Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability criterion.

Compensators

Lag, Lead, Lag-Lead compensators

UNIT–V:

Components of control systems

DC Servo motor - AC Servo motor- Synchro transmitter and receiver-Potentiometer

State Space Analysis Of LTI Systems

Concepts of state, state variables and state model, state space representation of transfer function, solving the time invariant state equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

Text Books:

Control Systems principles and design, M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
Automatic control systems, Benjamin C.Kuo, Prentice Hall of India,2nd Edition.
Control Systems Engineering, U.A.Bakshi, U.V.Bakshi Technical Publications.

Reference Books

Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India. Control Systems, ManikDhanesh N, Cengage publications.
Control Systems Engineering, I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
Control Systems Engineering, S.Palani,TataMcGraw Hill Publications.

II Year - I Semester				
20EC3T02 – DIGITAL SYSTEM DESIGN	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are to understand

1. To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, binary codes and error detecting and correcting binary codes.
2. To study the theory of Boolean algebra and to study representation of switching functions using Boolean expressions and their minimization techniques.
3. To study the combinational logic design of various logic and switching devices and their realization.
4. To study the sequential logic circuits design both in synchronous and Asynchronous modes for various complex logic and switching devices, their minimization techniques and their realizations.
5. To study some of the programmable logic devices and their use in realization of switching functions.

COURSE OUTCOMES:

After going through this course, the student will be able to

1. Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD. Convert a number from one number system to its equivalent in of the other number system.
2. Deploy simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
3. Design and analyze combinational circuits using combinational logic functions/ building blocks.
4. Design and Analyze different PLD's from Boolean expressions.
5. Design and Analyze sequential circuits using sequential logic functions/building blocks.

UNIT I [12Hrs]

Review of Number systems & Codes: Representation of numbers of different radix, conversion from one radix to another radix, r-1's complements and r's complements of signed numbers-problem solving. 4 bit codes- BCD, Excess-3, 2421, 8-4-2-1 etc. Basic logic operations -NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR - Gates, Standard SOP and POS Forms, Gray code, error detection & error correction codes (parity checking-even parity, odd parity, Hamming code), Stuck at faults, NAND-NAND and NOR-NOR realizations, basic logic gates implementation using diodes.

UNIT II [10Hrs]

Minimization Techniques: Boolean theorems, principle of complements, duality, De-morgan theorems, minimization of logic functions using Boolean theorems, minimization of Switching functions using K-Map up to 6 variables, tabular minimization, problem solving (code-converters using K-Map etc..).

UNIT III [10Hrs]

Combinational Logic Circuits I: Design of Half adder, half subtractor, full adder, full subtractor, applications of full adder, 4-bit binary subtractor, adder-subtractor circuits, BCD adder circuit, Excess 3 adder circuit, look-a-head adder circuit, Design of decoder, demultiplexer, 7 segment decoder, higher order demultiplexing, encoder, multiplexer, higher order multiplexing, realization of Boolean functions using decoders and multiplexers, priority encoder, 4-bit digital comparator.

UNIT IV [8Hrs]

Combinational Logic Circuits II: PROM, PAL, PLA-Basics structures, realization of Boolean function with PLDs, programming tables of PLDs, merits & demerits of PROM, PAL, PLA comparison, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

UNIT V [10Hrs]

Sequential Circuits : Classification of sequential circuits (synchronous and asynchronous), basic flip-flops, truth tables and excitation tables (NAND RS latch, nor RS latch, RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals). Conversion from one flip-flop to another flip-flop, Design of ripple counters, synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

TEXT BOOKS:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition.
2. Switching and finite automata theory by ZVI kohavi, 2nd edition.
3. Digital Design by Mano PHI.

REFERENCES:

1. Micro electronics by Milliman MH edition.
2. Modern Digital Electronics by RP Jain, TMH.
3. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers.

URLs:

1. https://nptel.ac.in/courses/108/105/108105132/
2. https://nptel.ac.in/courses/117/106/117106086/

II Year - I Semester				
20EC3T03 – ANALOG COMMUNICATIONS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course is to understand

1. Familiarize with the fundamentals of Signals and analog communication systems.
2. Familiarize with various techniques for analog modulation and demodulation of signals.
3. Distinguish the figure of merits of various analog modulation methods.
4. Develop the ability to classify and understand various functional blocks of radio transmitters and receivers.
5. Familiarize with basic techniques for generating and demodulating various pulse modulated signals.

COURSE OUTCOMES

After going through this course, the student will be able to

1. Understand an analog communication system.
2. Analyse time domain and frequency domain equations for all forms of amplitude modulation Schemes.
3. Analyse and Calculate noise frequency components in AM, DSB, SSB and angle modulation systems.
4. Understand AM and FM Transmission and Reception.
5. Explain Pulse Modulation Techniques-PAM, PWM, PPM

UNIT I [14Hrs]

Introduction to signals: Definition of Signals and Systems, Classification of Signals, Classification of Systems. Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems.

Amplitude Modulation: Introduction to communication system, Need for modulation, Multiplexing , Amplitude Modulation - Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT II [8Hrs]

DSB Modulation: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description.

SSB Modulation: Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation- Frequency

description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT III [10Hrs]

Angle Modulation: Basic concepts, Frequency Modulation- Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM.

UNIT IV [10Hrs]

Noise: Noise in Analog communication System, Noise in DSB & SSB System, Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis.

Pulse Modulation: Time Division Multiplexing, Sampling, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, TDM vs FDM.

UNIT V [8Hrs]

Transmitters: Radio Transmitter – Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter.

Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

TEXT BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3rd Edition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.
3. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed
4. Signals & Systems - A. Anand Kumar, PHI Learning, 2012.

REFERENCES:

1. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.
2. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA, 2006.
3. Analog Communication Systems -Sanjay Sharma, SK Publications.

URLs:

1. https://nptel.ac.in/courses/117/105/117105143/
2. https://mrcet.com/downloads/digital_notes/ECE/III%20Year/ANALOG%20COMMUNICATIONS-18.pdf

II Year - I Semester				
20BS3T03 – PROBABILITY AND STATISTICS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives:

COB 1: Know the importance of usage of Probability and Statistics.
COB 2: To help the students acquire a necessary base of Correlation, Quality Checking.

Course Outcomes:

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

CO 1: Use the knowledge of Probability and Statistics in various situations. (L3)
CO 2: Analyze the concepts, Random variables and Probability distributions. (L4)
CO 3: Understand sampling theory and estimation.(L2)
CO 4: Decide the test applicable for giving inference about Population Parameter based on Sample statistic.(L3)
CO 5: Measure Correlation between variables and obtain lines of regression. (L5)
CO 6: Design quality control charts for quality checking. (L6)

UNIT I:-Introduction to Probability and Statistics
Statistics-Measures of Central Tendency-mean, mode, median, Measures of Dispersion-Variance, standard deviation, Skewness, Kurtosis.
Probability-Addition law of Probability-Independent Events-Conditional Probability-Bayes Theorem (with out proof).

UNIT II:-Random variables and Distributions
Introduction- Random variables- Distribution function- Discrete distributions (Binomial and Poisson distributions only) Continuous distributions: Normal, Gamma and Weibull distributions.

UNIT III Sampling Theory and Estimation & Tests of Hypothesis
Introduction - Population and samples- Sampling distribution of mean for large and small samples (with known and unknown variance) – Proportion sums and differences of means - Sampling distribution of variance -Point and interval estimators for means and proportions.

Introduction - Type I and Type II errors - Maximum error - One tail, two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences using Z-test, Student's t-test - F-test and Chi –square test

UNIT IV : - Curve fitting and Correlation
Introduction – Method of Least square, Fitting a straight line –Second degree curve-exponential curve - power curve by method of least squares, Simple Correlation and Regression

UNIT V Statistical Quality Control Methods

Introduction - Methods for preparing control charts – Problems using $\bar{x}$, p, R charts and attribute charts

Text Books:

1. **Dr.T.S.R.Murthy**, Probability and Statistics for Engineers, BS Publications
2 **Jay l.devore**, Probability and Statistics for Engineering and the Sciences.8th edition,Cengage.
3. **Dr T K V Iyengar**, **Dr B.Krishna Gandhi**, **S.Ranhanatham** and Dr. **M.V.S.S.N Prasad**, Probability and Statistics, S.Chand & Company Ltd.
4. **T.Veerarajan,** Probability, Statistics and Random Processes. Tata Mc Graw Hill Publication

Reference Books:

1. **S.C .Gupta , V.K .Kapoor**, Fundamentals of Mathematical Statistics, Sultan Chand & Sons Publishers
2**. Sheldon, M. Rosss**, Introduction to probability and statistics Engineers and the Scientists 4 th edition, Academic Foundation,2011
3. **Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye** , Probability and statistics for Engineers and Scientists , Eighth edition, Pearson Education.
4. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9th Edition,PHI.

II Year - I Semester				
20EC3L01 – ELECTRONIC CIRCUITS -I LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Any Ten Experiments from following

1. P-N Junction Diode Characteristics.
2. Zener Diode Characteristics.
3. Rectifiers
   - Part A: Half-wave Rectifier.
   - Part B: Full-wave Rectifier (with C, LC, π-filter).
4. BJT Characteristics and h-Parameter calculations (CE Configuration).
   - Part A: Input Characteristics.
   - Part B: Output Characteristics.
5. BJT Characteristics and h-Parameter calculations (CB Configuration).
   - Part A: Input Characteristics.
   - Part B: Output Characteristics.
6. FET Characteristics and h-Parameter calculations (CS Configuration).
   - Part A: Drain Characteristics.
   - Part B: Transfer Characteristics.
7. Linear wave shaping (RC Integrator & RC differentiator).
8. Non Linear wave shaping – Clippers.
9. Non Linear wave shaping – Clampers.
10. Transistor as a switch.
11. UJT Characteristics.
12. BJT-CE Amplifier.
13. Emitter Follower-CC Amplifier.

Equipment required for Laboratory

1. Boxes (DLB, DRB and DCB).
2. Ammeters (Analog / Digital).
3. Voltmeters (Analog / Digital).
4. Active & Passive Electronic Components.
5. Regulated Power supplies.
6. Analog/Digital Storage Oscilloscopes.
7. Analog/Digital Function Generators.
8. Digital Multimeter.

II Year - I Semester				
20EC3L02 – ANALOG COMMUNICATIONS LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

PART A: Any nine experiments from the following

1. Amplitude Modulation & Demodulation
2. DSB SC - Modulation & Demodulation.
3. SSB Modulation and Demodulation
4. Frequency Modulation & Demodulation.
5. Pre-emphasis & De-emphasis.
6. Spectrum Analysis of Modulated signal using Spectrum Analyzer.
7. AGC Circuits.
8. Verification of Sampling Theorem.
9. Pulse Amplitude Modulation – Modulation & Demodulation.
10. PWM, PPM - Modulation & Demodulation.
11. Phase Locked loop (PLL).
12. Mixer Characteristics
13. AM Super hetrodyne receiver
14. Design of FM receiver (90.4 MHz).

PART B: Any three experiments from the following using MATLAB Software

1. Amplitude Modulation – Modulation & Demodulation.
2. AM - DSB SC -. Modulation & Demodulation.
3. Frequency Modulation – Modulation. & Demodulation.
4. Pulse Amplitude Modulation – Modulation & Demodulation.
5. PWM, PPM - Modulation & Demodulation.

Equipment required for Laboratory

Software:

1. Simulations software (MATLAB).
2. Computer Systems with required specifications.

Hardware:

1. RPS - 0 – 30 V.
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz.
4. Components.
5. Multimeters.
6. Spectrum Analyser

II Year - I Semester				
20EC3L03 – DIGITAL SYSTEM DESIGN LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Any Ten Experiments from following

1. Verification of Truth Tables of Logic Gates.
2. Verification of Functional Table of 3 to 8 Line Decoder / De- Multiplexer
3. Four variable logic function using 8 To 1 Multiplexer.
4. Design Full Adder Circuit / Full Subtractor and Verify Its Functional Table.
5. Verification of Functional Tables of J K Edge Triggered Flip –Flop, J K Master Slave Flip
   Flop, D Flip Flop.
6. Design a Four Bit Ring Counter Using D Flip – Flops / JK Flip-flop and Verify Output.
7. Design a Four Bit Johnson's Counter Using D Flip-Flops / JK Flip Flops and Verify Output.
8. Verify the Operation of 4-Bit Universal Shift Register for Different Modes of Operation
9. Mod-8 Synchronous Counter Circuit Using T-Flip-Flops.
10. One Bit Comparator.
11. BCD Adder Circuit
12. IC74154 De-Multiplexer
13. 7 Segment Display Circuit Using Decoder and 7-Segment Led.

Equipment required for Laboratory

1. Trainer Kits.
2. Active & Passive Electronic Components.
3. Regulated Power supplies.
4. Digital Multimeters.

II Year - I Semester				
20BS3M03 – ENVIORNMENTAL STUDIES	**L**	**T**	**P**	**C**
	1	**0**	**0**	**0**

Course Contents:

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance,

: Eco Systems

- Concept of an eco system
- Structure and function of an eco system.
- Producers, consumers, decomposers.
- Ecological succession.
- Food chains, food webs and
- Ecological pyramids.

Structure and function of the following eco systems:

- Forest ecosystem
- Grass land ecosystem

Unit 2: Natural Resources

Renewable and non renewable resources:

a) Natural resources and associated problems

- Forest resources
- Water resources
- Mineral Resources
- Food Resources
- Energy Resource
- Land Resources

b) Role of individual in conservation of natural resources.

UNIT 3: Biodiversity and it's Conservation

- Introduction-Definition: genetics, species and ecosystem diversity.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
- India as a mega diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitats loss, poaching of wild life, man wildlife conflicts.

- Endangered and endemic spaces of India.
- Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT 4: Environmental Pollution

Definition Causes, effects and control measures of:
a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes

Role of an individual in prevention of pollution

Pollution case studies

Unit 5: Social issues and the Environment

- Water conservation, rain water harvesting
- Resettlement and rehabilitation of people; its problems and concerns, case studies
- Climate change, global warming, acid rain, ozone layer depletion, case studies.
- Consumerism and waste products
- Environment protection Act
- Air (prevention and control of pollution) Act
- Water (prevention and control of pollution) Act
- Wildlife protection act
- Forest conservation act
- Population growth

Field work

Visit to a local area to document environment assets river / forest / grassland / hill / mountain. Visit to a local polluted site-urban/rural/industrial/agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river

Recommended Books:

1. Textbook of Environmental studies, Erach Bharucha, UGC
2. Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

II Year - I Semester				
20EC3S01 – Arduino Programming	**L**	**T**	**P**	**C**
	1	**0**	**2**	**2**

OBJECTIVES

1.Understand what is meant by Microcontroller, Microprocessor, Embedded System, Integrated Development Environment (IDE), and Arduino.

2.Understand the layout of Arduino UNO board.

3.Understand Arduino IDE, and how to write, compile, and upload a code to Arduino.

4.Deal with LED using Arduino digital output pins.

5.Interfacing Obstacle Sensor, LCD.

List of Experiments

1.Introduction to Arduino Programming
2.Blink of built in LED
3.Traffic Light Control
4.Analog Read Serial
5.Obstacle Sensor
6.Temperature sensor
7.LCD
8.Stepper Motor
9.Develop a project

II Year - II Semester				
20EC4T05 – ELECTRONIC CIRCUITS -II	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are to understand

1. Learn and understand the purpose of cascading of single stage amplifiers and derive the overall voltage gain.
2. Know the effect of negative feedback on amplifier characteristics
3. Learn and understand the basic principle of oscillator circuits and perform the analysis of different oscillator circuits.
4. Compare different Power amplifiers and tuned amplifier circuits.
5. Understand the working principle of various multivibrators.

COURSE OUTCOMES

After going through this course, the student will be able to

1. Analysis of cascaded RC coupled BJT, FET amplifiers and different types of the coupled amplifiers with its frequency response.
2. Analysis of the different types of feedback amplifiers.
3. Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators.
4. Understand Power amplifiers and Tuned amplifiers.
5. Analyze different types of Multivibrators.

UNIT I [7Hrs]

Multistage Amplifiers: Classification of amplifiers, methods of coupling, cascaded transistor amplifier and its analysis, analysis of two stage RC coupled amplifier, high input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower.

UNIT-II [10Hrs]

Feedback Amplifiers: Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of analysis of feedback amplifiers.

UNIT III [10Hrs]

RC Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and FET and their analysis.

LC Oscillators: Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and FET and their analysis, Crystal oscillators, Frequency and amplitude stability of oscillators

UNIT IV [12Hrs]

Power Amplifiers: Classification of amplifiers (A –E), Class A power Amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier, Thermal stability and Heat sinks, Distortion in amplifiers.

Tuned Amplifiers: Introduction, Q-Factor, small signal tuned amplifier, capacitance single tuned amplifier, double tuned amplifiers, staggered tuned amplifiers.

UNIT-V [10Hrs]

MULTIVIBRATORS

Bistable Multivibrator: Analysis of Fixed Bias, Self-Bias Bistable Multivibrator, Collector catching Diodes, Commutating Capacitors, Methods of Triggering using RC network & Diode, Emitter Coupled Bistable Multivibrator (Schmitt trigger).

Monostable Multivibrator: Analysis of Collector Coupled Monostable Multivibrator, Triggering method of a Monostable Multivibrator, Applications

Astable Multivibrator: Analysis of Collector Coupled Astable Multivibrator, Applications

TEXT BOOKS:

1. Integrated Electronics- J. Millman and C.C.Halkias, Tata Mc Graw- Hill, 1972.
2. Electronic Circuit Analysis - B.V.Rao,K.R.Rajeswari,P.C.R.Pantulu,K.B.R.Murthy, Pearson Publications.
3. Electronic Devices and Circuits Theory- Robert L.Boylestad and Louis Nashelsky, Pearson/Prentice Hall, Tenth Edition.
4. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991

REFERENCES:

1. Microelectronic Circuits-Sedra A.S. and K.C. Smith, Oxford University Press, Sixth Edition.
2. Electronic Circuit Analysis and Design- Donald A. Neaman, Mc Graw Hill.
3. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.

URLs:

1. https://nptel.ac.in/courses/117/103/117103063/
2. https://nptel.ac.in/courses/108/108/108108122/

II Year - II Semester				
20ES4T11 – ELECTROMAGNETIC WAVES AND TRANSMISSION LINES	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:
The main objectives of this course are to understand

1. The basic parameters of Transmission line
2. To Implement various concepts of transmission lines and its applications
3. Fundamentals of steady electric and magnetic fields using various laws
4. Maxwell's Equations for time varying fields and applying boundary conditions at different media interfaces.
5. Plane Wave characteristics in different media for normal and oblique incidence

COURSE OUTCOMES:
At the end of this course the student can able to

1. Understand different types of transmission lines and derive relation between primary and secondary constants.
2. Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart
3. Understand the relation between EM static fields using different laws.
4. Apply the Maxwell equations to analyze the time varying behavior of EM waves.
5. Gain the knowledge in uniform plane wave concept and its characteristics in various media.

Prerequisites: Review of Coordinate Systems

UNIT I: [10Hrs]
Transmission Lines - I : Types, Parameters, T&π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

UNIT II: [10Hrs]
Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UH F Lines as Circuit Elements,Impedance Transformations ,λ/8,λ/4 and λ /2 Lines –. Smith Chart – Construction and Applications, Quarter wave transformer ,Single Stub Matching, Double stub matching Illustrative Problems.

UNIT III: [16Hrs]
Electrostatics: Coulomb's Law, Electric Field Intensity,Electric Flux Density ,Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy

Density ,Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Illustrative Problems.

Magneto Statics : Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Illustrative Problems.

UNIT IV: [10Hrs]

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements . Conditions at a Boundary Surface. Illustrative Problems.

UNIT V: [12Hrs]

EM Wave Characteristics: Wave Equations for free space, Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations. Wave Propagation in Lossy dielectrics, lossless dielectrics, wave propagation in good conductors

Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Skin Depth,Surface Impedance. Poynting Vector and Poynting Theorem. Illustrative Problems.

TEXT BOOKS:

1. Principles of Electromagnetics, Matthew N.O. Sadiku, S.V. Kulkarni, Oxford University Press, 6th edition, 2015.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI,2nd Edition,2000.
3. Electromagnetic Field Theory and Transmission Lines –GSN Raju, Pearson Education2006

REFERENCE BOOKS:

1. Engineering Electromagnetic – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.
2. Transmission Lines and Networks, Umesh Sinha, Satya Prakashan, Technical India Publications, New Delhi, 2010
3. Electromagnetic Field Theory and Transmission Lines: G Sasi Bhushana Rao, Wiley India 2013.

4. URLs:

1. https://www.whitman.edu/mathematics/calculus-online/chapter16.html
2. www.nptelvideos.in/2012/12/transmission-lines-and-emwaves.html
3. https://www.youtube.com
4. www.sanfoundry.com
5. www.creativestellars.blogspot.com

II Year - II Semester				
20EC4T06 – DIGITAL COMMUNICATIONS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are to understand

1. Pulse digital modulation systems such as PCM, DPCM and DM.
2. Digital Modulation techniques .
3. Various digital modulation techniques and able to analyze various systems for their performance in terms of probability of error.
4. Study the concept of entropy and need for source coding.
5. Study Block codes, cyclic codes and convolution codes.

