ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

KKR & KSR Institute of Technology and Sciences

(AUTONOMOUS)

Vinjanampadu, Vatticherukuru (Mandal), Guntur, AndhraPradesh-522017

R20 Regulation Course Structure (Choice Based Credit System) Bachelor of Technology (B.Tech)

(Applicable from the batches admitted in AY: 2020-2021& Lateral Entry AY:2021-2022)

Department of Electronics and Communication Engineering

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

SEMESTER-I (I-I)

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH1T01	Communicative English	3	0	0	3	30	70	100
2	20SH1T02	Applied Physics	3	0	0	3	30	70	100
3	20SH1T07	Linear Algebra and Vector Calculus	3	0	0	3	30	70	100
4	20EE1T01	Electrical Installation and Electronics Engineering Practice	2	0	2	3	30	70	100
5	20CS1T01	Problem Solving and Programming Using C	3	0	0	3	30	70	100
6	20GE1M01	Environmental Science	2	0	0	---	---	---	---
PRACTICAL									
7	20SH1L01	English Communicative Skills Lab	0	0	3	1.5	15	35	50
8	20SH1L02	Applied Physics Lab	0	0	3	1.5	15	35	50
9	20CS1L01	Problem Solving and Programming Using C Lab	0	0	3	1.5	15	35	50
		Total Credits				**19.5**	**195**	**455**	**650**

Theory: BSC-2, HSMC-1, ESC-2 Practical: BSC-1, HSMC-1, ESC-1

SEMESTER-II (I-II)

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH2T04	Applied Chemistry	3	0	0	3	30