COURSE OUTCOMES:

At the end of this course the student can able to

1. Explain the Pulse digital Modulation systems,
2. Understand the fundamentals of digital modulation keying techniques.
3. Determine the probability of error for various digital modulation schemes.
4. Understand the basics of information theory and source coding techniques.
5. Determine the errors present in the data using Linear block codes and Convolution codes.

UNIT-I[10hrs]

Elements of digital communication system, Advantages of digital communication system, line coding formats,Sampling, quantization , Pulse Code Modulation, Companding in PCM systems, Differential PCM systems (DPCM), Delta modulation and drawbacks, Adaptive Delta modulation, noise in PCM and DM systems.

UNIT-II[10hrs]

Digital Modulation Techniques: Introduction, coherent reception, non-coherent detection of ASK, FSK,PSK, DPSK, DEPSK, QPSK and M-ary technique, Need for MSK.

UNIT-III[8hrs]

Data Transmission: Base band digital data transmission, Base band signal receiver, optimum filter, matched filter, probability of error , probability of error using matched filter**,** calculation of error probability using ASK,BPSK,BFSK.

UNIT-IV[10hrs]

Information Theory: Discrete messages, concept of amount of information and its properties, Average information, entropy and its properties. Information rate, mutual information and its properties.

Source coding: Shannon‘s theorem, Shanon-Fano coding and Huffman coding. Efficiency calculations, channel capacity of discrete and analog channels, capacity of a Gaussian channel and bandwidth – S/N trade off.

UNIT-V[14hrs]

Linear Block Codes: Introduction, matrix description of linear block codes, error detection and error correction capabilities of linear block codes. Hamming codes. Binary cyclic codes: Algebraic structure, encoding and syndrome calculation.

Convolution codes: Encoding of convolution codes: time domain approach, transform domain approach, graphical approach (state, tree and Trellis diagrams). Decoding of convolution codes using Viterbi algorithm.

TEXT BOOKS:

1. Digital communications - Simon Haykin, John Wiley, 2005.
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.
3. Electronic communication systems - Wayne Tomasi, 5 edition, Pearson
4. Communication Systems - Analog and Digital, R.P.Singh, S.Sapre, McGraw-Hill Education, 2012

REFERENCE BOOKS:

1. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003.
2. Digital Communications – John Proakis, TMH, 1983.
3. Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004.

URLS:

1. https://nptel.ac.in/courses/117/105/117105144/
2. https://www.aceec.ac.in/electronics-and-communication-engineering/

II Year - II Semester				
20HS4T02 – MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives:

COB 1:Tounderstand the Business environment, study the basic principles of managerial economics,and to know various factors influencing demand of the products.
COB 2: To analyze production and cost concepts and know the nature of markets, Methods of Pricing in the different market structures.
COB 3: To learn accounting practices and financial management techniques for effective business decision making and to promote entrepreneurial abilities for engineers.

Course Outcomes:

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

CO 1:	**Assess various types of Business & Business Environment.**
CO 2:	**Define Managerial Economics and Measure demand of a particular product or services by applying various methods in given situations.**
CO 3	**Analyze the concepts of production, cost & break-even analysis.**
CO 4:	**Determine the price of a product or services in given market condition.**
CO 5:	**Prepare accounting concepts and able to analyze financial systems and calculate the capital budgeting methods to manage theprojects.**

Unit I: - Business & Environment:
Introduction & features of Business Organization. Forms of business organisations - Sole Proprietorship, Partnership, and Joint Stock Company, Startups - Features - Process
Internal and External factors affecting Business Environment

Unit II:- Introduction to Managerial Economics and Estimation of Demand
Introduction to Managerial economics,Definition, Nature and Scope,
Demand Analysis: Definition-types of demand - Demand Determinants, Law of Demand.
Elasticity of Demand: Definition, Types – Price Elasticity – Income Elasticity – Cross Elasticity – Advertising Elasticity its Significance.
Demand Forecasting: definition, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, judgmental approach to demand forecasting)

Unit III:-Concepts of production, cost & break-even analysis
Concept of Production: Production Function – Types – One variable input factor - Two variables – Law of returns to Scale -Cobb-Douglas Production function, Economies of Scale.
Cost Analysis: Definition of cost and Types of Cost concepts,
Break-even Analysis (BEA): Managerial Significance and limitations of Break-Even Analysis - CVP (Simple numerical problems)

Unit IV: -Markets& Pricing strategies:
Market structures: Introduction to Market Structures – Types & features of perfect competition, monopoly and monopolistic competition.

Pricing Strategies: Methods of Pricing - Factors Effecting Pricing.

Unit V: - Introduction to Financial Accounting& Analysis of Financial Statements: Accounting Principles, Double-Entry Book Keeping, Journal, Ledger, and Trial Balance. **Final Accounts** (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments)

Capital Budgeting:
Introduction of capital and types of capital - Capital Budgeting -Traditional Methods (payback period, accounting rate of return) and Modern methods (Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

1. R.L.Varshney& K.L Maheswari, "Managerial Economics", 5th Edition, S.Chand Publishers, 2005.
2. Dr. A. R. Aryasri, "Managerial Economics and Financial Analysis", 3rd Edition, TMH, 2011
3. Dr. D.M.Mithani, "Introduction To Economics" , Himalaya Publishing House.
4. P Venkata Rao, J.V.Prabhakar Rao "Managerial Economics and Financial Analysis", 1st Edition, Maruti Publications, 2012.
5. Dr. N. AppaRao, Dr. P. Vijay Kumar: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi – 2011.
6. Dr. D. Raghunathareddy, M.V. Narasimha chary, "Managerial Economics and Financial Analysis",Scitech publication(India) Pvt.Ltd.,

Reference Books:

1. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012.
2. D N Dwivedi, "Managerial Economics", 8th Edition, PHI, 2010.
3. Prasanna Chandra, "Financial Management Theory and Practice", 7th Edition, TMH publishing company limited.
4. Lipsey &Chrystel, Economics, Oxford University Press.
5. Vyuptakesh Sharan, "International Financial Management", 5th Edition, PHI learning Private Limited, NewDelhi – 2010.
6. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI Pvt,Ltd., - 2006
7. ManabAdhikary, "Business Economics", 2nd Edition, Excel Books, New Delhi – 2002
8. James C. Van Horne(Stanford University), "Financial Management And Policy", PHI Pvt,Ltd., - 2001
9. H. Craig Peterson & W. Cris Lewis, "Managerial Economics", 4th Edition, Pearson Education Ltd.,

II Year - II Semester				
20BS4T04 – NUMERICAL METHODS AND COMPLEX VARIABLE	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives:

COB 1: To help the student Understand the numerical way of solving equations and integration.
COB 2: To become familiar with the concepts of Complex Functions.

Course Outcomes:

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

CO 1: Use Numerical Methods in Solving Equations. (L3)
CO 2: Calculate function value and its integration value by using different numerical methods. (L3)
CO 3: Understand Methods of finding numerical solution of differential equations. (L2)
CO 4: Use the knowledge of Beta and Gamma functions in evaluating improper integrals(L2).
CO 5: Understand Functions of complex variables and will be able to find analytic Function. (L2)
CO 6: Evaluate definite integral of given complex function using Cauchy's theorem and residues. (L5)

Unit I: - Solution of Algebraic and Transcendental Equations

Introduction- Bisection method – Method of false position (Regula-False Method) – Iteration method – Newton- Raphson method (One Variable)

Unit II: - Interpolation and Numerical Integration

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences-Backward Differences –Central differences – Symbolic relations and separation of symbols - Differences of a Polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals - Lagrange's Interpolation formula-Trapezoidal rule- Simpson's 1/3rd and 3/8th rule.

Unit III: - Numerical solution of Ordinary Differential Equations with initial conditions

Solution of ordinary differential equations with initial conditions by Taylor's series Method - Picard Method of successive Approximations Euler's method, Modified Euler's Method – Runge-Kutta method (second and fourth order).

UNIT IV: Special functions

Def of improper integral, Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals

Unit-V: - Functions of Complex variable & Complex Integration

Complex function, Real and Imaginary parts of Complex function, Limit**,** Continuity and Derivative of Complex function, Cauchy-Riemann equations, Analytic function, Entire function, singular point, conjugate Function**,** *C -R* equations in polar form, Harmonic functions, Milne-Thomson method**.** Line integral of a complex function, Cauchy's theorem (only statement) - Cauchy's Integral Formula (only statement), Taylor's series(only statement),Laurent's series (only statement)-Zeros of an analytic function- Types of Singularities-pole of order m, simple pole- Residues, Residue theorem (only statement).

Evaluation of integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_{0}^{2\pi} f(\cos\theta, \sin\theta)d\theta$

Text Books:

1. **B.S.GREWAL,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. **B. V. Ramana**, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. **Dr T K V Iyengar**, **Dr B.Krishna Gandhi**, **S.Ranhanatham** and Dr. **M.V.S.S.N Prasad**, Engineering Mathematics, S.Chand & Company Ltd.

Reference Books:

1. **N.P.Bali & Manish Goyal**, A Text book of Engineering Mathematics, Lakshmi Publications.
2. **James ward brown, Ruel V.Churchill**, Complex variable and Applications, Mc.Graw Hill Publications
3. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, 10th Edition, Wiley-India
4. **Steven C. Chapra**, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education

.

II Year - II Semester				
20EC4L05 – ELECTRONIC CIRCUITS –II LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Note: The students are required to design the electronic circuit and they have to perform the simulation using Multisim/ Pspice/Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware laboratory.

Any Ten Experiments from following

1. Voltage-Series Feedback Amplifier.
2. Current-Shunt Feedback Amplifier.
3. RC Phase Shift/Wien Bridge Oscillator.
4. Hartley/Colpitt's Oscillator.
5. Two Stage RC Coupled Amplifier.
6. Darlington Pair Amplifier.
7. Class A Series-fed Power Amplifier.
8. Complementary Symmetry Class B Push-Pull Power Amplifier.
9. Single Tuned Voltage Amplifier.
10. Astable Multivibrator.
11. Monostable Multivibrator.
12. Bistable Multivibrator.
13. Schmitt Trigger.

Equipment required for Laboratory

Software:

1. Multisim / Spice/Equivalent Licensed simulation software tool.
2. Computer Systems with required specifications.

Hardware:

1. Regulated Power supplies.
2. Analog/Digital Storage Oscilloscopes.
3. Analog/Digital Function Generators.
4. Digital Multimeters.
5. Decade Résistance Boxes/Rheostats.
6. Decade Capacitance Boxes.
7. Ammeters (Analog or Digital).
8. Voltmeters (Analog or Digital) & Active & Passive Electronic Components.

II Year - II Semester				
20EC4L06 – DIGITAL COMMUNICATIONS LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Minimum Twelve Experiments to be conducted:

1. Digital Sequence generation and Analysis
2. Pulse Code Modulation and De- Modulation.
3. Differential Pulse Code Modulation and De- Modulation.
4. Delta Modulation and De- Modulation.
5. Adaptive Delta Modulation and De- Modulation.
6. Time Division Multiplexing and De-Multiplexing.
7. Amplitude Shift Keying: Generation and Detection.
8. Phase Shift Keying: Generation and Detection.
9. Frequency Shift Keying: Generation and Detection.
10. DPSK: Generation and Detection.
11. QPSK: Generation and Detection.
12. Companding.
13. Source Encoder and Decoder.
14. Linear Block Code- Encoder and Decoder.
15. Binary Cyclic Code- Encoder and Decoder.
16. Convolution Code- Encoder and Decoder.

Experiment required for laboratories:

1. RPS - 0 - 30 V .
2. CRO - 0 - 20 M Hz.
3. Function Generator - 0 - 1 M Hz.
4. RF Generator - 0 - 1000 M Hz/0 - 100 M Hz.
5. Multimeters.
6. Lab Experimental kits for Digital Communication.
7. Components.

II Year - II Semester				
20EC4S02 – HDL PROGRAMMING (Skill Oriented Course)	**L**	**T**	**P**	**C**
	1	**0**	**2**	**2**

bjective:

The students are required to design and draw the internal logical structure of the following Digital Integrated Circuits and to develop HDL Source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.

Introduction to VHDL:

Design flow, program structure, levels of abstraction, Elements of VHDL: Data types, data objects, operators and identifiers, Generic statements, Packages, Libraries and Bindings, Subprograms. VHDL Programming using structural and data flow modeling

Behavioural Modeling:

Process statement, variable assignment statement, signal assignment statement, wait statement , if statement, case statement ,null statement, loop statement, exit statement, next statement ,assertion statement, more on signal assignment statement ,Inertial Delay Model, Transport Delay Model ,Creating Signal Waveforms, Signal Drivers , Other Sequential Statements , Multiple Processes. Logic Synthesis, Inside a logic Synthesizer

List of Experiments:

1. Realization of Logic Gates
2. Design of Full Adder using different modeling systems
3. 3 to 8 Decoder using different modeling styles
4. 8 to 3 Encoder (with and without parity)
5. 8 x 1 Multiplexer and 2x 4 De-multiplexer using different modeling styles
6. 4- Bit comparator
7. D Flip-Flop, T-Flip Flop
8. Decade counter
9. Shift Register
10. 8-bit serial in-parallel out and parallel in-serial out
11. Fast In & Fast Out (FIFO)
12. ALU Design.
13. Universal shift register
14. 4*4 multiplier
15. Flip flops(R-S, J-K)

Equipment/Software required:

1. Xilinx Vivado software / Equivalent Industry Standard Software
2. Xilinx Hardware / Equivalent hardware

3. Personal computer system with necessary software to run the programs and Implement.

TEXT BOOKS:

1. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.
2. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.

II Year - II Semester				
20ES4L13 – OOPS THROUGH JAVA LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

1. a. Write a JAVA program give example for command line arguments.
   b. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
2. a Write a JAVA program to determine multiplication of two matrices.
   b. Write a JAVA program to sort an array of strings
   c. Write a JAVA program to check whether given string is palindrome or not.
3. a Write a JAVA program for the following
   Example for call by value.
   Example for call by reference.
   b. Write a JAVA program to give the example for 'this' operator. And also use the 'this' keyword as return statement.
4. a Write a JAVA program to demonstrate static variables, methods, and blocks.
   b. Write a JAVA program to give the example for 'super' keyword.
5. a Write a JAVA program that illustrates simple inheritance.
   b. Write a JAVA program that illustrates multi-level inheritance
6. a Write a JAVA program demonstrating the difference between method overloading and method overriding.
   b. Write a JAVA program demonstrating the difference between method overloading and constructor overloading.
7. a Write a JAVA program that describes exception handling mechanism.
   b. Write a JAVA program for example of try and catch block. In this check whether the given array size is negative or not.
   c. Write a JAVA program to illustrate sub class exception precedence over base class.
   d. Write a JAVA program for creation of user defined exception.
8. a Write a JAVA program to illustrate creation of threads using runnable class.(start method start each of the newly created thread. Inside the run method there is sleep() for suspend the thread for 500 milliseconds).
   b. Write a JAVA program to create a class MyThread in this class a constructor, call the base class constructor, using super and starts the thread. The run method of the class starts after this. It can be observed that both main thread and created child thread are executed concurrently
9. a Write a JAVA program illustrating multiple inheritance using interfaces.
   b. Write a JAVA program to create a package named pl, and implement this package in ex1 class.
   c. Write a JAVA program to create a package named mypack and import it in circle class.
10 .a Write a JAVA program to give a simple example for abstract class.
   b. Write a JAVA program that describes the life cycle of an applet.
11 .a Write a JAVA program to create a grid layout control.

b. Write a JAVA program to create a border layout control.

c. Write a JAVA program to create a simple calculator.

12. a Write a JAVA program that displays the x and y position of the cursor movement using Mouse.

b. Write a JAVA program that displays number of characters, lines and words in a text file.

III Year - I Semester				
20EC5T07 – LINEAR IC APPLICATIONS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. To understand the basic operation &performance parameters of differential amplifiers.
2. To understand & learn the measuring techniques of performance parameters of OP-AMP
3. To learn the linear and non-linear applications of operational amplifiers.
4. To understand the analysis & design of different types of active filters using OP-AMP
5. To learn the internal structure, operation and applications of different analog ICs

COURSE OUTCOMES:

After going through this course, the student

1. Capable of identifying the differential amplifier with different configurations.
2. Gain adequate knowledge on structure of op-amp and its characteristics
3. Able to design linear and non-linear applications, Understand the concepts of active filter
4. Experience the knowledge on how a 555-timer used for different applications.
5. Gains adequate knowledge on analog to digital and digital to analog using OP-AMP.

UNIT I **[12Hrs]**

INTEGRATED CIRCUITS: Differential Amplifier- DC and AC analysis of Dual input Balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator. Basic Current Mirror Circuit, Improved Version of current mirror circuit.

UNIT II **[12Hrs]**

Characteristics of OP-Amps: Integrated circuits-Types, Classification, Package Types and Temperature ranges, Power supplies, Op-amp Block Diagram, ideal and practical Op-amp Specifications, DC and AC characteristics,741 op-amp & its features, Op-Amp parameters &Measurement, Input & Out put Off set voltages & currents, slew rate, CMRR, PSRR, drift, Frequency Compensation techniques.

UNIT III **[15Hrs]**

LINEAR and NON-LINEAR APPLICATIONS OF OP-AMPS: Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers.

FILTERS, OSCILLATORS: Comparison between Passive and Active networks, Design& Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters, Sample & Hold circuits. Precision rectifiers, RC Phase shift oscillator, Wien bridge oscillator**.**

UNIT IV **[10Hrs]**

TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, Monostable and Stable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles, and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of VCO, Fixed and variable Voltage regulators

UNIT V **[8Hrs]**

DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and Monolithic DAC, Different types of ADCs –parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

TEXTBOOKS:

1. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition,2003.
2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI,1987.
3. Operational Amplifiers–C.G. Clayton, Butterworth & Company Publ. Ltd./Elsevier, 1971

REFERENCES :

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SKKataria&Sons;2nd Edition,2010
2. Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, McGrawHill, 1988.
3. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, CenageLearning India Ltd.

URL's

https://www.youtube.com/results?search_query=linear+ic+applications

https://www.youtube.com/watch?v=XlKLTLpKvPo

https://www.youtube.com/watch?v=yIQ70rcjo9Q

https://www.youtube.com/watch?v=q9cRpDsh0lg

III Year - I Semester				
20EC5T08 ANTENNA AND WAVE PROPAGATION	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. To understand the basic concepts of radiation mechanism in free space and the antenna parameters.
2. To investigate the characteristics of Wire antennas and design of array of antennas for various specifications and applications
3. Introduce the working principles of various types of antennas.
4. To Understand the major applications of antennas and how antennas are employed to meet electronic system requirements
5. Understand the concepts of radio wave propagation in the atmosphere

COURSE OUTCOMES:

After going through this course, the student will be able to

1. Identify basic antenna parameters.
2. Quantify the fields radiated by various types of antennas analyze antenna arrays
3. understand basic principles of aperture antennas and lens antennas.
4. Design Rectangular patch antennas and antenna measurements for various antenna parameters.
5. Identify the characteristics of radio wave propagation

UNIT I **[12Hrs]**

ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism and Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Beamwidths, Polarization, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain, Antenna Apertures, Aperture Efficiency,Reciprocity, equivalence ofradiation and receive patterns, equivalence of impedances, effective aperture, effective length, Frii's transmission formula. illustrated Problems.

UNIT II **[12Hrs]**

WIRE ANTENNAS AND ANTENNA ARRAYS : Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole and Small loop– Evaluation of Field Components, Power Radiated, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height. Loop .Two element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison. Yagi-Uda Arrays, Helical Antennas – geometry design in Axial Mode and Normal Modes (Qualitative Treatment).

UNIT III **[12Hrs]**

APERTURE ANTENNAS : Reflector Antennas : Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Off-set Feeds, Cassegrain Feeds. Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns, Lens Antennas:Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications.

UNIT IV **[10Hrs]**

MICROSTIP ANTENNAS AND ANTENNA MEASUREMENTS

Microstrip Antennas-Introduction, Features, Advantages and Limitations Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics.
Antenna Measurements – Patterns Required, Set Up, Distance Criterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

UNIT V **[12Hrs]**

WAVE PROPAGATION: Concepts of Propagation – frequency ranges and types of propagations. Ground Wave Propagation–Characteristics, Parameters, Wave Tilt. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Critical Frequency, MUF and Skip Distance, Optimum Frequency, LUHF, Virtual Height, Ionospheric Abnormalities, Ionospheric Absorption. Space Wave Propagation – Mechanism, LOS and Radio Horizon. Tropospheric Wave Propagation – Radius of Curvature of path, Effective Earth's Radius, Effect of Earth's Curvature, Field Strength Calculations, M-curves and Duct Propagation and Tropospheric scattering.

TEXT BOOKS

1. "Antennas and Wavepropagation– John D. Kraus and Ronald J. Marhefka, 4th Edition, TMH, 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.
3. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001

REFERENCES

1. G.S.N Raju, "Antennas and Wave Propagation", 1st Edn Pearson Education, 2004.
2. Antennas and Wave Propagation – by R.L.Yadava ,2nd Edition PHI learning Private Limited,Delhi 2012
3. Antennas and Wave Propagation by Sisir K Das, Annapurna Das Tata MC Graw Hill Education Private limited,2013

URL's

http://nptel.ac.in/courses/108101092/

III Year - I Semester				
20EC5T09 – MICROPROCESSORS AND EMBEDDED SYSTEMS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. To understand the organization and architecture of Microprocessor
2. To understand assembly language programming using MP-8086
3. To gain the knowledge about interfacing supporting peripherals with 8086
4. To understand the architecture and organization of 8051 micro controller
5. To understand ARM architectures and organization of peripherals

COURSE OUTCOMES:

After going through this course, the student

1. Enumerate the architecture of 8086 Microprocessor
2. Develop Applications Using the 8086 Microprocessor and 8051 Microcontroller
3. Analyze various interfacing techniques and apply them for the design of processor
4. Acquire the knowledge of microcontrollers and the operations they perform.
5. Acquire the knowledge of the architecture of advanced microcontrollers and their operation

UNIT-I **[12 Hrs]**

8086: Introduction to Microprocessors, architecture, Register organization, memory segmentation, Memory addresses, physical memory organization, Operational modes, Signal pin descriptions-common function signals, timing diagrams.

UNIT-II **[8Hrs]**

Instruction set and assembly language programming of 8086: Instruction formats. Addressing modes, instruction set and assembler directives. Procedures, Macros, Simple programs involving logical, branch and call- return instructions, Interrupts of 8086.

UNIT-III **[12 Hrs]**

8086 Interfacing: 8255 PPI, interfacing of led, seven segment displays, Stepper motor interfacing, D/A &A/D converter, Memory interfacing to 8086, PIC-8259, USART-8251.

UNIT-IV **[12 Hrs]**

8051 Microcontroller: Overview of 8051 microcontroller, Architecture, I/O ports, Memory organization, addressing modes and instruction set of 8051Simple Programs, Timers, interrupts, Serial Communication.

UNIT- V **[12 Hrs]**

Introduction to Embedded Systems: Embedded Systems Overview, Design Challenge, Embedded Processor technology, IC technology, Design technology

Introduction to ARM Processor: Architecture, Registers, Pipeline, Interrupts ARM Instructions, LPC 2148, Architecture, and GPIO.

TEXT BOOKS:

1. A.K.Ray, K.M.Bhurchandi, ”Advanced Microprocessors and Peripherals”, Tata McGraw Hill Publications, 2000.
2. Ajay V Deshmukh,”Microcontrollers”, TATA McGraw Hill publications, 2012
3. Embedded System Design: A Unified Hardware/Software Approach, Frank Vahid and Tony Givargis, Draft version, Fall 1999
4. Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.

REFERENCES

1. Douglas-v-Hall,“Microprocessors-and-Interfacing-Programming-and-Hardware-2nd-Edition-TMH, 2006
2. Dr Mark Fisher, “ARM Cortex M4 cook book”- PACKT,March-2016
3. Microprocessors and Microcontrollers by N.Senthil Kumar, M.Saravanan and S.Jeevananthan, Oxford University Press, Seventh Impression 2013.
4. Raj Kamal, “Embedded systems: Architecture, programming and design”, TMH, 2nd Edition, 2007.

URLs:

https://www.tutorialspoint.com/microprocessor/microcontrollers_overview.htm

https://www.tutorialspoint.com/embedded_systems/es_processors.htm

https://www.electronicwings.com/arm7/lpc2148-32-bit-arm7tdmi-s-processor-gpio-ports-and-registers

https://embetronicx.com/about-us/

III Year - I Semester				
20EC5D01 INFORMATION THEORY & CODING	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Apply the basic concepts of information theory (entropy, channel capacity etc.)
2. Learn the principles and applications of information theory in communication systems
3. Study various data compression methods and describe the most common such methods
4. Understand the theoretical framework upon which error-control codes are built

COURSE OUTCOMES:

After going through this course, the student will be able to

1. Understand the basic concepts of information theory and entropy.
2. Determine the capacity of various channels.
3. Calculate Compression ratio of various source coding techniques.
4. Understand the design and analysis of coding/decoding scheme for digital Communication application.

UNIT I **[12 Hrs]**

Information theory: Concept of amount of information - units, Entropy -marginal, conditional and joint entropies - relation among entropies Mutual information, information rate, channel capacity, redundancy and efficiency of channels. Chain Rules, Data-Processing Inequality, Fano's Inequality

UNIT II **[12 Hrs]**

Discrete channels: Symmetric channels, Binary Symmetric Channel, Binary Erasure Channel, Cascaded channels, repetition of symbols, Binary unsymmetric channel, and Shannon theorem.

Continuous channels: Capacity of band limited Gaussian channels, Shannon-Hartley theorem, Trade off between band width and signal to noise ratio, Capacity of a channel with infinite band width, Optimum modulation system.

UNIT III **[12 Hrs]**

Source Coding: Encoding techniques, Purpose of encoding, Instantaneous codes, Construction of instantaneous codes, Kraft's inequality, Coding efficiency and redundancy, Noiseless coding theorem. Construction of basic source codes: - Shannon-Fano algorithm, Huffman coding, Arithmetic coding, LZW coding

UNIT IV **[12 Hrs]**

Error Detection and Correction: Parity check coding, Linear block codes, Error detecting and correcting capabilities, Generator and Parity check matrices, Standard array and Syndrome decoding, Hamming codes, Encoding and decoding of systematic and unsystematic codes

UNIT V **[12 Hrs]**

Cyclic codes: - Generator polynomial, Generator and Parity check matrices, Encoding of cyclic codes, Syndrome computation and error detection, Decoding of cyclic codes, BCH codes, RS codes, Burst error correction.

TEXT BOOKS:

1. Information Theory, Coding and Cryptography - Ranjan Bose, 2nd Edition, Tata McGraw Hill, New Delhi, 2008
2. Communication Systems - Simon Haykin, John Wiley & Sons. Pvt. Ltd.
3. Digital Communications Fundamentals and Applications - Bernard Sklar, Prentice Hall, 2/e, 2001

REFERENCES:

1. Principles of Communication Systems - Taub & Schilling, Tata McGraw-Hill
2. Principles of Digital Communication - Das, Mullick & Chatterjee, Wiley Eastern Ltd.
3. Error Control Coding Fundamentals and Applications - Shu Lin & Daniel J. Costello Jr, Prentice Hall Inc.

URL'S:

https://nptel.ac.in/courses/108102117

III Year - I Semester				
20EC5D02 DISPLAY DEVICES	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. To understand properties of light.
2. To analyze Display Glasses, Inorganic Semiconductor TFT Technology.
3. To compare Inorganic Phosphors, Cathode Ray Tubes, Vacuum Florescent Displays.
4. To differentiate between Paper like and Low Power Displays.
5. To analyze Micro-display Technologies.

COURSE OUTCOMES:

After going through this course, the student will be able to

1. Understand Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Binocular Vision and Depth Perception.
2. Understand Photolithography for Thin Film LCD, Wet Etching, Dry Etching; Flexible Displays.
3. Understand Thin Film Electroluminescent Displays, AC Powder Electroluminescent Displays, Organic Electroluminescent Displays: OLEDs, Active Matrix for OLED Displays .
4. Be aware of Colorant Transposition Displays, MEMs Based Displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic 3-D Technology
5. Understand Liquid Crystals on Silicon Reflective Micro-display, Trans missive Liquid Crystal Micro-display, MEMs Micro-display, DLP Projection Technology.

UNIT -I **[12Hrs]**

Properties of Light, Geometric Optics, Optical Modulation, Vision and Perception, Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Binocular Vision and Depth Perception, Driving Displays: Direct Drive, Multiplex and Passive Matrix, Active Matrix Driving, Panel Interfaces, Graphic Controllers, Signal Processing Mechanism, Power Supply, Fundamentals, Power Supply Sequencing.

UNIT-II **[12Hrs]**

Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology, Transparent Conductors, Patterning Processes: Photolithography for Thin Film LCD, Wet Etching, Dry Etching; Flexible Displays: Attributes, Technologies Compatible with Flexible Substrate and Applications, TFT Signal Processing Techniques, Touch Screen Technologies:Introduction, Coatings, Adhesive, Interfaces with Computer Mechanism.

UNIT-III **[12Hrs]**

Inorganic Phosphors, Cathode Ray Tubes, Vacuum Florescent Displays, Filed Emission Displays Plasma Display Panels, LED Display Panels,Inorganic Electroluminescent Displays: Thin Film ElectroluminescentDisplays, AC Powder Electroluminescent Displays, Organic Electroluminescent Displays: OLEDs, Active Matrix for OLED Displays

UNIT-IV **[12Hrs]**

Paper like and Low Power Displays: Colorant Transposition Displays,MEMs Based Displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic3-D Technology, Volumetric and 3-D Volumetric DisplayTechnology, Holographic 3-D Technology; Mobile Displays: TransreflectiveDisplaysfor Mobile Devices, Liquid Crystal Optics for MobileDisplays, Energy Aspects of Mobile Display Technology.

UNIT-V **[12Hrs]**

Micro display Technologies: Liquid Crystals on Silicon Reflective Microdisplay, Trans missive Liquid Crystal Micro-display, MEMs Microdisplay,DLP Projection Technology; Micro-display Applications:Projection Systems, Head Worn Displays; Electronic View Finders, Multifocus Displays, Occlusion Displays, Cognitive Engineering andInformationDisplays,Display Metrology, Standard MeasurementProcedures, Advanced Measurement Procedures: Spatial Effects, Temporal Effects, Viewing Angle, Ambient Light; Display Technology DependentIssues, Standards and Patterns, Green Technologies in DisplayEngineering.

TEXTBOOKS:

1. Janglin Chen, Wayne Cranton, Mark Fihn , "Handbook of Visual Display Technologies" Springer International Publishing , December 2011.
2. Handbook of Visual Display Technology. (2016). Germany: Springer International Publishing.
3. Castellano, Joseph A Handbook of Display Technology. United States, Elsevier Science, 2012.

REFERENCES:

1. Liquid Crystal Displays: Addressing Schemes and Electro-Optical Effects (Wiley Series in Display Technology) 1st Editionby Ernst Lueder
2. Electronic Display Measurement: Concepts, Techniques, and Instrumentation 1st Edition by Peter A. Keller
3. Optics of Liquid Crystal Displays (Wiley Series in Pure and Applied Optics) 1st Edition by PochiYeh (Author), Claire Gu (Author)

URL's:

https://www.colorado.edu/ecee/online-masters/curriculum/photonics-and-optics/ecea-5607-displays

III Year - I Semester				
20EC5D03 COMPUTER NETWORKS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Understand state-of-the-art in network protocols, architectures, and applications.
2. Process of networking research
3. Constraints and thought processes for networking research
4. Problem Formulation—Approach—Analysis.

COURSE OUTCOMES:

After going through this course, the student will be able to

1. Identifying the network models and identifying different reference models.
2. Analyzing the organization structure and select the most appropriate network architecture and technology.
3. Understands the concepts of internetworking devices and routing techniques
4. Knowledge on how datagram is transferred and ordered and how connection oriented and connectionless services work.
5. Knowledge on naming services and DNS, SMTP, SNMP, FTP, HTTP protocols

UNIT – I **[12 Hrs]**

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models.

UNIT-II **[12Hrs]**

Physical Layer: Guided Transmission Media, Digital Modulation and Multiplexing: Frequency Division Multiplexing, Time DivisionMultiplexing, Code Division Multiplexing . **Data Link Layer** - Services Provided to the Network Layer – Framing – Error Control – Flow Control, ErrorDetection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols-A Simplex Stop and Wait Protocol for an Error free channel-A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols-A One Bit Sliding Window Protocol-A Protocol UsingGo-Back-N- A Protocol Using Selective Repeat

UNIT-III **[12Hrs]**

Medium Access Control Sublayer-The Channel Allocation Problem-Static Channel Allocation-Assumptions for Dynamic Channel Allocation, Multiple Access Protocols-Aloha-Carrier Sense Multiple Multiple Access ProtocolsCollision-Free Protocols-Limited Contention Protocols-Wireless LAN Protocols, Ethernet-Classic Ethernet Physical Layer-Classic Ethernet MAC Sublayer Protocol-Ethernet Performance-Fast Ethernet Gigabit Ethernet-10-Gigabit Ethernet.

UNIT –I V **[12 Hrs]**

Network Layer : Design Issues – Store and Forward Packet Switching-Services Provided to theTransport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortestpath Algorithm, Congestion Control Algorithms-Approaches to Congestion Control-Traffic Aware Routing Admission Control-Traffic Throttling-Load Shedding.

UNIT – V **[12 Hrs]**

Transport Layer – The Internet Transport Protocols: Udp, the Internet Transport Protocols: TCP

Application Layer –The Domain Name System: The DNS Name Space, Resource Records, Name Servers, Electronic Mail: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery.

TEXT BOOKS:

1. Computer Networks, Tanenbaum and David J Wetherall, 5th Edition, Pearson Edu, 2010
2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf,McGraw HillEducation
3. A course in Computer Networks, Dr Sanjay Sharma, Katson book publications.

REFERENCE BOOKS:

1. Larry L. Peterson and Bruce S. Davie, "Computer Networks - A Systems Approach" (5thed), MorganKaufmann/ Elsevier, 2011.
2. Wayne Tomasi "Introduction to Data communication and Networking" 1st Edition, PearsonEducation India, 2007.
3. Computer Networks Sarika Gupta, Gaurav Gupta, Khanna Book publication 1st Edition.

URL's:

https://www.pcmag.com/encyclopedia/term/maclayer#:~:text=(Media%20Access%20Control%20layer)%20The,Token%20Ring%2C%20FDDI%20and%20MAP**.**

https://www.cloudflare.com/en-in/learning/network-layer/what-is-the-network-layer/

https://www.geeksforgeeks.org/transport-layer-responsibilities/'

III Year - I Semester				
20EC5L07 – LINEAR IC APPLICATIONS LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Minimum Twelve Experiments to be conducted:

1. Study of ICs - IC 741, IC 555, IC 565, IC 566, IC 1496 - Functioning, Parameters and Specifications.
2. OP-AMP Applications- Adder, Subtractor, Comparator Circuits.
3. Implementation of an Integrator and Differentiator Circuits using Op-Amp 741.
4. Implementation of first order LPF, HPF using Op-Amp 741.
5. Implementation of Second order BPF, Band Reject (Wideband) and Notch Filters using Op- Amp 741
6. IC 741 Oscillation Circuits - Phase Shift and Wien Bridge Oscillator.
7. Function Generator using OP AMPs.
8. IC 555 Timer – Monostable Operation and Astable Operation Circuit.
9. Schmitt Trigger Circuit - using IC 741 AND IC 555.
10. Evaluate Capture range and Lock range using PLL IC 565.
11. IC 566 - VCO Applications.
12. Voltage Regulator using IC 723.
13. Three Terminal Voltage Regulators - 7805, 7809, 7912.
14. 4-bit DAC using OP AMP.

Equipment required:

1. RPS
2. DSO.
3. Function Generator.
4. Multi Meters.
5. Bread Boards.
6. Components - IC741, IC555, IC565, IC1496, IC723, 7805, 7809, 7912 and other essential components
7. Analog IC Tester

III Year - I Semester				
20EC5L08 – MICROPROCESSORS AND EMBEDDED SYSTEMS LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

LIST OF EXPERIMENTS

PART-A: 8086 Assembly Language Programming using Assembler Directives (Minimum of 5 Experiments has to be performed)

1.Sorting Ascending / descending order
2.Multi-byte addition/subtraction/Multiplication/division.
3.Sum of squares of a given n-numbers.
4.Sum of cubes of a given n-numbers.
5.Factorial of given n-numbers.
6.Processing of strings
7.Conversion programs (BCD to ASCII/BCD to Decimal/ Decimal to ASCII/Packed to Unpacked)

PART- B: 8086 interfacing (Minimum of 2 Experiments has to be performed)

8.Stepper motor interface.
9.D/A Interface through Intel 8255.
10. Display Interface through Intel 8279.

PART- C: 8051 Assembly Language Programs (Minimum of 3 Experiments has to be performed)

11. Finding number of 1's and number of 0's in a given 8-bit number
12. Addition of even numbers from a given array
13. Average of n-numbers
14. LCM/GCD of an array

PART-D: (Minimum of 2 Experiments has to be performed)

15. Interfacing of key board with ARM
16. Interfacing of Buzzer with ARM

17. Interfacing of Traffic light controller with ARM

Equipment Required:

1.Regulated Power supplies.

2.Analog /Digital Storage Oscilloscopes.

3.8086 Microprocessor kits.

4.8051 microcontroller kits.

5.ARM processors

6.ADC module.

7.DAC module.

8.Stepper motor module.

9.Keyboard module.

10. LED, 7-Segemt Units.

11. Digital Multimeters.

12. ROM/RAM Interface module.

13. Bread Board etc.

III Year - I Semester				
20EC5S03 – CLOUD FOUNDATIONS	**L**	**T**	**P**	**C**
(Skill Advanced Course)	**1**	**0**	**2**	**2**

PART A (AWS Cloud Foundations)

1. Cloud Concepts Overview
2. Cloud Economics and Billing
3. AWS Global Infrastructure Overview
4. Cloud Security
5. Networking and Content Delivery
6. Compute, Storage, Data Bases
7. Cloud Architecture
8. Auto Scaling and Monitoring

PART B (AWS Cloud Architecting)

1. Introducing Cloud Architecting
2. Adding a Storage, Compute, Data Base layer
3. Creating a Networking environment, Connecting Networks
4. Securing user and Application Access
5. Implementing Elasticity, High Availability, Monitoring
6. Automating Your Architecture
7. Caching Content
8. Building Decoupled Architectures
9. Building Micro Services and Server less Architectures
10. Planning for Disaster
11. Bridging to Certification

III Year - I Semester				
20EE5E01 DIGITAL CONTROL SYSTEMS	**L**	**T**	**P**	**C**
(Open Elective-I)	**3**	**0**	**0**	**3**

UNIT – I

Introduction and signal processing: Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Signals and processing – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

UNIT–II

Z–transformations: z–Transforms – Theorems – Finding inverse z–transforms – Formulation of difference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses.

UNIT–III

State space analysis and the concepts of Controllability and observability: State space representation of discrete time systems – State transition matrix and methods of evaluation – Discretization of continuous – Time state equations – Concepts of controllability and observability – Tests(without proof).

UNIT – IV

Stability analysis: Mapping between the s–Plane and the z–Plane – Primary strips and Complementary strips – Stability criterion – Modified Routh's stability criterion and Jury's stability test.

UNIT – V

Design of discrete–time control systems by conventional method and State feedback controllers: Transient and steady state specifications – Design using frequency response in the w–plane for lag and lead compensators – Root locus technique in the z–plane. Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula.

Text Books:

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.

2. Digital Control and State Variable Methods by M.Gopal, TMH, 4th Edition.

Reference Books:

1.Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003

III Year - I Semester				
20CS5E01 COMPUTER ORGANIZATION (Open Elective-I)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The course objectives of Computer Organization are to discuss and make student familiar with the

1. Principles and the Implementation of Computer Arithmetic
2. Operation of CPUs including RTL, ALU, Instruction Cycle and Busses
3. Fundamentals of different Instruction Set Architectures and their relationship to the CPU Design
4. Memory System and I/O Organization
5. Principles of Operation of Multiprocessor Systems and Pipelining

COURSE OUTCOMES:

By the end of the course, the student will

1. Develop a detailed understanding of computer systems
2. Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
3. Develop a detailed understanding of architecture and functionality of central processing unit
4. Exemplify in a better way the I/O and memory organization
5. Illustrate concepts of parallel processing, pipelining and inter processor communication

UNIT I

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating, Point Representation. Other Binary Codes, Error Detection Codes. Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms.

UNIT II

Register Transfer Language and Micro operations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit. Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description.

UNIT III

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer. Microprogrammed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

UNIT IV

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory. Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

UNIT V

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration. Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor.

Text Books:

1) Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.

2) Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5/e, McGraw Hill, 2002.

Reference Books:

1) Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.

2) Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.

3) Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer, 2006.

III Year - I Semester				
20CS5E02 OBJECT ORIENTED PROGRAMMING (Open Elective-I)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

1. Understanding the OOP's concepts, classes and objects, threads, files, applets, swings and act.

2. This course introduces computer programming using the JAVA programming language with object oriented programming principles.

COURSE OUTCOMES:

1. Understand Java programming concepts and utilize Java Graphical User Interface in Program writing.

2. Write, compile, execute and troubleshoot Java programming for networking concepts.

3. Build Java Application for distributed environment.

UNIT I

Introduction to OOP, procedural programming language and object oriented language, principles of OOP, applications of OOP, history of java, java features, JDK, JVM, program structure. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associatively, primitive type conversion and casting, flow of control.

UNIT II

Arrays, command line arguments, Classes and objects, class declaration, creating objects, methods, constructors and constructor overloading, garbage collector, importance of static keyword and examples, this keyword, nested classes.

UNIT III

Inheritance, types of inheritance, super keyword, final keyword, overriding and abstract class. Interfaces, creating the packages, using packages, importance of CLASSPATH and java.lang package. Exception handling, importance of try, catch, throw, throws and finally block, user defined exceptions, Assertions.

UNIT IV

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread

synchronization, communication between threads. Reading data from files and writing data to files, random access file

UNIT V

Introduction to Java FX, AWT: introduction, components and containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Container class, Layouts, Menu and Scrollbar.

Text Books:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.

2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.

3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

Reference Books:

1. Swing: Introduction, JFrame, JApplet, JPanel, Componets in Swings, Layout Managers in

2. Swings, JList and JScrollPane, Split Pane, JTabbedPane, JTree, JTable, Dialog Box.

III Year - I Semester				
20ML5E01 ARTIFICIAL INTELLIGENCE (Open Elective-I)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

1. To provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. To provide a basic exposition to the goals and methods of Artificial Intelligence.

COURSE OUTCOMES:

1. Upon successful completion of the course, the student will be able to:
2. Enumerate the history and foundations of Artificial Intelligence
3. Apply the basic principles of AI in problem solving
4. Choose the appropriate representation of Knowledge

UNIT I

Introduction: What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT II

Problem Solving: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

UNIT III

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system,axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic

UNIT IV

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

UNIT V

Expert system and applications: Introduction phases in building expert systems, expert system versustraditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools

Text Books:

1) Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Pearson

2) Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

Reference Books:

1. Artificial intelligence, A modern Approach , 2nd edition, Stuart Russel, Peter Norvig, PEA

2. Artificial Intelligence- Rich, Kevin Knight, Shiv Shankar B Nair, 3rd edition, TMH

3. Introduction to Artificial Intelligence, Patterson, PHI

III Year - I Semester				
20ME5E01 INDUSTRIAL AUTOMATION AND ROBOTICS (Open Elective-I)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

COB1: To give students practice in applying their knowledge of mathematics, science, and Engineering and to expand this knowledge into the vast area of robotics.

COB2: The students will be exposed to the concepts of robot kinematics, Dynamics, Trajectory planning

COB3: Mathematical approach to explain how the robotic arm motion can be described.

COB4: The students will understand the functioning of sensors and actuators

COURSE OUTCOMES:

After successful completion of the course, the students should be able to

CO1. Identify the need of Robotics & Automation

CO2. Explain various components used in Industrial Robotics

CO3. Apply D-H convention to estimate kinematics of manipulator.

CO4. Analyze how to plan the trajectory for the robot and various robot programming methods

CO5. Develop robots for different manufacturing applications

UNIT-I

INTRODUCTION: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – Need of Automation, Advantages & Disadvantages of automation, – classification by coordinate system and control system.

UNIT-II

COMPONENTS OF THE INDUSTRIAL ROBOTICS: Function line diagram representation of robot arms, common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors, Types of Gripper Mechanisms, Considerations in Gripper selection and design.

UNIT- III

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation – problems.

MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

UNIT- IV

General considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language.

UNIT-V

ROBOT ACTUATORS AND FEED BACK COMPONENTS: Actuators: Pneumatic, Hydraulic actuators, Comparison of Electruc, Hydraulic and pneumatic devices, electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

ROBOT APPLICATIONS IN MANUFACTURING: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection, Introduction to Drones

Text Books:

1. Industrial Robotics / Groover M P /Pearson Edu.

2. Robotics and Control / Mittal R K & Nagrath I J / TMH.

3. Drones The Ultimate Guide/ Casey Publishing- Gray candle publishing.

References:

1. Robotics / Fu K S/ McGraw Hill.

2. Robotic Engineering / Richard D. Klafter, Prentice Hall Principles of Heat Transfer – Frank Kreith, RM Manglik & MS Bohn, Cengage learning publishers.

3. Robot Analysis and Control / H. Asada and J.J.E. Slotine / BSP Books Pvt.Ltd.

4. Introduction to Robotics / John J Craig / Pearson Edu.

III YEAR I SEMESTER	L	T	P	C
20CE5E01 INTERIOR SPACE DESIGN (Open Elective - I)	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

To familiarize students with the importance and concepts of design of interior spaces of residential and commercial spaces

COURSE OUTCOMES:

After completing the course the student will be able to

1. Explain the purpose of designing interior spaces
2. Analyse ergonomic principles
3. Apply the anthromorphic data to design the spaces
4. Deisgn interior spaces of commercial and business complexes
5. Evaluate the importance of plants in the interior design

UNIT – I **(08h)**

Introduction to designing residential interior spaces - purpose of designing residential interior spaces considerations for designing residential interior spaces big and small. Criteria for planning a house- orientation grouping of rooms circulation between within the rooms flexibility privacy roominess light and ventilation services aesthetics cost.

UNIT – II **(09h)**

Factors contributing to selection of furniture and furnishing climate needs and preferences availability of materials cost. Ergonomic principles - its importance and application in designing- residential interior spaces with focus on special population

UNIT – III **(8h)**

Anthropometric data- relation of human body measurements to furniture design and work station design - study of body postures and its importance in designing residential spaces.

UNIT – IV **(12h)**

Introduction to commercial interior space design- types of commercial interior spaces - factors influencing - materials used. Designing consideration for commercial spaces shops, restaurants, clinics, offices, library. Application of ergonomic principles in designing commercial interior spaces

Study of different body postures adopted in carrying out activities and its relation in designing different work counters in various commercial spaces

UNIT – V **(8h)**

Importance and use of accessories plants landscapes in designing commercial interior spaces

Text Books:

1. Residential planning and design by Jeannie Ireland, 2018, Fairchild Books.
2. The interior plan by Roberto J.Rengel, 2nd edition, Bloomsbury Academic USA
3. Shaping interior space by Roberto J.Rengel, 2nd edition, Fairchild Books.

References Books:

1. Space planning for commercial office interiors by Mary Lou Bakker, 2nd edition, Bloomsbury Academic USA
2. Live Beautiful by Athena Calderone, 2020, Harry N. Abrams publishers
3. The Interior Design Reference & Specification by Mimi Love and Chris Grimley,2018, Rockport Publishers

III Year - I Semester				
20EC5E01 – PRINCIPLES OF COMMUNICATIONS (Open Elective-I) (Not For ECE Students)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

This course will enable students to:

1. Understand the fundamentals of Signals and operations on analog signals.
2. Understand the fundamentals of Analog communication systems.
3. Understand the concepts in Angle modulation for the design of communication systems
4. Learn pulse modulation and sampling techniques
5. Learn various digital Modulation techniques used in Communication systems.

COURSE OUTCOMES:

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

1. Classify various types of signals and perform various operations on signals.
2. Analyze the performance of analog modulation schemes in time and frequency domains.
3. Analyze the performance of angle modulated signals.
4. Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation.
5. Analyze various Digital Modulation Schemes.

UNIT - I **[12 Hrs]**

Introduction to signals: Definition of Signals and Systems, Classification of Signals, Classification of Systems. Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling.

UNIT – II **[12 Hrs]**

Amplitude Modulation: Introduction to communication system, Need for modulation, Amplitude Modulation - Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT - III **[12 Hrs]**

Angle Modulation: Angle Modulation fundamentals, Frequency Modulation - Modulation index, Narrowband FM, Wideband FM, FM Modulator- Reactance Modulator FM demodulation- Slope detector, Phase Modulation, Frequency Modulation verses Amplitude Modulation,

UNIT-IV **[12 Hrs]**

Signal Sampling: Sampling, Sampling Theorem, Nyquist rate, Multiplexing Techniques

Analog Pulse Modulation: Pulse Amplitude Modulation, PulseWidth Modulation, Pulse Position Modulation.

UNIT - V **[12 Hrs]**

Elements of Digital Communication: Block diagram of Digital Communication, Advantages, Generation and reconstruction of PCM and DPCM.

Text books:

1. Principles of Communication Systems – H Taub & D. Schilling, GautamSahe, TMH, 2007, 3rdEdition.
2. Louis E. Frenzel, Principles of Electronic Communication Systems, 3rd Edition. Tata Mcgraw Hill.
3. K. Sam Shanmugam "Digital and Analog Communication Systems", Wiley India Edition, 2008.

References:

1. Communication Systems – B.P. Lathi, BS Publication,2006.
1. Principles of Communication Systems - Simon Haykin, John Wiley,2ndEdition.
2. Electronics & Communication System – George Kennedy and Bernard Davis,TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH,2007.
4. Wayne Tomasi, Electronic Communications Systems, 5th Edition, Pearson Education.

URL'S

https://onlinecourses.nptel.ac.in/noc22_ee05/preview

III Year - II Semester				
20EC6T10 VLSI Design	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Learn the various fabrication steps of IC and come across basic electrical properties of MOSFET.
2. Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect and to verify the functionality, timing, power and parasitic effects.
3. Understand the Scaling of MOS Circuits.
4. Learn concepts and techniques of modern integrated circuit design and testing (CMOS VLSI).

COURSE OUTCOMES:

After going through this course, the student

1. Demonstrate the fabrication steps of various MOS technologies
2. Evaluate electrical properties of MOS transistors.
3. Construct layouts using MOS technology-specific layout and scaling rules.
4. Estimate the parasitic of MOS circuits
5. Illustrate the design prospects of various subsystems

UNIT I **[12Hrs]**

Introduction To MOS Technology: Evolution of VLSI, Moore's Law, Basic MOS transistors, enhancement and depletion modes of transistor action, MOS and related VLSI technology, NMOS, CMOS, BICMOS, IC production process, Comparison between CMOS and Bipolar technologies.

UNIT II **[14Hrs]**

Basic Electrical Properties of MOS and BI-CMOS Circuits: IDS versus VDS Relationship, aspects of MOS transistor threshold voltage, MOS trans conductance and output conductance, MOS transistor figure of merit, pass transistor, MOS inverter ,determination of pull–up to pull-down ratio for nMOS inverter driven by another nMOS inverter and for an nMOS inverter driven through one or more pass transistors, alternative forms of pull –up, the CMOS inverter, MOS transistor circuit model, Bi-CMOS inverter, latch –up in CMOS circuits and Bi-CMOS latch up susceptibility.

UNIT III **[10Hrs]**

MOS and Bi-CMOS Circuit Design Processes: VLSI design flow, MOS layers, stick diagrams, design rules and Layout- wires and vias, Lambda based design rules. 2µ meter, 1.2µ meter design rules, double metal double poly CMOS rules. Layout diagrams of Universal gates.

UNIT IV **[12Hrs]**

Scaling of MOS Circuits: Scaling models, Scaling factors for device parameters, Limitations of Scaling.

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concepts applied to MOS transistors and inverters, Area capacitance of layers, standard unit of capacitance some area capacitance calculations, delay unit, inverter delays, driving large capacitive loads, wiring capacitances, choice of layers. Introduction to FINFET and TFET.

UNIT V **[12Hrs]**

FPGA Design: FPGA design flow, Basic FPGA architecture, FPGA Technologies, FPGA families- Altera Flex 8000FPGA, Xilinx XC4000 series FPGA, Xilinx Vertex FPGA. Case studies: FPGA Implementation of Half adder and full adder.

Introduction to synthesis: Logic synthesis, RTL synthesis, High level Synthesis.

Text Books

1. Essential of VLSI Circuits and systems - Kamran Eshraghian, Douglas A.Pucknell, Sholeh Eshraghian, PHI, 2005.
2. Principles of CMOS VLSI Design - Neil H.Weste, John Wiely, 2006 Edition.
3. CMOS Digital Integrated Circuits Analysis and Design - Sung-Mo Kang, Yusuf Leblebici, TMH Education, 2003.

Reference Books

1. Introduction to VLSI Circuits and systems - John P. UyemuraJhon Wiely, 2005 Edition.
2. Modern VLSI Design, Wayne Wolf - PHI, 4th Edition.
3. Fundamentals of Logic Design- Charles H. Roth Jr, Larry L Kinney,Sixth Edition, Cengage Learning.

URL's:

https://nptel.ac.in/courses/117101058

https://archive.nptel.ac.in/courses/108/101/108101089/

III Year - II Semester				
20EC6T11 DIGITAL SIGNAL PROCESSING	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. To understand the basic concepts and techniques for processing signals and digital signal processing fundamentals.
2. To Understand the processes of analog-to-digital and digital-to-analog conversion and relation between continuous-time and discrete time signals and systems.
3. To Master the representation of discrete-time signals in the frequency domain, using z-transform, discrete Fourier transforms(DFT).
4. To Understand the implementation of the DFT in terms of the FFT, as well as some of its applications (computation of convolution sums, spectral analysis).
5. To learn the basic design and structure of FIR and IIR filters with desired frequency responses and design digital filters.
6. The impetus is to introduce a few real-world signal processing applications.
7. To acquaint in FFT algorithms, Multi-rate signal processing techniques and finite word length effects.

COURSE OUTCOMES:

After going through this course the student will be able to

1. Perform time, frequency and z-transform analysis on signals and systems
2. Understand the inter relationship between DFT and various transforms
3. Understand the significance of various filter structures and effects of rounding errors
4. Design a digital filter for a given specification
5. Understand the fast computation of DFT and Appreciate the FFT processing
6. Understand the trade-off between normal and multi rate DSP techniques and finite length word effects

UNIT I [12Hrs]

Introduction to Digital Signal Processing: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, Linear Shift Invariant Systems, Stability, and Causality, Realization of Digital Filters: Solution of Difference Equations Using Z-Transform, Realization of Digital Filters - Direct, Canonic forms.

UNIT II [12 Hrs]

Discrete Fourier Transforms: Properties of DFT. Linear Convolution of Sequences using DFT. **Computation of DFT:** Over-lap Add Method, Over-lap Save Method.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

UNIT III **[12 Hrs]**

IIR Digital Filters: Analog Filter Approximations - Butterworth and Chebyshev, Design of IIR Digital filters from Analog Filters, Bilinear Transformation Method.

UNIT IV **[12 Hrs]**

FIR Digital Filters: Characteristics of FIR Digital Filters. Design of FIR Filters: using Window Techniques, Comparison of IIR & FIR filters.

UNIT V **[10 Hrs]**

Multirate Digital Signal Processing: Introduction, Down sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion, Applications of Multi Rate Signal Processing.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI,2007.
2. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI,2009.
3. Digital Signal Processing - NagoorKhani, TMG,2012.

REFERENCE BOOKS:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier,2008.
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L.Harris,bThomson,2007.
3. Digital Signal Processing –A.Anandkumar, PHI ,2016.

URLs:

http://nptel.ac.in

http://en.wikipedia.org

http://coursera.org

III Year - II Semester				
20EC6T12 MICROWAVE and OPTICAL COMMUNICATION	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. To get familiarized with fundamental characteristics of waveguides through electromagnetic field analysis.
2. Understand the function, design, and integration of the major microwave components, oscillators, power amplifier.
3. Understand a Microwave test bench setup for measurements.
4. Understand the utility of Optical Fibers in Communications.

COURSE OUTCOMES:

After going through this course, the student will be able to

1. Design different modes in waveguide structures
2. Calculate S-matrix for various waveguide components and splitting the microwave Energy in a desired direction
3. Measure various microwave parameters using a Microwave test bench.
4. Understand the mechanism of light propagation through Optical Fibers.

UNIT I **[12Hrs]**

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves, Rectangular Waveguides – TE or TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE or TM mode fields in the cross-section, Mode Characteristics, Wavelengths and Impedance Relations and Cavity Resonators.

UNIT II **[12Hrs]**

MICROWAVE TUBES: Two Cavity Klystrons-Structure, Velocity Modulation and Bunching process, Reflex Klystrons-Structure, principle of working. HELIX TWTS: Significance. Types and Characteristics of Slow Wave Structures; Structure of TWT.

MICROWAVE SOLID STATE DEVICES: Introduction, Classification, Applications. TEDs Gunn Diode – Principle, RWH Theory, Characteristics, LSA Mode of operation**.**

UNIT III **[12Hrs]**

WAVEGUIDE COMPONENTS : Scattering matrix parameters: Definition, Properties, Salient Features - Waveguide T junctions and applications , Attenuators – Resistive Card, Rotary Vane types, 2 Hole, Bethe Hole types, Isolators and circulators

MICROWAVE MEASUREMENTS: Description of Microwave Bench- Different Blocks, Microwave Power Measurement- Bolometer Method. Measurement of Attenuation by Reflection Method, VSWR, Impedance Measurement.

UNIT I V **[12Hrs]**

OPTICAL COMMUNICATION BASICS : Overview of optical fiber communication, Total Internal Reflection, Numerical Aperture, Graded index fibers, Cut off wavelength. optical fiber connectors, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Multimode fiber joints, single mode fiber joints. Losses in Optical Fibers.

UNIT –V [12Hrs]

OPTICAL SOURCES AND DETECTORS: Qualitative treatment, Structures, Materials, Quantum efficiency, Physical principles and comparison of Optical sources and detectors, Related problems. Optical system design- Point to point links – Component Choice and considerations, Link power budget.

TEXT BOOKS :

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rdEdition,1994.
2. Microwave Engineering- Annapurna Das and Sisir K. Das, Mc Graw Hill Education, 3rdEdition,2014
3. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition,3rd Edition,2000.

REFERENCES :

1. Microwave Engineering – G S N Raju , I K International Publishing House Pvt. Limited,2008.
2. Microwave Engineering - G.S. Raghuvanshi, Cengage Learning India Pvt. Ltd., 2012.
3. Optical Fiber Communications: Principles and Practice-Senior John M. Third edition, Pearson Education Limited- 2009.

URL's:

https://nptel.ac.in/courses/108103141

https://nptel.ac.in/courses/108106167

III Year - II Semester				
20EC6D07 Bio Medical Instrumentation	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Understand the Basic Concepts of Biomedical Engineering.
2. Introduce an Fundamentals of Transducers as Applicable to Physiology
3. Explore the Human Body Parameter Measurements Setups.
4. Give Basic Ideas about how Lasers are used in Bio Medical Field.

COURSE OUTCOMES:

After going through this course, the student

1. Understand the importance in the Development of Biomedical Instrumentation.
2. Understand the Transducer types, potentials and Electrodes used in Biomedical Applications.
3. Understand Measuring and Monitoring Instruments in different aspects of living body
4. Understand Modern Imaging systems like X-ray and Digital Radiography
5. Understand the clear idea about the Pacemakers and the use of computers in Biomedical Applications.

UNIT-I **[12 Hrs]**

Introduction to Biomedical Instrumentation: The Age of Biomedical Engineering, Development of Biomedical instrumentation, Biometrics, Introduction to the Man-Instrument System, Components of the Man-Instrument System, Physiological Systems of the Body, Problems Encountered in Measuring a Living System.
Sources of Bioelectric Potentials: Resting and Action Potentials, Propagation of Action Potentials, the Bioelectric Potentials.

UNIT-II **[12 Hrs]**

Basic Transducer principles: The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications
Electrodes: Electrode Theory, Bio potential Electrodes, Biochemical Transducers.

UNIT-III **[12 Hrs]**

Instrumentation for sensory measurements and the study of behaviour: Psychophysiological Measurements, Instruments for Testing Motor Responses, Instrumentation for Sensory

Measurements, Instrumentation for the Experimental Analysis of Behaviour, Biofeedback Instrumentation.

Biotelemetry: Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, the Components of a Biotelemetry System, Implantable Units, Applications of Telemetry in Patient Care.

UNIT-IV **[12 Hrs]**

X-ray and Digital Radiography Instrumentation: Basis of Diagnostic Radiology, Nature of X-rays, Production of X-rays, X-ray Machine, Visualization of X-rays, Dental X-ray Machines, Portable and Mobile X-ray Units, Physical Parameters for X-ray Detectors, Digital Radiography.

UNIT-V **[12 Hrs]**

Cardiac Pacemakers: Need for Cardiac Pacemaker, External Pacemakers, Implantable Pacemakers, Recent Developments in Implantable Pacemakers, Pacing System Analyzer.

The Computer in Biomedical Instrumentation: The Digital Computer, Microprocessors, Interfacing the Computer with Medical Instrumentation and Other Equipment, Biomedical Computer Applications.

TEXTBOOKS:

1. Handbook of Biomedical Instrumentation –Technology and Application By R.S. Khandpur Published by Tata McGraw-Hill-2nd Edition.
2. Biomedical Instrumentation and Measurements-by Leslie Cromwell published by Prentice-Hall-2nd Edition.
3. Biomedical Engineering and Design Handbook vol1-Fundamentals-by Myer Kutz published by McGraw-Hill-2nd Edition.

REFFERENCES

1. Principles of Biomedical Engineering-by Sundararajan Published by Artech House.
2. Medical Instrumentation –Application and Design by john G.webster Published by John Wiley and sons.
3. A Textbook of Medical Instruments by S.Ananthi Published by A New Age International Limited.

URL'S:

https://www.sciencedirect.com/book/9780080187556/an-introduction-to-biomedical-instrumentation

https://www.britannica.com/science/bioelectric-potential

https://www.xraymachine.in/radiology-instruments.html

https://link.springer.com/book/10.1007/978-1-4613-0745-7?noAccess=true

III Year - II Semester				
20EC6D08 DIGITAL IMAGE PROCESSING	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Study the Image Fundamentals and Mathematical Transforms Necessary for Image Processing.
2. Study the Image Enhancement Techniques
3. Study Image Restoration Procedures.
4. Study the Image Compression Procedures.

COURSE OUTCOMES:

After going through this course, the student

1. Become familiar with digital image fundamentals
2. Get exposed to simple image enhancement techniques in Spatial and Frequency domain.
3. Learn concepts of degradation function and restoration techniques.
4 Learn the concepts of different color models and color image processing.
5. Study the image segmentation and representation techniques and become familiar with image compression and recognition methods

UNIT I **[12 Hrs]**

Digital Image Fundamentals: Steps in Digital Image Processing, Components of an image processing system, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Relationships between pixels, Introduction to mathematical tools used in image processing, 2D transforms – DFT, DCT, Walsh, Hadamard, Harr.

UNIT II **[12 Hrs]**

Image Enhancement

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering.
Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III **[12 Hrs]**

Image Restoration: Image Restoration/degradation model, Properties, Noise models, Mean

Filters, Order Statistics, Adaptive filters, Band reject Filters, Band pass Filters, Notch Filters, Optimum NotchFiltering, Inverse Filtering

UNIT IV **[12 Hrs]**

Color Image Processing: Color fundamentals, color models, pseudo color image processing, basic full color image processing, color transformations, Image segmentation based on color, noise in colorimages, color image compression.

UNIT V **[12 Hrs]**

Image Segmentation: Edge detection, Thresholding, Region based segmentation, Region growing, Region splitting and merging, Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm, Hit-or-Miss transformation. Grey-scale morphology.

Introduction to Image Compression Methods: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding.

TEXT BOOKS:

1. Digital Image Processing Pearson - Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, 2010.
2. Fundamentals of Digital Image Processing - Anil K. Jain, Pearson, 2002.
3. Digital Image Processing Pearson - Kenneth R. Castleman, 2006.

REFERENCES:

1. Multidimensional Digital Signal Processing - D,E.Dudgeon and RM. Mersereau,Prentice Hall Professional Technical Reference, 1990.
2. Digital Image Processing - William K. Pratt, John Wiley, New York, 2002
3. Image processing, analysis and machine vision - Milan Sonka et al, Brookes/Cole, Vikas

URL'S:

https://www2.geog.soton.ac.uk/users/trevesr/obs/rseo/what_is_a_digital_image.html

http://www.eie.polyu.edu.hk/~enyhchan/imagee.pdf

https://www.robots.ox.ac.uk/~az/lectures/ia/lect3.pdf

III Year - II Semester				
20EC6D09 SYSTEM ON CHIP DESIGN	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. To acquire the knowledge in measurement of information and errors.
2. To study the generation of various code methods.
3. To study the various application of codes

COURSE OUTCOMES:

After going through this course, the student

1. Understand Design, optimize, and program a modern System-on-a-Chip.
2. Gets adequate knowledge on Analyse a computational task; characterize its computational requirements for SoC.
3. Understand the concepts of Customization ans Configurability.
4. Acquire knowledge on SoC Design Methodologies and Tools
5. Understand the Applications of SoCs.

UNIT I **[12 Hrs]**

Introduction to System Approach: Motivation, design, programming, optimization, and use of modern System-on-a-Chip (SoC) architectures, Components in the system: processor, memory and connectivity. Hardware and Software in the SoC, programmability versus performance. Approaches to designing a SoC.

UNIT II **[12 Hrs]**

Basics SoC Chip: Time, Area, Power, Reliability, and Configurability: Design-space formulation and exploration, Costs and metrics (energy, area, runtime, reliability and predictability), Quantitative design and analysis.

UNIT III **[12 Hrs]**

Customization and Configurability: SoC Customization, Processor Customization Approaches, Customizing Instruction Processors Reconfigurable Technologies, Reconfiguration Overhead Analysis, Trade-Off Analysis: Reconfigurable Parallelism, Mapping the design into reconfigurable logic, High-Level Synthesis (HLS): Coding C to Gates, Coding HLS Accelerators.

UNIT IV **[12 Hrs]**

SoC Design Methodologies and Tools HW/SW co-design: Analysis, partitioning, real-time scheduling, hardware acceleration, Virtual platform models, co-simulation and FPGAs for prototyping of HW/SW systems, Transaction-Level Modeling (TLM), Electronic System-Level (ESL) languages: SystemC; High-Level Synthesis (HLS): allocation, scheduling, binding, resource sharing, pipelining, SoC and IP integration, verification and test.

UNIT V **[12 Hrs]**

Applications of SoCs: Practical applications of systems on the chip. Applications in cryptography. Applications of the SoC for image processing, video and 3D graphics. Other applications, Next Generation challenges of SoC Design, Case studies

TEXT BOOKS:

1. W. Wolf, Modern VLSI Design: IP Based Design, Person Education
2. M. J. Flynn, W. Luk, Computer System Design: System-on-Chip, John Wiley & Sons
3. Joseph YIU, Arm Education media : System on Chip design with arm cortex – M processors

REFERENCE BOOKS:

1. S. Sutherland, RTL Modelling with System Verilog for Simulation and Synthesis, Create Space Independent Publishing
2. D. Thomas, Logic Design and Verification Using System Verilog, Create Space Independent Publishing
3. S. Pasricha, N Dutt, On-Chip Communication Architectures: System-on-Chip Interconnect, Morgan Kaufmann

URL'S:

https://www.youtube.com/watch?v=PRQXzjTrCJY
https://www.youtube.com/watch?v=O5dsVjqNeaI
https://www.youtube.com/watch?v=-Yczb63-aFU
https://www.youtube.com/watch?v=rjziV6FEPmQ
https://www.youtube.com/watch?v=bizI0T2nmHg
https://www.youtube.com/watch?v=X7_k3bfEa54

III Year - II Semester				
20EC6L09 VLSI LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Note: The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the following experiments with the Industry standard EDA Tools.

List of Experiments:

i. Design and Implementation of an Inverter

ii. Design and Implementation of NAND gate

iii.Design and Implementation of NOR gate

iv.Design and Implementation of XOR gate

v. Design and Implementation of Full Adder

vi. Design and Implementation of Full Subtractor

vii. Design and Implementation of Decoder

viii. Design and Implementation of RS-Latch

ix. Design and Implementation of D-Latch

x. Design and Implementation of static RAM cell

Software Required:

i. Mentor Graphics Software / Equivalent Industry Standard Software.

ii. Personal computer system with necessary software to run the programs and to implement.

III Year - II Semester				
20EC6L11 MWOC LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Minimum Twelve Experiments to be conducted:

Part – A (Any 8 Experiments):

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Directional Coupler Characteristics.
4. Attenuation Measurement
5. Scattering parameters of Circulator.
6. Scattering parameters of E-Plane Tee and H- PlaneTee
7. Scattering parameters of Magic Tee.
8. Radiation Pattern of Horn and Parabolic Antennas.
9. Synthesis of Microstrip antennas (Rectangular Structure) Using HFSS.

Part – B (Any 4 Experiments) :

1. Measurement of NA.
2. Characterization of LED.
3. Intensity modulation of Laser output through an optical fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of losses for Analog Optical link.

Equipment Required:

1. Regulated Klystron Power Supply, Klystron mount
2. VSWR Meter
3. Micro Ammeter
4. Multi meter
5. CRO
6. GUNN Power Supply, Pin Modulator
7. Crystal Diode detector
8. Micro wave components (Attenuation)
9. Frequency Meter
10. Slotted line carriage
11. Probe detector
12. Wave guide shorts
13. SS Tuner
14. Directional Coupler

15. E, H, Magic Tees
16. Circulators, Isolator
17. Matched Loads
18. Pyramidal Horn and Parabolic Antennas
19. Turntable for Antenna Measurements
20. HFSS Software
21. Fiber Optic Analog Trainer based LED
22. Fiber Optic Analog Trainer based laser
23. Fiber Optic Digital Trainer
24. Fiber cables - (Plastic, Glass)

III Year - II Semester				
20EC6L10 DIGITAL SIGNAL PROCESSING LAB	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Minimum Twelve Experiments to be conducted:

Part: 1 (Signals)

1.Generation of discrete time signals
2.To verify the Linear Convolution
   a) Using MATLAB
   b) Using Code Composer Studio(CCS)
3.To verify the Circular Convolution for discrete signals
   a) Using MATLAB
   b) Using Code Composer Studio(CCS)
4.To Find the addition of Sinusoidal Signals
5.To verify Fast Fourier Transform(FFT)
   a) Using MATLAB
   b) Using Code Composer Studio(CCS)
6.Transfer Function Stability Analysis: using pole-zero plot/Bode plot/Nyquist plot.

Part: 2 (Filters)

7.Frequency Response of IIR low pass, high pass Butterworth Filter
8.Frequency Response of IIR Band pass Butterworth Filter
9.Frequency Response of IIR Band stop Butterworth Filter
10. Frequency Response of IIR low pass, high pass Chebyshev Filter
11. Frequency Response of FIR low pass Filter using Rectangular, Triangle Window
12. Frequency Response of FIR low pass Filter using hamming and hanning Windows

Part: 3 (Image Processing)

13.To Implement Various Basic operations on Images
14.To generate the histogram equalization to the image.
15.Compute the edge of an image using spatial filters.

III Year - II Semester				
20EC6S04 INTERNET OF THINGS (Skill Advanced Course)	**L**	**T**	**P**	**C**
	1	**0**	**2**	**2**

1. Introduction to IOT

2. Components of IOT

Part –A (Arduino)

3. Review of 'C' language

4. Arduino Programming

5. Write an Embedded C Program to Interface DC Motor and Servo Motor with Arduino Uno.

6. Write an Embedded C Program to interface the following with Arduino Uno and Ultrasonic Sensor

7. Develop an Application to Interface GSM with Arduino and transmit the message "WELCOME TO BVCEC-ECE" to the number specified.

8. Design an application to monitor temperature and humidity of a city Using Arduino.

Part –B(Raspberry-pi)

9. Introduction to Raspberry-Pi.

10. Installation of Raspbian os.

11. Configuration and programming of GPIO pins in Raspberry-Pi

12. Components of Raspberry-Pi.

12. Controlling LED lights using Raspberry-Pi

13. Make music with Sonic Pi using Raspberry-Pi

14. Game Designing with Scratch using Raspberry-P

III Year - II Semester				
20EE6E02 ARTIFICAL NEUTRAL NETWORKS AND FUZZY LOGIC (Open Elective-2)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT–I
Introduction to AI techniques
Introduction to artificial intelligence systems– Humans and Computers –Knowledge representation – Learning process – Learning tasks – Methods of AI techniques.

UNIT–II
Neural Networks
Organization of the Brain – Biological Neuron – Biological and Artificial neuron Models, MC-Culloch-pitts neuron model, Activation functions, Learning rules, neural network architectures- Single-layer feed-forward networks: – Perceptron, Learning algorithm for perceptron- limitations of Perceptron model

UNIT–III
ANN paradigm
Multi-layer feed-forward network (based on Back propagation lgorithm)–Radial-basisn function networks- Recurrent networks (Hopfield Networks).

UNIT – IV
Classical and Fuzzy Sets
Introduction to classical sets – properties – Operations and relations – Fuzzysets – Membership – Uncertainty – Operations – Properties – Fuzzy relations – Cardinalities – Membership functions.

UNIT–V
Fuzzy Logic System Components
Fuzzification – Membership value assignment – Development of rule base and decision making system – Defuzzification to crisp sets – Defuzzification methods.

Text Books:
1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by S.Rajasekaran and G.A. Vijayalakshmi Pai – PHI Publication.
2. Fuzzy logic with fuzzy applications- by T.J. Ross, TMH.
Reference Books:
1. Introduction to Artificial Neural Systems – Jacek M. Zurada, Jaico Publishing House, 1997.
2. Fundamentals of Neural Networks Architectures, Algorithms and Applications - by laurene Fausett, Pearson.
3. Neural Networks, Algorithms, Applications and programming Techniques by James A. Freeman, David M. Skapura.
4. Introduction to Neural Networks using MATLAB 6.0 by S N Sivanandam, S Sumathi, S N Deepa TMGH.

III Year - II Semester				
20ME6E01 OPERATIONS RESEARCH	**L**	**T**	**P**	**C**
(Open Elective-2)	**3**	**0**	**0**	**3**

Course Objectives:

To learn the importance of Operations Research in the design, planning, scheduling, manufacturing and business applications and to use the various techniques of Operations Research in solving such problems.

Course outcomes:

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

CO1. Solve Liner Programming Problems.
CO2. Estimate Optimal Solution for Transportation, Assignment Problems and
CO3. Apply sequencing principles to allocate jobs on different machines and Identify best replacement period for machines.
CO4. Solve Game theory Problems and estimate service times in queuing models
CO5. Model the Project Management Problems through CPM and PERT

Detailed Syllabus:

UNIT – I

INTRODUCTION TO O.R.: Development – definition– characteristics and phases – types of operation research models – applications.

LINEAR PROGRAMMING: Problem formulation – graphical solution – simplex method – artificial variables techniques -two–phase method, big-M method, duality principle.

UNIT – II

TRANSPORTATION PROBLEM: Formulation – optimal solution, unbalanced transportation problem.

ASSIGNMENT PROBLEM – Formulation – optimal solution - variants of assignment problem- traveling salesman problem.

UNIT – III

SEQUENCING – Introduction – flow **–**shop sequencing – *n* jobs through two machines – *n* jobs through three machines – job shop sequencing – two jobs through 'm' machines.

REPLACEMENT: Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

UNIT – IV

THEORY OF GAMES: Introduction – mini. max (max. mini) – criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points – 2 x 2 games – dominance principle – m x 2 & 2 x n games -graphical method.

WAITING LINES: Introduction – single channel – poison arrivals – exponential service times – with infinite population and finite population models– multichannel – poison arrivals – exponential service times with infinite population single channel poison arrivals.

UNIT – V

NETWORK ANALYSIS: Project planning, scheduling and controlling – tools for project management – critical path method – programme evaluation and review technique (PERT) – cost analysis and crashing – resource leveling – updating.

TEXT BOOKS:

1. Operations Research-An Introduction/Hamdy A Taha/Pearson publishers
2. Operations Research –Theory & publications / S.D.Sharma-Kedarnath/McMillan publishers India Ltd
3. Operations Research – Quantitative Techniques for Management, S Chand & Sons, 2018

REFERENCES:

1. Introduction to O.R/Hiller & Libermann/TMH
2. Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.
3. Operations Research: Methods & Problems / Maurice Saseini, Arhur Yaspan & Lawrence Friedman/Wiley
4. Operations Research / R.Pannerselvam/ PHI Publications.
5. Operations Research / Wagner/ PHI Publications.
6. Operation Research /J.K.Sharma/MacMilan Publ.
7. Operations Research/ Pai/ Oxford Publications
8. Operations Research/S Kalavathy / Vikas Publishers
9. Operations Research / DS Cheema/University Science Press
10. Operations Research / Ravindran, Philips, Solberg / Wiley publishers

III YEAR II SEM	**Code : 20AD6E01**	**L -3**	**T -0**	**P -0**	**C -3**

DOT NET TECHNOLOGIES

UNIT I

C#.NET .NET Enterprise Architecture , NET Framework , Base Class Libraries (BCL) , Common Language Run Time (CLR) , Microsoft Intermediate Language (MSIL) , Common Language Specification (CLS) , .NET Products , .NET Services , Download Installation of Visual Studio Community edition 2022.Core 6.0, SQL Server Console Applications

UNIT II

C# Languages Basics , Data Types , Type Conversion , Boxing & Unboxing , Conditional Statements , Looping , Methods in C# , Properties, Arrays , Indexes, Structures, Enumerations , Strings, Regular Expressions , Collections

UNIT III

GUI Applications Development, Windows forms and controls , Creating Menus , Toolbars, Image list , Tree View, List view Data Base Programming , ADO.NET Introduction , Data Providers in .NET , Connection, Command , Data reader , Data Adapter , Data Set, Command Builder , Data Relations , ADO.NET and XML

UNIT IV

ASP.Net Introduction to web applications State management techniques, Session & ViewState Response.Redirect & Server.Response Query strings SQL Server RDBMS concepts Tables and data storage ,Anomalies and Normalization techniques. 1NF, 2NF, 3NF, Relations , Primary key, Foreign key , Different data types in SQL Server , Create, Read, Update & Delete data in tables (SQL Queries) Group by, Order by on records. Aggregation operations, Numeric operations Operators String operations, Datetime operations. Exception handling , User defined data and table types , Temp tables , Triggers , Stored procedures , Functions

UNIT V

Introduction to ASP.NET MVC The role of the Model, View, and Controller Key benefits of ASP.NET MVC Getting Started with ASP.NET MVC ASP.NET MVC project templates Understanding the structure of an ASP.NET MVC project Naming conventions Creating views Defining controllers Defining a data model Creating a ASP.NET MVC 4 Application Creating strongly-typed views Understanding URLs and action methods Using HTML helpers Handling form post-backs Data validation Using the Razor View Engine Getting started with Razor Razor design goals Implementing a Razor view Razor syntax Accessing Model Data in Razor Views. Deployment Server Requirements Configuration Options Preparing an application for deployment Deploying to IIS and Windows Azure

Text Books:

1. DOT NET Technologies by Nikisha Dakee and Deepali Deshmukh | 1 January 2020
2. Dot Net Technology by Vishwajit K Barbudhe, Shraddha N Zanjat, et al. | 25 April 2020

III Year - II Semester	Code: 20CS6E03	L -3	T -0	P -0	C -3

MEAN STACK DEVELOPMENT

- **Course Outcomes:**
- After the completion of the course, student will be able to
- Enumerate the Basic Concepts of Web & Markup Languages
- Develop web Applications using Scripting Languages & Frameworks
- Make use of Express JS and Node JS frameworks
- Illustrate the uses of web services concepts like restful, react js
- Apply Deployment Techniques & Working with cloud platform

UNIT I

Introduction to Web: Internet and World Wide Web, Domain name service, Protocols: HTTP, FTP, SMTP. Html5 concepts, CSS3, Anatomy of a web page. XML: Document type Definition, XML schemas, Document object model, XSLT, DOM and SAX Approaches.

UNIT II

JavaScript: The Basic of JavaScript: Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Constructors, Pattern Matching using Regular Expressions. Angular Java Script Angular JS Expressions: ARRAY, Objects, $eval, Strings, Angular JS Form Validation & Form Submission, Single Page Application development using Angular JS.

UNIT III

Node.js: Introduction, Advantages, Node.js Process Model, Node JS Modules. Express.js: Introduction to Express Framework, Introduction to Nodejs , What is Nodejs, Getting Started with Express, Your first Express App, Express Routing, Implementing MVC in Express, Middleware, Using Template Engines, Error Handling , API Handling , Debugging, Developing Template Engines, Using Process Managers, Security & Deployment.

UNIT IV

RESTful Web Services: Using the Uniform Interface, Designing URIs,
Web Linking, Conditional Requests. React Js: Welcome to React, Obstacles and Roadblocks, React's Future, Keeping Up with the Changes, Working with the Files, Pure React, Page Setup, The Virtual DOM, React Elements, ReactDOM, Children, Constructing Elements with Data, React Components, DOM Rendering, Factories.

UNIT V

Mongo DB: Introduction, Architecture, Features, Examples, Database Creation & Collection in Mongo DB. Deploying Applications: Web hosting & Domains, Deployment Using Cloud Platforms.

Text Books:

1) Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2) Web Technologies, Uttam K Roy, Oxford
3) Pro Mean Stack Development, ELadElrom, Apress
4) Restful Web Services Cookbook, Subbu Allamraju, O'Reilly
5) JavaScript & jQuery the missing manual, David sawyer mcfarland, O'Reilly
6) Web Hosting for Dummies, Peter Pollock, John Wiley Brand

Reference Books:

1) Ruby on Rails up and Running, Lightning fast Web development, Bruce Tate, Curt Hibbs, Oreilly (2006).
2) Programming Perl, 4ed, Tom Christiansen, Jonathan Orwant, Oreilly (2012).
3) Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
4) An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage Learning.

III YEAR II SEMESTER	L	T	P	C
20CE6E02 – GREEN BUILDINGS (Open elective – II)	3	0	0	3

Course Objective:

- To impart knowledge on building materials and utilization of green building design concept.

Course Outcomes:

At the end of course, Student will be able to

1. explain the environmental implications of buildings.
2. describe the implications of building technologies
3. analyse thermal issues and comforts in buildings.
4. assess utility of solar energy in buildings.
5. Explain built environment for green composite in building.

UNIT – I **(8h)**

Introduction: What is Green Building, why to go for Green Building, Benefits of Green Buildings, Green Building Materials and Equipment in India, what are key Requisites for Constructing a Green Building, Important Sustainable features for Green Building.

UNIT – II **(8h)**

Green Building Concepts and Practices: Indian Green Building Council, Green Building Moment in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Building, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings, LEED India Rating System and Energy Efficiency.

UNIT-III **(10h)**

Green Building Design: Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximize System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources. Ecofriendly captive power generation for factory, Building requirements.

UNIT- IV **(8h)**

Air Conditioning: Introduction,CII Godrej Green business centre, Designphilosophy, Designinterventions, Energymodeling, HVAC System design, Chillerselection, pumpselection, Selection of cooling towers, Selection of air handing units, Precooling of fresh air, Interior lighting system, Key feature of the building. Eco-friendly captive power generation for factory, Building requirement.

UNIT –V **(9h)**

Material Conservation Handling of non-process waste, waste reduction during construction, materials with recycled content,localmaterials,materialreuse,certified wood ,Rapidly renewable building materials and furniture; Indoor Environment Quality And Occupational Health: Air

conditioning, Indore air quality, Sick building syndrome, Tobacco smoke control, Minimum fresh air requirements avoid use of asbestos in the building, improved fresh air ventilation, Measure of IAQ, Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels.

Text Books:

1. Michael Bauer, Peter Mösle and Michael Schwarz "Green Building – Guidebook for Sustainable Architecture" Springer, 2010.
2. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison "Green Building Handbook" Volume I, 4th printing, 2001, Spon Press.

References:

1. MiliMajumdar, "Energy-efficient buildings in India" 1st edition, 2002, Tata Energy Research Institute.

2. TERI "Sustainable Building Design Manual- Volume I & II" 1st edition, 2009, Tata Energy Research Institute.

3. Standard for the design for High Performance Green Buildings by Kent Peterson, 1st edition, 2009, American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. and U.S. Green Building Council.

III Year – II Semester				
20EC6E02 – MICROCONTROLLERS AND APPLICATIONS (Open Elective-2) (Not for ECE Students)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Give an understanding about the concepts and basic architecture of 8051.
2. Provide background knowledge and core expertise in microcontroller.
3. Study the architecture and addressing modes of 8051.
4. Impart knowledge about assembly language programs of 8051.
5. Help understand the importance of different peripheral devices & their interfacing to 8051.
6. Impart knowledge of different types of external interfaces including LEDS, LCD, Keypad,Switches.

COURSE OUTCOMES:

After going through this course, the student

1. Understand the architecture of micro controller
2. Understand the programming model of micro controllers
3. Acquire the knowledge of Real time control using Interrupts
4. Analyze the knowledge of Real time control using Timers
5. Gain the knowledge on Interfacing of different devices

UNIT I **[12Hrs]**

OVERVIEW OF ARCHITECTURE AND MICROCONTROLLER RESOURCES

Architecture of a microcontroller –Microcontroller resources- Resources in advanced and next generation microcontrollers –8051microcontroller–Internaland External memories–Counters and Timers - Interrupts.

UNIT II **[12Hrs]**

8051 FAMILYMICROCONTROLLERS INSTRUCTION SET

Basic assembly language programming, Data transfer instructions–Data and Bit-manipulation instructions–Arithmetic instructions –Instructions for Logical operations on the Registers, Internal RAM, and SFRs–Program flow control instructions–Interrupt control flow.

UNIT III **[12Hrs]**

REAL TIME CONTROL INTERRUPTS

Interrupt handling structure of an MCU – Interrupt Latency and Interrupt deadline –Multiple sources of the interrupts–Non-maskable interrupt sources–Enabling or disabling of the sources– Polling to determine the interrupt source and assignment of the priorities among them– Interrupt structure in Intel 8051.

UNIT IV **[12Hrs]**

REALTIMECONTROL TIMERS

Programmable Timers in the MCU's–Free running counter and real time control

UNIT V **[12Hrs]**

SYSTEMS DESIGN_DIGITAL AND ANALOG INTERFACING METHODS

Switch Keypad and Keyboard interfacings-LED and Array of LEDs –Keyboard-cum-Display controller (8279)–Alphanumeric Devices–Display Systems and its interfaces.

TEXT BOOKS :

1. Microcontrollers Architecture, Programming, Interfacing and System Design–Raj Kamal Pearson Education, 2005.
2. The 8051 Microcontroller and Embedded Systems–Mazidi and Mazidi, PHI, 2000.
3. Microcontrollers [theory and Applications] –Ajay V Deshmukh, TMH,2005

REFERENCES:

1. Microcontrollers (Theory & Applications) –A.V. Deshmuk, WTMH, 2005.
2. Design with PIC Microcontrollers–John B. Peatman, Pearson Education, 2005.

URL:

https://www.youtube.com/watch?v=2-geyR_aM28

https://www.youtube.com/watch?v=nfq_WaPGb6o

IV Year - I Semester				
20EC7D10 – RADAR ENGINEERING	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Learn about the various applications RADAR can be used.
2. Understand the various parameters of Transmitter and Receiver of RADAR
3. Learn the concept of Doppler Effect to measure parameters of RADAR.
4. Understand different types of tracking and acquisition of targets.
5. Learn about the various antenna system and communication equipment needed for RADAR operation.

COURSE OUTCOMES:

After going through this course, the student

1. Derive the radar range equation and to solve some analytical problems.
2. Classify the different types of radars and its applications.
3. Explain the Performance of MTI and Pulse Doppler radars.
4. Understand the concept of tracking and different tracking techniques.
5. Understand the various components of radar receiver and its performance

UNIT I **[12Hrs]**

Basics of Radar

Introduction, Maximum Unambiguous Range, simple Radar range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Illustrative Problems.

Radar Equation

Modified Radar Range Equation, SNR, probability of detection, probability of False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT II **[12Hrs]**

CW and Frequency Modulated Radar

Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems .

FM-CW Radar

Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Multiple Frequency CW Radar.

UNIT III **[12Hrs]**

MTI and Pulse Doppler Radar

Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, N th Cancellation Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT IV **[12Hrs]**

Tracking Radar

Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT V **[12Hrs]**

Radar Antenna: Functions of The Radar Antenna, Electronically Steered Phased array Antennas, Radiation Pattern, Beam Steering and Beam Width changes, Series versus parallel feeds, Applications, Advantages and Limitations. Radomes. (Chapter 8 of Text book1)

Radar Receivers – Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers.

TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd 2007
2. Radar Engineering – GSN Raju, IK International.

REFERENCE BOOKS:

1. Introduction to Radar Systems, 3rd edition – M.I. Skolnik, TMH Ed., 2005
2. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee.
3. Microwave and Radar Engineering - Gottapu Sasibushana Rao.

URL's:

https://www.ll.mit.edu/outreach/radar-introduction-radar-systems-online-course

https://www.radartutorial.eu/06.antennas/Radar%20Antenna.en.html

https://www.tutorialspoint.com/radar_systems/radar_systems_range_equation.htm

IVYear - I Semester				
20EC7D11 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Introduce The Fundamentals of Electronics Instruments and Measurement
2. Providing an In-Depth Understanding of Measurement Errors, Bridge Measurements, Digital Storage Oscilloscope, Function Generator and Analyzer, Display Devices, Data Acquisition Systems and Transducers.
3. Address the Underlying Concepts of Transducers and Sensors.

COURSE OUTCOMES:

After going through this course, the student will be able to

1. Select the instrument to be used based on the requirement.
2. Analyze the different signal generators and wave analyzers.
3. Understand the design of bridges for different applications.
4. Identify the different transducers for measurement of different parameters.
5. Understand the different types of Sensors and it's applications.

UNIT I **[12 Hrs]**

Performance characteristics of instruments: Static characteristics- Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics- speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi-range, Range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension, shunt. Thermocouple type RF ammeter, Ohmmeters series type, shunt type, Multimeter for Voltage, Current and resistance measurements.

UNIT II **[12 Hrs]**

Signal Generators- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform.

Wave Analyzers: Harmonic Distortion Analyzers, Spectrum Analyzers, Digital Fourier Analyzers.

Oscilloscopes: Sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope

UNIT III **[12Hrs]**

Bridges:AC Bridges Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance -Schearing Bridge. Wheat stone bridge. Wien Bridge, Errors and precautions in using bridges. Q-meter.

UNIT IV **[12 Hrs]**

Active Transducers : Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.

Passive Transducers : Resistance, Capacitance, inductance, Strain gauges, LVDT

UNIT V **[12 Hrs]**

Magnetic sensors: Magnetic field, Magnetic flux density – magneto resistors, Hall sensors, super conduction squids.
Acoustic or sonic sensors: Intensity of sound, frequency of sound in various media, various forms of microphones.

TEXTBOOKS:

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.
3. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.

REFERENCES:

1. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.
2. Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education - 2005.
3. Doebelin, "Measurement Systems: Application and Design", McGraw Hill Kogakusha Ltd.

URLs:

https://www.tutorialspoint.com/electronic_measuring_instruments/electronic_measuring_instruments_performance_characteristics.htm

https://www.techtarget.com/whatis/definition/oscilloscope

https://www.electrical4u.com/maxwell-bridge-inductance-capacitance-bridge/

https://byjus.com/physics/transducer/

IV Year - I Semester				
20EC7D12 – SYSTEM DESIGN THROUGH VERILOG	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Understand the concepts of Verilog Language.
2. Design the digital systems as an activity in a larger systems design context.
3. Study the design and operation of semiconductor memories frequently used in application specific digital system.
4. Inspect how effectively ICs are embedded in package and assembled in PCBs for different application.
5. Design and diagnosis of processors and I/O controllers used in embedded systems.

COURSE OUTCOMES:

After going through this course the student will be able to

1. Construct the combinational circuits, using discrete gates and programmable logic devices.
2. Describe how arithmetic operations can be performed for each kind of code, and also combinational circuits that implement arithmetic operations.
3. Design a semiconductor memory for specific chip design.
4. Design embedded systems using small microcontrollers, larger CPUs/ DSPs, or hard or soft processor cores.
5. Synthesize different types of I/O controllers that are used in embedded system

UNIT-I **[12 Hrs]**

Introduction and Methodology: Digital Systems and Embedded Systems, Real-World Circuits, Models, Design Methodology .**Combinational Basics**: Combinational Components and Circuits, Verification of Combinational Circuits .**Number Basics**: Unsigned integers, Signed Integers, Fixed point Numbers, Floating-point Numbers .**Sequential Basics**: Sequential Datapaths and Control Clocked SynchronousTiming Methodology.

UNIT-II **[12 Hrs]**

Memories: Concepts, Memory Types, Error Detection and Correction

UNIT -III **[12 Hrs]**

Implementation Fabrics: Integrated Circuits, Programmable Logic Devices, Packaging and Circuit boards, Interconnection and Signal integrity.

UNIT -IV **[12 Hrs]**

I/O interfacing: I/O devices, I/O controllers, Parallel Buses, Serial Transmission, I/O software .

UNIT -V **[12 Hrs]**

Design Methodology: Design flow, Design optimization, Design for test, Nontechnical Issues .

TEXT BOOK:

1. 1.Peter J. Ashenden, “Digital Design: An Embedded Systems Approach Using VERILOG”, Elesvier, 2010.
2. Michael D. Ciletti, “Advanced Digital Design with the Verilog HDL”Pearson (Prentice Hall), Second edition.

REFERENCE BOOKS:

1. Ming-Bo Lin, “Digital System Designs and Practices: Using Verilog HDL and FPGAs”, \Vlley, 2008
2. Charles Roth, Lizy K. John, Byeong Kil Lee, “Digital Systems Design Using Verilog”, Cengage, lst Edition.
3. Donald E. Thomas, Philip R. Moorby, “The Verilog Hardware DescriptionLanguage”, Springer, Fifth edition.

URL’s:

https://onlinecourses.nptel.ac.in/noc21_ee97/preview

https://www.udemy.com/course/system-design-using-verilog/

https://www.digimat.in/nptel/courses/video/108103179/L10.html

IV Year - I Semester				
20EC7D14 CELLULAR MOBILE COMMUNICATIONS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Understand the cellular mobile systems and they learn about the mobile radio environment andoperation of cellular system.
2. Learn interference and frequency management and about the channel assignment which is to beused in the real world problems.
3. Know how to make a cell splitting and how much amount of hand off takes place.

COURSE OUTCOMES:

After going through this course the student will be able to

1. Explain basics of cellular mobile communication.
2. Describe the co channel interference reduction ,cell coverage for signal and traffic.
3. Classify different Omni directional antennas and bidirectional antennas used for interference reduction.
4. Analyse the frequency management and channel assignment and explain handoff
5. Discuss the Digital cellular systems like GSM , CDMA and TDMA and different generations.

UNIT I **[12 Hrs]**

Cellular Mobile Radio Systems: Introduction to Cellular Mobile System, uniqueness of mobile radioenvironment, operation of cellular systems, Hexagonal shaped cells.

Elements of Cellular Radio System Design: General description of the problem, Concept of frequency reuse channels, co-channel interference reduction factor, Desired C/I from a normal case in an omni directional antenna system

UNIT II **[12 Hrs]**

Cell Coverage for Signal and Traffic: General introduction, propagation over water or flat open area, Foliage loss, Propagation in Near-in distance, Long distance propagation

Cell Site and Mobile Antennas: Equivalent circuits of antennas, antennas at cell site, mobile antennas.

UNIT III **[12 Hrs]**

Co-channel Interference Reduction: Co-channel interference, Exploring co-channel interference areas in a system, real time co-channel interference measurement at mobile radio transceiver, design of Omni directional antenna system in the worst case , design of directional antenna system, loweringthe antenna height, reduction of co-channel interference by means of notch and tilted antenna pattern,umbrella pattern effect.

UNIT IV **[12 Hrs]**

Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment

Handoff Strategies: Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff.

UNIT V **[12 Hrs]**

Digital Cellular System: GSM, TDMA,CDMA,FDMA,SDMA, Generations- 1G, 2G, 3G, 4G, 5G.

TEXTBOOKS:

1. .Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
2. .Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition,2007.
3. 3.Mobile Cellular Communication – G Sasibhushana Rao Pearson

REFERENCES:

1. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
3. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI, 2005.

URL'S:

https://www.electronics-notes.com/articles/connectivity/cellular-mobile-phone/basic-cellular-system-concept.php

https://www.everythingrf.com/community/what-is-co-channel-interference

https://www.tutorialspoint.com/handoff-in-mobile-connections

IV Year - I Semester				
20EC7D15 ANALOG IC DESIGN	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Get in-depth understanding of the analog integrated circuit and building blocks
2. Introduced to the basics of MOSFET, its characteristics, second order effects, small signal model of MOSFET.
3. Analyze the small signal analysis and large signal analysis for single stage amplifiers, differential amplifiers, current sources, current mirrors and frequency response of amplifiers.

COURSE OUTCOMES:

After going through this course the student will be able to

1. Explain the small- and large-signal models of CMOS transistors.
2. Demonstrate single stage amplifiers with different loads.
3. Design and analyze differential amplifiers.
4. Design and analyze Current Mirror circuits.
5. Analyze Frequency response of amplifiers.

UNIT I **[12 Hrs]**

Basic MOS Device Physics

General Considerations, MOSFET as a Switch, MOSFET Structure, MOS Symbols, MOS I/V Characteristics, Threshold Voltage, Derivation of I/V Characteristics, Second-Order Effects, MOS Device Models, MOS Device Layout, MOS Device Capacitances, MOS Small Signal Model, NMOS versus PMOS Devices, Long Channel Devices versus Short Channel Devices.

UNIT II **[12 Hrs]**

Single-Stage Amplifiers

Basic Concepts, Common-Source Stage, Common-Source Stage with Resistive Load ,CS Stage with Diode-Connected Load, CS Stage with Current-Source Load, CS Stage with Source Degeneration. Source Follower, Common Gate Stage, Cascode Stage, Folded Cascode Amplifiers.

UNIT III **[12 Hrs]**

Differential Amplifiers

Single ended and differential operation. Basic Differential Pair, Qualitative Analysis, Quantitative Analysis, Common-Mode Response, Differential Pair with MOS Loads.

UNIT IV **[12 Hrs]**

Passive and Active Current Mirrors

Basic Current Mirrors, Cascode Current Mirrors, Active Current Mirrors, Large-Signal Analysis, Small-Signal Analysis, Common Mode Properties.

UNIT V **[12 Hrs]**

Frequency Response of Amplifiers

General Considerations, Miller Effect, Association of Poles with Nodes, Common-Source Stage, Source Followers, Common Gate Stage, Cascode Stage, Differential Pair Feedback General Considerations, Properties of Feedback Circuits, Effect of Loading, Effect of Feedback on Noise.

TEXT BOOKS

1. Analog CMOS Integrated Circuits - Behzad Razavi, 2nd Edition, McGraw Hill, 2017.
2. CMOS Analog Circuit Design - Phillip E. Allen, Douglas R.Holberg, 3rd edition, Oxford University Press, 2013.
3. Analog Integrated Circuit Design - Kenneth Martin, 2nd Edition Wiley Publications, 2013.

REFERENCE BOOKS

1. Analysis and Design of Analog Integrated Circuits - Paul. R. Gray, Paul. R. Hurst, Stephen H. Lewis & R. G. Meyer, 5th Edition, John Wiley Publications, 2010.
2. Microelectronic Circuits - Sedra and Smith, 6th Edition, Oxford Publications, 2013.
3. Fundamentals of Microelectronics - B.Razavi, 2nd Edition, Wiley Publications, 2009.

URL's:

https://nptel.ac.in/courses/117106030

https://onlinecourses.nptel.ac.in/noc22_ee37/preview

https://www.digimat.in/nptel/courses/video/108103179/L10.html

IV Year - I Semester				
20EC7D16 NETWORK SECURITY AND CRYPTOGRAPHY	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. In this course the following principles and practice of cryptography and network security are covered
2. Classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers)
3. Public-key cryptography (RSA, discrete logarithms),
4. Algorithms for factoring and discrete logarithms, cryptographic protocols,hash functions, authentication, key management, key exchange, signature schemes,
5. Email and web security, viruses, firewalls, digital right management, and other topics.

COURSE OUTCOMES:

After going through this course the student will be able to

1.To be familiarity with information security awareness and a clear understanding of its importance.
2.To master fundamentals of secret and public cryptography
3.To be familiar with Authentication and Hash fuctions.
4.To be familiar with Data Integrity Services.
5.To be familiar with network security designs using available secure solutions (such asPGP, SSL, IPSec, etc)

UNIT- I **[12 Hrs]**

INTRODUCTION

Basic Principles Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography. Classical Techniques: Conventional encryption model, Classical encryption model.

UNIT- II **[12 Hrs]**

MODERN TECHNIQUES

Simplified DES, Block cipher principles, Modes of operation, Triple DES, RSA Algorithm, Diffe-Hellman Key exchange. Data Encryption Standard, Advanced Encryption Standard.

UNIT- III **[12 Hrs]**

NUMBER THEORY

Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorem, Chineese remainder theorem, Message authentication and hash functions, Security of hash functions and MAC's.

UNIT- IV **[12 Hrs]**

DATA INTEGRITY

Data Integrity, Digital Signature Schemes & Key Management Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.

UNIT –V **[12 Hrs]**

NETWORK SECURITY

Network Security-I Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS , Network Security-II Security at the Network Layer: IPSec, System Security

TEXT BOOKS:

1. Cryptography and Network Security, Behrouz A Forouzan, DebdeepMukhopadhyay, (3e) Mc Graw Hill.
2. Cryptography and Network Security, William Stallings, (6e) Pearson.
3. Everyday Cryptography, Keith M.Martin, Oxford. REFERENCE BOOKS: 1. Network Security and Cryptography, Bernard Meneges, Cengage Lerning.

REFERENCE BOOKS:

1.Network Security and Cryptography, Bernard Meneges, Cengage Lerning.
2.Introduction to Computer networks and cyber Security, Chwon Hwa Wu, J David Irwin, CRC Press.
3.Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dream Tech.

URL's:

https://nptel.ac.in/courses/106105031

IV Year - I Semester				
20EC7D17 SATELLITE COMMUNICATIONS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Introduced to the fundamentals of satellite communication.
2. Understanding how a satellite communication system successfully transfers information from one earth station to another.
3. Expose to examples of applications and tradeoffs that typically occurs in engineering system design.

COURSE OUTCOMES:

After going through this course the student will be able to

1. Understand basic concepts, types, applications and orbital elements of communication satellite systems.
2. Understand various subsystems of communication satellites and their functions.
3. Analyze and design satellite uplink and down links for transmission.
4. Understand concepts of various multiple access techniques used for communication satellites.
5. Understand the concepts of earth station technology and design considerations for LEO,MEO and Geo satellites.
6. Understand the concepts of satellite navigation, architecture and applications of

   GPS&DGPS.

UNIT I **[12Hrs]**

Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Indian space programme – overview, Future Trends of Satellite Communications.

Orbital mechanics and launchers: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

UNIT II **[12Hrs]**

Satellite Subsystem: Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

Satellite Link Design: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.

UNIT III **[12Hrs]**

Multiple Access: Frequency division multiple access (FDMA) Inter modulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA),Spread spectrum transmission and reception.

UNIT IV **[12Hrs]**

Earth station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

Low Earth Orbit And Geo-Stationary Satellite Systems: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs

UNIT V **[12Hrs]**

Satellite Navigation and the Global Positioning System: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004

REFERENCES :

1. Satellite Communications : Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

URL's:

https://nptel.ac.in/courses/117105131
https://www.tutorialspoint.com/satellite_communication/index.htm

IV Year - I Semester				
20EC7D18 WIRELESS SENSOR AND NETWORKS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Understand the WSN node Architecture and Network Architecture.
2. Identify the Wireless Sensor Network Platforms.
3. Understand the different protocols of Wireless networks.

COURSE OUTCOMES:

After going through this course the student will be able to

1. It provides an insight into different layers and their design considerations.
2. A thorough knowledge of infrastructure establishment and sensor network platform is provided.
3. Students will be able to analyze modelling and simulation of various communication networks
4. Students will be able to generate test and estimate parameters.
5. By the end of the programme, students will apply this knowledge for detection estimation and simulation of various communication networks.

UNIT I **[12Hrs]**

Introduction to Ad-hoc / Sensor Networks: Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints and challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks.

Architectures Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT II **[12 Hrs]**

Networking Technologies Physical Layer and Transceiver Design Considerations, Personal area networks (PANs)-blue tooth, hidden node and exposed node problem, Topologies of PANs, MANETs, and WANETs.

UNIT III **[12 Hrs]**

MAC Protocols for Wireless Sensor Networks: Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT IV **[12 Hrs]**

Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols, Proactive Routing

UNIT V **[12 Hrs]**

Security in WSNs: Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad-Hoc Wireless Networks.

Applications of WSN: Ultra-wide band radio communication, Wireless fidelity systems, Home automation, smart metering Applications

TEXT BOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, CRC Press
3. Protocols and Architectures for Wireless Sensor Networks - Holger Karl & Andreas Willig, John Wiley, 2005.

REFERENCES:

1. Wireless Sensor Networks- Technology, Protocols, and Applications - Kazem Sohraby, Daniel Minoli, & Taieb Znati, John Wiley, 2007.
2. Wireless Sensor Networks - An Information Processing Approach, Feng Zhao & Leonidas J.Guibas, Elsevier, 2007.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh,1 ed. Pearson Education.--

URL's:

https://archive.nptel.ac.in/courses/106/105/106105160/

http://www.erg.abdn.ac.uk/users/gorry/course/lanpages/mac.html&sa=U&ved=2ahUKEwjJivXAm47YAhXBmpQKHdIHAMUQFjABegQIHxAB&usg=AOvVaw0C99V2cMB-e2dsr3tfBnH6

https://en.m.wikipedia.org/wiki/Personal_area_network&sa=U&ved=2ahUKEwj6zZ30m47YAhVEE5QKHRHeAkAQFjABegQIFRAB&usg=AOvVaw31yXdG2VtmeEtMm8kQGWLm

IV Year - I Semester				
20EC7D19 DSP PROCESSORS & ARCHITECTURES	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1.Recall digital transform techniques.
2. Introduce architectural features of programmable DSP Processors and Analog Devices.
3.To be familiar in DSP devices(TMS 320C54XX)
4.Learn Interfacing Memory and I/O Peripherals to Programmable DSP Devices for better understanding.
5.To be familiar in working with analog devices(DSP family).

COURSE OUTCOMES:

After going through this course the student will be able to

1.Give an overview of entire digital signal processing techniques i.e. convolution, DFT, FFT, IIR, & FIR filters.
2.Give an The fixed and floating point representation, different types of errors introduced during A-D and D-A converter stage.
3.Explain the Architectural view about TMS320c54XX.
4.Outline to introduce the DSP computational building blocks and special types of addressing modes compared to normal microprocessor.
5. Give an overview of Architecture of ADSP devices.

UNIT I **[12 Hrs]**

Introduction to Digital Signal Processing:

Introduction to DSP system, sampling process , DFT, FFT,linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational accuracy in DSP implementations

Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT II **[12 Hrs]**

Architectures for Programmable DSP Devices -I

Basic Architectural features, DSP Computational Building Blocks, Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XXProcessors, Program Control, TMS320C54XX Instructions and Programming.

UNIT III **[12 Hrs]**

Architectures for Programmable DSP Devices -II

On-Chip Peripherals, Interrupts of TMS320C54XX Processors, Pipeline Operation of TMS320C54XX Processors.Pipelining and performance of TMS320C54XX Processors.

UNIT IV **[12 Hrs]**

Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

UNIT-V **[12Hrs]**

Analog Devices Family of DSP Devices- ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor. Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

TEXT BOOKS

1. Digital Signal Processors, Architecture, and Programming - B.Venkata Ramani and M. Bhaskar, TMH, 2004.
2. DSP Implementation using DSP microprocessor with Examples from TMS32C54XX - Avtar Singh, S.Srinivasan, Thomson 2004.
3. Digital signal processing - Jonathen Stein, John Wiley 2005.

REFERENCE BOOKS

1. DSP Processor Fundamentals, Architectures & Features - Lapsley et al., S. Chand & Co, 2000.
2. Digital Signal Processing App Using the ADSP-2100 Family by TheApplications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar,PHI.

URL's:

https://www.tutorialspoint.com/digital_signal_processing/

https://www.dspguide.com/ch28/3.html

http://www.digimat.in/nptel/courses/video/117102060/L02.html

IV Year - I Semester				
20EC7D20 DIGITAL IC DESIGN	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. Understand the MOS Design.
2. Study Combinational MOS Logic Circuits and Sequential MOS Logic Circuits.
3. Design and to develop the Digital Integreated Circuits for different Applications.
4. 4.Understand concepts of Semiconductor Memories, Flash Memory, and RAM array organization.

COURSE OUTCOMES:

After going through this course the student will be able to

1. Understand the concepts of MOS Design.
2. Design and analysis of Combinational and Sequential MOS Circuits.
3. Design Sequential MOS Circuits.
4. Describe the different dynamic logic circuits.
5. Understand the interconnect techniques.
6. Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.

UNIT I **[15 Hrs]**

MOS Design: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT II **[15 Hrs]**

Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR& NAND gate, Complex Logic circuits design -Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates (Pass Gates), Designing with Transmission gates.

UNIT III **[10 Hrs]**

Sequential MOS Logic Circuits: Behavior of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT IV **[10Hrs]**

Dynamic Logic Circuits: Basic principle, Voltage Bootstrapping, Synchronous dynamic passtransistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

UNIT V **[10 Hrs]**

Semiconductor Memories: Memory Types, RAM array organization, SRAM operation Leakage currents in SRAM cells, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation.

TEXT BOOKS:

1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011

REFERENCES:

1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.
2. CMOS VLSI Design – Neil H.E Weste, David harris, Ayan Banerjee 3rd Edition, Pearson

URL's:

https://archive.nptel.ac.in/courses/108/106/108106158/

https://archive.nptel.ac.in/courses/117/101/117101058/

https://youtu.be/WqcK1e68est

https://youtu.be/pmw9VzmvVb8

IV YEAR – I SEMESTER				
20EC7D21 FPGA ARCHITECTURES	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The student will

1. Familiarization of various complex programmable logic devices of different families.
2. Understand Field programmable gate arrays and realization techniques.
3. Understand hot design methods.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

1. Demonstrate various architectures and device technologies of PLDs and CPLDs.
2. Illustrate aspects of FPGA Architectures.
3. Explain SRAM Programmable FPGAs.
4. Explain Anti-Fuse Programmed FPGAs.
5. Analyze System level Design and their application for Combinational and Sequential Circuits

UNIT I **[12HRS]**

Introduction to Programmable Logic Devices

Introduction, Simple Programmable Logic Devices - Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/Generic Array Logic; Complex Programmable Logic Devices - Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

UNIT II **[12HRS]**

Field Programmable Gate Arrays Classes

FPGA design flow, Basic FPGA architecture, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, and Applications of FPGAs

UNIT III **[12HRS]**

Essentials and SRAM Programmable FPGA

Introduction, Programming Technology, Device Architecture, The Xilinx XC2000, XC3000 and XC4000 Architectures.

UNIT IV **[12HRS]**

Anti-Fuse Programmed FPGAs

Introduction, Programming Technology, Device Architecture, the Actel ACT1, ACT2 and ACT3 Architectures.

UNIT V **[12HRS]**

Design Applications:

General Design Issues, Counter Examples, A Fast Video Controller, A position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

TEXT BOOKS:

1.Field Programmable Gate Array Technology - Stephen M. Trimberger, Springer International Edition.
2.Digital Systems Design- Charles H. Roth Jr, Lizy Kurian John, Cengage Learning.
3.FPGA based System Design by Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.

REFERENCE BOOKS

1.Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
2.Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/Samiha Mourad, Pearson Low Price Edition.
3.CMOS VLSI Design - A circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banejee, Pearson 2009.

URL's :

https://nptel.ac.in/courses/117108040
https://www.niser.ac.in/sercehep2017/notes/FPGA_Lecture_SERC_NISER.pdf
https://youtu.be/ht7nEjNydDU

IV YEAR – I SEMESTER				
20EE7E03 ELECTRICAL DISTRIBUTION SYSTEMS	**L**	**T**	**P**	**C**
(Open Elective-3)	**3**	**0**	**0**	**3**

UNIT – I

General Concepts

Introduction to distribution systems - Distribution system losses – Coincidence factor – Contribution factor loss factor – Numerical Problems – Load Modelling and Characteristics – Relationship between the load factor and loss factor – Classification and characteristics of loads (Residential, commercial, Agricultural and Industrial).

UNIT – II

Substations

Location of substations**:** Rating of distribution substation – Service area with'n'primary feeders – Benefits and methods of optimal location of substations.

Distribution Feeders: Design Considerations of distribution feeders**:** Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

UNIT – III

System Analysis

Voltage drop and power–loss calculations**:** Derivation for voltage drop and power loss in lines – Uniformly distributed loads and non-uniformly distributed loads – Numerical problems – Three phase balanced primary lines.

UNIT – IV

Protection, Coordination & Automation

Objectives of distribution system protection –Time current characteristics – **Protective devices:** Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers, Modulated case circuit breakers, Earth leakage circuit breakers – Protection schemes of parallel& Ring main feeders.

Coordination of protective devices: General coordination procedure –Various types of coordinated operation of protective devices - Residual Current Circuit Breaker

Automation: Block diagram approach of SCADA.

UNIT – V

Compensation for Power Factor Improvement & Voltage Control

Capacitive compensation for power factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location – Numerical problems.

Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR – Line drop compensation – Numerical problems.

Text Book:

1. “Electric Power Distribution system, Engineering” – by TuranGonen, McGraw–hill Book Company.

Reference Books:

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing company, 4th edition, 1997.
3. Electrical Power Distribution Systems by V.Kamaraju, Right Publishers

IV YEAR – I SEMESTER				
20ME7E03 FINITE ELEMENT METHODS (Open Elective-3)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives:

COB1: To learn basic elementary stress-strain relations of different problems and to understand the concepts behind variational methods.

COB2: To learn the theory and characteristics of finite elements that represent engineering structures.

COB3: To study boundary conditions to a global structural equation and reduce it to a solvable form for solving structural problems.

COB4: To understand the element characteristic equation procedure and generation of global stiffness equation for solving two dimensional and axi-symmetric problems.

COB5: To learn how to choose higher order elements to reduce the error in the solution of a continuum.

Course Outcomes:

After successful completion of the course, the students should be able to

CO1. Analyse elementary stress-strain relations of different problems and can understand the concepts behind variational methods. Identify the application and characteristics of FEA elements for discretization of different continuum.

CO2. Apply Suitable boundary conditions to a global structural equation and reduce it to a solvable form for solving structural problems.

CO3. Develop element characteristic equation procedure and generation of global stiffness equation for solving two dimensional and axi-symmetric problems.

CO4. Choose higher order elements to reduce the error in the solution of a continuum.

CO5. Identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow.

UNIT-I

Introduction to finite element method, stress and equilibrium, strain–displacement relations, stress–strain relations, plane stress and plane strain conditions, variational and weighted residua l methods, concept of potential energy, one dimensional Problems. Discretization of domain, element shapes, discretization procedures, assembly of stiffness matrix, band width, node numbering, mesh generation, interpolation functions, local and global coordinates, convergence requirements, treatment of boundary conditions.

UNIT–II

Analysis of Trusses: Finite element modeling, coordinates and shape functions, assembly of global stiffness matrix and load vector, finite element equations, treatment of boundary conditions, stress, strain and support reaction calculations.
Analysis of Beams: Element stiffness matrix for Hermite beam element, derivation of load vector for concentrated and UDL, simple problems on beams.

UNIT–III

Finite element modeling of two-dimensional stress analysis with constant strain triangles and treatment of boundary conditions, formulation of axisymmetric problems.

UNIT-IV

Higher order and iso parametric elements: One dimensional quadratic and cubic elements in natural coordinates, two dimensional four node diso parametric elements and numerical integration.

UNIT–V

Steady state heat transfer analysis: one dimensional analysis of a fin and two dimensional analysis of thin plate, analysis of a uniform shaft subjected to torsion. Dynamic Analysis: Formulation of finite element model, element consistent and lumped mass matrices, evaluation of eigen values and eigen vectors, free vibration analysis.

TextBooks:

1. The Finite Element Methods in Engineering/SSRao/Pergamon.
2. IntroductiontoFiniteElementsinEngineering/TirupathiR.Chandrupatla,Ash okD.Belegundu,PearsonPublishers.

IV Year - I Semester	Code: 20CS7E04	L -3	T - 0	P -0	C -3

NATURE INSPIRED COMPUTING TECHNIQUES

Course Objectives:

Learn the theoretical foundations of Nature Inspired Computing techniques, how they can be used to solve problems, and in which areas are most useful and effective.

Course Outcomes:

By completing the course the students will be able to:

 Understand the strengths, weaknesses and appropriateness of nature-inspired algorithms.

 Apply nature-inspired algorithms to optimization, design and learning problems.

UNIT I

Analysis of Algorithms: Analysis of Optimization Algorithms, Nature Inspired Algorithms, Parameter Tuning and Parameter Control: Parameter Tuning, Hyper optimization, Multi objective View, Parameter Control, Simulated Annealing: Algorithm, Basic Convergence Properties, Stochastic Tunneling

UNIT II

Genetic Algorithms: Introduction, Role of Genetic Operators, Choice of Parameters, GA Variants, **Differential Evolution:** Introduction, Differential Evolution, Variants, Choice of Parameters, Convergence Analysis, **Particle Swarm Optimization:** Swarm Intelligence, PSO Algorithm, Accelerated PSO, Binary PSO

UNIT III

Firefly Algorithms: Firefly Behavior, Standard Firefly Algorithm Variations of Light Intensity and Attractiveness, Controlling Randomization, Firefly Algorithms in Applications

Cuckoo Search: Cuckoo Breeding Behavior, Levy Flights, Cuckoo Search: Special Cases of Cuckoo Search, Variants of Cuckoo Search, Global Convergence, Applications

UNIT IV

Bat Algorithms: Echolocation of Bats: Behavior of Microbats, Acoustics of Echolocation, Bat Algorithms: Movement of Virtual Bats, Loudness and Pulse Emission, Binary Bat Algorithm, Variants of the Bat Algorithm, Convergence Analysis, Applications: Continuous Optimization, Combinatorial Optimization and Scheduling, Inverse Problems and Parameter Estimation, Classifications, Clustering and Data Mining, Image Processing, Fuzzy Logic and Other Applications

UNIT V

Flower Pollination Algorithms: Introduction, Characteristics of Flower Pollination, Flower Pollination Algorithms, Multi-Objective Flower Pollination Algorithms, Validation and Numerical Experiments: Single-Objective Test Functions, Multi-Objective Test Functions, Applications: Single-Objective Design Benchmarks, Multi-Objective Design Benchmarks

Text Books:

1. "Nature-Inspired Optimization Algorithms", Yang, Xin-She, Elsevier Science, 2014.

Reference Books:

1. "Nature-Inspired Computing and Optimization: Theory and Applications," Germany: Springer International Publishing, 2017.

IV YEAR -I SEMESTER	L	T	P	C
20CE7E03 – DISASTER MANAGEMENT **(Open Elective – III)**	**3**	**0**	**0**	**3**

Course Objectives:

The objectives of the course are to familiarize students with

- various types of disasters
- impact of disasters
- disaster risk reduction
- impact of environmental modifications

Course Outcomes:

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

1. Identify the Disaster Concepts to Management
2. explain the concepts of Development and Disasters.
3. analyse the disaster impacts.
4. plan the disaster risk reduction.
5. Discuss about the disasters,environment and development.

UNIT – I **8H**

Introduction - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT – II **10H**

Disasters- Disasters classification; natural disasters (floods, draught, cyclones, volcanoes,Earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT –III **8H**

Disaster Impacts- Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT – IV **10H**

Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local

institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programs in India and the activities of National Disaster Management Authority.

UNIT – V **9H**

Disasters, Environment and Development- Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Text Books:

1. Disaster Risk Reduction in South Asia, Pradeep Sahni, 2004, Prentice Hall.
2. Handbook of Disaster Management: Techniques & Guidelines, Singh B.K., 2008, , Rajah Publication.

Reference Books:

1. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003.
2. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation.
3. Disaster management by AK Srivastava (1^{ST} JAN 2021).
4. Disaster science & managements by tushar bhattacharya, Tata McGraw hill education Pvt Ltd, New delhi

IV Year - I Semester				
20EC7E03 – EMBEDDED AND REAL TIME SYSTEMS	**L**	**T**	**P**	**C**
(Open Elective-3)	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are given below

1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained.
3. Different steps involved in the design and development of firmware for embedded systems are elaborated.
4. Internals of Real Time operating system and the fundamentals of RTOS based embedded firm ware design is discussed. And Fundamental issues in hardware software co-design were presented and explained.
5. Familiarize with the different IDEs for firm ware development for different family of processors/controllers and embedded operating systems. And embedded system implementation and testing tools are introduced and discussed.

COURSE OUTCOMES:

At the end of this course the student can able to

1. Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
2. Analyze the hardware components required for an embedded system and the design approach of an embedded hardware.
3. Distinguish the various embedded firmware design approaches on embedded environment.
4. Understand how to integrate hardware and firmware of an embedded system using real time operating system.
5. Understand how to embedded system development and its testing

UNIT-I **[12 Hrs]**

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface ,Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II **[12 Hrs]**

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III **[12 Hrs]**

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross compiler.

UNIT-IV **[12 Hrs]**

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronisation, Device Drivers.
HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co Design Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware, ICE.

UNIT-V **[12 Hrs]**

EMBEDDED SYSTEM DEVELOPMENT AND TESTING: The integrated development environment, Types of files generated on cross compilation, Deassembler / Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools, The main software utility tool, Debugging tools, Quality assurance and testing of the design, Testing on host machine.

TEXTBOOKS:

1. Embedded Systems Architecture-By Tammy Noergaard, Elsevier Publications, 2013.
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited, 2013.
3. Embedded System Design: A Unified Hardware/Software Approach, Frank Vahid and Tony Givargis, Draft version, Fall 1999

REFERENCES:

1. Embedded System Design, FrankVahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.
3. Embedded/Real-Time Systems: Concepts, Design & Programming- Dr. K. V. K. K. Prasad, Dreamtech , 2010

URLs.:

https://nptel.ac.in/courses/108102045

https://freevideolectures.com/course/2999/embedded-systems-i

IV Year - I Semester				
20EE7E04 – POWER QUALITY	**L**	**T**	**P**	**C**
(Open Elective-4)	**3**	**0**	**0**	**3**

Unit–I

Introduction

Overview of power quality – Concern about the power quality– Transients – Long–duration voltage variations – Short–duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations.

Unit–II

Voltage imperfections in power systems

Voltage sags – Voltage swells and interruptions – Sources of voltage sag, swell and interruptions – Nonlinear loads –Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection.

Unit–III

Voltage Regulation and power factor improvement:

Principles of regulating the voltage – Device for voltage regulation – Utility voltage Regulator application – Capacitor for voltage regulation – End–user capacitor application – Flicker – Power factor penalty.

Unit– IV

Harmonic distortion and solutions

Voltage distortion vs Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers and motors.

Unit–V

Distributed Generation and Power Quality

Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts – DG on low voltage distribution networks.

Textbooks:

1.Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.

2.Electric power quality problems –M.H.J.Bollen IEEE series-Wiley India publications,2011.

Reference Books:

1.Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.

2.Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.

3.Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.

4.Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.

5.Power Quality c.shankaran, CRC Press, 2001

6.Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis)

7.Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

IV Year - I Semester				
20ME7E04 – 3D PRINTING TECHNOLOGIES	**L**	**T**	**P**	**C**
(Open Elective-4)	**3**	**0**	**0**	**3**

Course Objectives:

- To understand the fundamental concepts of Rapid Prototyping and 3-D printing, its advantages and limitations.
- To classify various types of Additive Manufacturing Processes and know their working principle, advantages, limitations etc.
- To have a holistic view of various applications of these technologies in relevant fields such as mechanical, Bio-medical, Aerospace, electronics etc.

Course Outcomes: At the end of the course, the student should be able to
CO1: Describe various CAD issues for 3D printing and rapid prototyping and related operations for STLmodel manipulation.

CO2:. Formulate and solve typical problems on reverse engineering for surface reconstruction from physical prototype models through digitizing and spline-based surface fitting.
CO3: Formulate and solve typical problems on reverse engineering for surface reconstruction from digitized mesh models through topological modelling and subdivision surface fitting.
CO4: Explain and summarize the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems.
CO5: Explain and summarize typical rapid tooling processes for quick batch production of plastic and metal parts

UNIT – I

Introduction: Prototyping fundamentals: Historical development, Fundamentals of Rapid Prototyping, Advantages, and Limitations of Rapid Prototyping, Commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain: Fundamental Automated Processes, Process Chain.

UNIT - II

Liquid-based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Solid ground curing (SGC): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies Solid-based Rapid Prototyping Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

UNIT - III

Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Rapid Tooling: Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification; Indirect Rapid Tooling Methods: Spray Metal Deposition, RTV Epoxy Tools, Ceramic tools, Investment Casting, Spin Casting, Die casting, Sand Casting, 3D Keltool process. Direct Rapid Tooling : Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP

UNIT - IV

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats. Rapid Prototyping Software's: Features of various RP software's like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor.

UNIT - V

RP Applications : Application - Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules.

TEXT BOOKS:

1. Rapid prototyping; Principles and Applications /Chua C.K., Leong K.F. and LIM C.S/World Scientific Publications

2. Rapid Manufacturing /D.T. Pham and S.S. Dimov/Springer

REFERENCE BOOKS:

1. Terry Wohlers, Wholers Report 2000, Wohlers Associates

2. Rapid Prototyping and Manufacturing /PaulF.Jacobs/ASME

IV Year - I Semester	Code: 20CS7E05	L -3	T -0	P -0	C-3

SECURE CODING TECHNIQUES

Course Outcomes:

At the end of the Course, student will be able to:

- Differentiate the objectives of information security
- Understand the trend, reasons and impact of the recent Cyber attacks
- Understand OWASP design principles while designing a web application
- Understand Threat modelling
- Importance of security in all phases of SDLC
- Write secure coding using some of the practices in C/C++/Java and Python programming languages

UNIT I

Network and Information security Fundamentals: Network Basics, Network Components, Network Types, Network Communication Types, Introduction to Networking Models, Cyber Security Objectives and Services, Other Terms of Cyber Security, Myths Around Cyber Security, Myths Around Cyber Security, Recent Cyber Attacks, Generic Conclusion about Attacks, Why and What is Cyber Security, Categories of Attack

UNIT II

Introduction to Cyber security: Introduction to OWASP Top 10, A1 Injection, A1 Injection Risks Root Causes and its Mitigation, A1 Injection, A2 Broken Authentication and Session Management, A7 Cross Site Scripting XSS,A3 Sensitive Data Exposure, A5 Broken Access Control, A4 XML External Entity (XEE), A6 Security Misconfiguration, A7 Missing Function Level Access Control, A8 Cross Site Request Forgery CSRF, A8 Insecure Deserialization, A9 Using Components With Known Vulnerabilities, A10 Unvalidated Redirects and Forwards, A10 Insufficient Logging and Monitoring, Secure Coding Practices, Secure Design Principles, Threat Modeling, Microsoft SDL Tool

UNIT III

Secure coding practices and OWASP Top 10: Declarative Security, Programmatic Security, Concurrency, Configuration, Cryptography, Input and Output Sanitization, Error Handling, Input Validation, Logging and auditing, Session Management, Exception Management, Safe APIs, Type Safety, Memory Management, Tokenizing, Sandboxing, Static and dynamic testing, vulnerability scanning and penetration testing

UNIT IV

Secure coding practices in C/C++ and Java: Potential Software Risks in C/C++, Defensive coding, Preventative Planning, Clean Code, Iterative Design, Assertions, Pre Post Conditions, Low level design

inspections, Unit Tests

Java- Managing Denial of Service, Securing Information, Data Integrity, Accessibility and Extensibility, Securing Objects, Serialization Security

UNIT V

Secure coding in Python: Interactive Python Scripting, Python Variables, Conditionals, Loops, Functions, External Modules, File operations, Web requests

Text Books:

1. Networking Fundamentals, 2019 edition, Packt, Author: Gordon Davies

2. Principles of Information Security, Authors: Michael E. Whitman and Herbert J. Mattord, Course technology incorp.

3. CSSLP SECURE SOFTWARE LIFECYCLE PROFESSIONAL ALL-IN-ONE EXAM GUIDE, Third Edition, 3rd Edition, Authors: Wm. Arthur Conklin, Daniel Paul Shoemaker, Released February 2022,Publisher(s): McGraw-Hill,ISBN: 9781264258215

4. OCP Oracle Certified Professional Java SE 11 Programmer II Study Guide: Exam 1Z0-816 and Exam 1Z0-817 Paperback – 6 August 2020, Authors: Scott Selikoff , Jeanne Boyarsky

5. OWASP 2017 Handbook,

https://owasp.org/www-pdf-archive/OWASP_Top_10_2017_RC2_Final.pdf

Web Reference : 1.https://www.stealthlabs.com/blog/infographic-top-15-cybersecurity- myths-vs-reality/

2. https://microage.ca/cybersecurity-layering-approach/

IV YEAR -I SEMESTER	L	T	P	C
20CE7E04 - PROJECT MANAGEMENT **(Open Elective – 4)**	**3**	**0**	**0**	**3**

Course Objectives:

The objectives of this course are

- To train the students in the field work so as to have a first-hand knowledge of practical problems related to Construction Management in carrying out engineering tasks.
- To optimize the time of construction of a project by project planning tools.
- To update the planners at site for material resources, time scheduling and project cost.
- To give knowledge of risk management and remedial measures.
- To make students aware of different construction equipment.

Course Outcomes:

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

1. Explain the construction project management and PERT.
2. Discuss about the construction equipment.
3. Determine the handling and hoisting and earth work equipment.
4. Describe the utility of the concreting equipment.
5. Plan the suitable manpower for construction projects.

UNIT-I **(12H)**

Construction project management and its relevance – Qualities of a project manager – project planning – coordination – scheduling - monitoring – bar charts – milestone charts – critical path method.

Project Evaluation and Review Technique – Cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources.

UNIT-II **(8H)**

Construction equipment – Economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of truck.

UNIT-III **(9H)**

Handling equipment – Calculation of truck production – compaction equipment – types of compaction rollers, and maintenances

Hoisting and Earthwork Equipment – Hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets.

UNIT-IV **(8H)**

Concreting Equipment: Crushers- Jaw crushers, gyratory crushers, impact crushers, selection of crushers equipment - screening of aggregate – concrete mixers – mixing and placing of concrete - compaction– consolidating and finishing.

UNIT–V **(8H)**

Construction Methods – Earthwork – piling – placing of concrete – form work, Fabrication and erection – quality control and safety engineering, man power planning in construction projects.

Text Books:

1. Construction Planning, Equipment and Methods' by Purifoy and Schexnayder, Shapira, 7th edition, TataMcgraw-hill.
2. Construction Project Management Theory and Practice by Kumar Neeraj Jha (2011),Pearson.

Reference Books:

1. Construction Project Management - An Integrated Approach' by Peter Fewings, Taylor and Francis, 3rd edition, Routledge publications.
2. Construction Management Emerging Trends and Technologies' by Trefor Williams, 2009. Cengage learning.
3. Construction Technology by Subir K.Sarkarand, Subhajit Saraswati, Oxford University press.
4. Construction project management by K.K.Chitkara,M.C.Graw-hill, 4th edition, 2019.
5. Construction project management by Piyush Bhandari, Notion press, 1stedition, 2021.

IV Year - I Semester				
20EC7E04 SMART SENSORS **(Open Elective – 4)** (Not for ECE Students)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

COURSE OBJECTIVES:

The main objectives of this course are

1. The student will come to know the various stimuli that are to be measured in real life instrumentation.
2. The student will be able to select the right process or phenomena on which the sensor should depend on
3. The student will be aware of the various sensors available for measurement and control applications.

COURSE OUTCOMES:

After going through this course the student will be able to

1. Appreciate the operation of various measuring and control instruments which they encounter in their respective fields.
2. Visualize the sensors and the measuring systems when they have to work in areas of interdisciplinary nature and also think of sensors and sensors systems when for a new situation they encounter in their career
3. Identify and select the right process or phenomena on which the sensor should depend on.
4. Know various stimuli that are to be measured in real life instrumentation.

UNIT – I **[12 HRS]**

Introduction to sensors and transducers .Need for sensors in the modern world. Different fields o and passive sensors. Static and dynamic characteristics of sensors - zero, I and II order senso Environmental factors and reliability of sensors.

Calibration: Calibration of measuring instruments, Primary calibration, secondary calibration and field calibration. Calibration methods for different parameters (temperature, pressure, humidity, flow...etc.). Automatic Calibration mechanisms

UNIT – II **[12 HRS]**

Sensors for mechanical systems or mechanical sensors - Displacement - acceleration and force - flow of fluids - level indicators - pressure in fluids - stress in solids. Typical sensors - wire and film strain gauges, anemometers, piezo electric and magnetostrictive accelerometers, potentio metric sensors, LVDT.

UNIT – III **[12 HRS]**

Thermal sensors – temperature – temperature difference – heat quantity. Thermometers for different situation – thermocouples thermistors – color pyrometry.

Optical sensors: light intensity – wavelength and color – light dependent resistors, photodiode, photo transistor, CCD, CMOS sensors.

Radiation detectors: Radiation Intensity, Particle counter – Gieger Muller courter (gas based), Hallide radiation detectors.

UNIT – IV **[12HRS]**

Magnetic sensors: magnetic field, magnetic flux density – magneto resistors, Hall sensors, super conduction squids.

Acoustic or sonic sensors: Intensity of sound, frequency of sound in various media, various forms of microphones, piezo electric sensors.

UNIT – V **[12 HRS]**

Electrical sensors: conventional volt and ammeters, high current sensors, (current transformers), high voltage sensors, High power sensors.

High frequency sensors like microwave frequency sensors, wavelength measuring sensors. MEMs and MEM based sensors.

TEXT BOOKS

1. Doebelin, “Measurement Systems: Application and Design”, McGraw Hill Kogakusha Ltd.
2. Julian W. Gardner, Vijay K. Varadan, Osama O. Awadelkarim “Microsensors, MEMS and Smart Devices”, New York: Wiley, 2001.
3. Henry Bolte, “Sensors – A Comprehensive Sensors”, John Wiley.

REFERENCES

1. Jocob Fraden,” Handbook of Modern Sensors, Physics, Designs, and Applications”, Springer.
2. Manabendra Bhuyan,” Intelligent Instrumentation Principles and Applications”, CRC Press.
3Randy Frank,” Understanding Smart Sensors”, Second edition, Artech House

URL’S:

https://youtu.be/nE1C4ghfvac
https://youtu.be/hsGHQUrEfss

IV Year - I Semester				
	L	T	P	C
20HS7E01 RESOURCES MANAGEMENT	3	0	0	3

Course Objectives:

COB 1: To make the students understand the importance of resources management and proper planning to effective utilization of resources in organization.

COB 2: To make the students understands the role of human relations in the management of operations and to Understands the marketing conditions, techniques for better business career.

COB 3: To impart knowledge on conceptual models of resources management and to familiarize with the tools of project management.

Course Outcomes:

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

CO 1:	Explain the concepts and importance of resources management
CO 2	Use Human resource management techniques for optimum utilization Human Resource.
CO 3:	Estimate Material Requirement of organization through applications of it.
CO 4:	Apply statistical quality techniques to know quality ofproduct with in the control limits
CO 5 :	Apply the project management techniques to decide the optimum time and cost for the project completion

Unit- I

Introduction to resources Management: Concept definition to Management-types of recourse-advantages and importance of resources management-optimization process of resources -Evaluation of organizational resources-Environmental Scanning-Establishment strategic advantage profile in resources.

Unit-2

Human Resources Management; Concept of HRM& HRD-Functions of HRM; job analysis , job description ,man power planning, selection, job evaluation and Merit rating –Marketing function-channels of distribution –product life cycle.

Unit -3

ManagementofMaterial Resources: Introduction-importance-functions-economic orderquantity(EOQ)-sorting methods; ABC,HML,SDE,VED FSN analysis-contemporary methods (JIT, MRP,TQM,SIX SIGMAS,BPO).

Unit-4

Management of Operational resources;Concept-Principals-work study-method study-Statistical quality control(R- chart, C- chart, P-chart) Accepting sampling

Unit-5

Project Management; Introduction - importance- historical background PERT-Network analysis- rules of networking-critical path method-time estimations-project crashing (simple problems),

Text Books:

1. Dr. A.R.Aryasri, Management Science, TMH, 4th edition, 2009
2. P. Vijaya kumar, N. Appa Rao, AB. Chhalill, Introduction to ManagemantScience,Cengage Learning India pvt ltd., Delhi.
3. O.P .Kanna,**Industrial Engineering And Management,Dhanpat Rai Publications(2010)**
4. Kootz&O'Donnell , Principles of management.

Reference Books:

1. Koontz &weihrich – Essentials of management, TMH, 8 th edition, 2010
2. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi.
3. R S Dwivedi, Human resource Management,Vikas Publishing House Pvt,ltd.,
4. Philip Kotler, K L keller, A koshy, M Jha, Marketing Management, 13Edition, Pearson
5. Pandey, Management Science, Standard Book

IV Year - I Semester				
20HS7E02 INDUSTRIAL MANAGEMENT	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives:

COB 1: To impart fundamental knowledge and skill sets required in the Industrial Management and Engineering profession, which include the ability to apply basic knowledge of mathematics, probability and statistics, and the domain knowledge of Industrial Management and Engineering

COB 2: To produce graduates with the ability to adopt a system approach to design, develop, implement and innovate integrated systems that include people, materials, information, equipment and energy.

COB 3: To enable students to understand the interactions between engineering, business, technological and environmental spheres in the modern society.

COB 4: To enable students to understand their role as engineers and their impact to society at the national and global context.

Course Outcomes:

CO1: Able to **describe** concept of industrial engg and management and functions of management

CO2: Able to **contrast** the location factors of plants and different layouts used of an industry.

CO3. Able to **understand** work study , methods study and work measurement for improving productivity .

CO4. Able to **interpret** the SQC tools and TQM approach for improving the product quality.

CO5. Able to **apply** concept of Value engg and project management using CPM and PERT

UNIT – I

INTRODUCTION: Definition of industrial engineering (I.E), development, applications, role of an industrialengineer, Productivity and its measurement. Concepts of management, importance, functions of management, Taylor's scientific managementprinciples,Fayol's principles of management , Mc Douglas Theory X and theory

UNIT – II

PLANT LAYOUT: Factors governing plant location, types of production layouts, advantages and disadvantagesof process layout and product layout, applications, quantitative techniques for optimal design of layouts, plant maintenance, preventive and breakdown maintenance.

UNIT – III

OPERATIONS MANAGEMENT:

production and its methods with applications. work study - method study- process charts and diagrams , micro-motion study and Therbligs.Work measurement – Stop Watch Time study, work sampling, PMTS, rating techniques.Principles of Ergonomics.

UNIT – IV

STATISTICAL QUALITY CONTROL: quality, quality control and SQC. inspection and its methods -single and double sampling .Control charts for variables and attributes -$\bar{X}$ and R charts, P charts, C charts S charts and numerical examples.

TOTAL QUALITY MANAGEMENT: zero defect concept, quality circles, implementation, applications, six sigma – definition, basic concepts, ISOquality systems.

UNIT – V

PROJECT MANAGEMENT: PERT and CPM – differences & applications, critical path, determination of floats,importance, project crashing, smoothing and numerical examples.

TEXT BOOKS:

1. Industrial Engineering and management / O.P Khanna/Khanna Publishers.
2. Industrial Engineering and Production Management/MartandTelsang/S.Chand& Company Ltd. New Delhi

Reference Books:

1. Industrial Management / Bhattacharya DK/Vikas publishers
2. Operations Management / J.G Monks/McGrawHill Publishers.
3. Industrial Engineering and Management Science/ T. R. Banga, S. C. Sharma, N. K. Agarwal/Khanna Publishers
4. Principles of Management /Koontz O' Donnel/McGraw Hill Publishers.
5. Statistical Quality Control /Gupta/Khanna Publishers
6. Industrial Engineering and Management /NVS Raju/Cengage Publishers

IV Year - I Semester				
20HS7E03 MANAGEMENT SCIENCE	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives:

COB 1: To make the students define the principles, functions, theories and practices of different management areas with a systematic and critical understanding of organizational structures.

COB 2: To make the students understands the role of human relations in the management of operations and to Understands the marketing conditions, techniques for better business career.

COB 3: To impart knowledge on conceptual models of strategic management and to familiarize with the tools of project management.

Course Outcomes:

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

CO 1:	Explain and infer the concepts and aspects of management
CO 2:	Apply statistical quality & inventory control techniques to know, quality of product with in the control limits
CO 3	Use Human resource management techniques for better people management.
CO 4:	Estimate Marketing and its applications.
CO 5:	Apply the project management techniques to decide the optimum time and cost for the project completion
CO 6 :	Analyzing Strategies which are suitable for the development of organization

Unit I: Introduction to Management:

Definition, Nature, Importance of Management, Functions of Management –

Evaluation of Management thought Taylor's scientific management theory, Fayol's principles of management, Contribution of Elton mayo, Theories of Motivation Maslow, Herzberg, Douglas MC Gregor.

Basic concepts of Organization-Authority, Responsibility, Delegation of Authority, Span of control, centralization Vs Decentralization, formal Vs informal organizations.

Organization structures - Line organization, Line and staff organization, Functional organization, Committee organization, Matrix organization, Decision making process.

Unit II: - Operations & Materials, Quality Control Management

Plant location, Factors influencing location, Principles and types of plant layouts,

Material Management: Need for Inventory control, EOQ, ABC analysis (simple problems) and Types of ABC analysis.

Statistical Quality Control: Statistical Quality Control, acceptance sampling, Control charts P-chart, X chart, R-chart, and C-chart Simple problems, TQM, Six Sigma, JIT, KPO.

Unit III: - Human Resource& Marketing Management:
Concepts of HRM, HRD, Basic functions of HR manager, Recruitment, Selection, Training, performance appraisal, Talent management - Stress management. Marketing Managementand its Marketing mix-Market segmentation - product life cycle- Channels of Distribution.

Unit IV: - Project Management:
Network analysis: Networking rules - Critical path method (CPM) - Programme evaluation and review technique (PERT), project crashing (simple problems)
.
Unit V: Strategic Management:
Vision, Mission, Goals, Strategy, Elements of Corporate Planning Process, Environmental Scanning (SWOT analysis), Steps in Strategy Formulation and Implementation,

Text Books:

1. Dr. A.R.Aryasri, Management Science, TMH, 4th edition, 2009
2. P. Vijaya kumar, N. Appa Rao, AB. Chhalill, Introduction to Managemant Science,Cengage Learning India pvt ltd., Delhi.
3. O.P .Kanna, **Industrial Engineering And Management, Dhanpat Rai Publications (2010)**
4. Kootz & O'Donnell , Principles of management.

Reference Books:

1. Koontz & weihrich – Essentials of management, TMH, 8 th edition, 2010
2. Stoner, Freeman, Gilbert, Management, 6th edition Pearson education, New Delhi.
3. R S Dwivedi , Human resource Management,Vikas Publishing House Pvt,ltd.,
4.Philip Kotler, K L keller, A koshy, M Jha, Marketing Management, 13Edition, Pearson
5. Pandey, Management Science, Standard Book

IV Year - I Semester				
20HS7E04 IPR & PATENTS	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Course Objectives:

- **COB 1:** To make the students acquaint the learners with the basic concepts of Intellectual Property Rights
- **COB 2:** To make the students develop expertise in the learners in IPR related issues
- **COB 3:** To impart knowledge with the emerging issues in IPR and the rationale for the protection of IPR.

Course Outcomes:

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

CO 1:	Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments
CO 2:	get an insight on Copyrights, Patents and Software patents which are instrumental for furtheradvancements
CO 3	IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seekPatents
CO 4:	learn the procedure of obtaining Trade Marks &Industrial Design
CO 5:	Create an awareness on various cyber laws for unfair practices

UNIT I

Introduction to Intellectual Property Rights (IPR): Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neighboring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual PropertyRights.

UNIT II

Copyrights and Neighboring Rights: Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers **–** Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip ProtectionAct.

UNIT III

Patents: Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board -

Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty New developments in Patents – Software Protection and Computer related Innovations

UNIT IV

Trademarks: Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

UNIT V

Trade Secrets & Cyber Law and Cyber Crime: Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets– Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law. Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions – E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.

Text Books:-

1) Deborah E.Bouchoux: Intellectual Property, Cengage Learning, NewDelhi
2) Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).

References:

1) Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, NewDelhi.
2)PrabhuddhaGanguli: Intellectual Property Rights, Tata Mc-Graw –Hill, NewDelhi
3) Richard Stim: Intellectual Property, Cengage Learning, NewDelhi
4)Cyber Law - Texts & Cases, South-Western's Special TopicsCollections.
5) R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
6) M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, SerialsPub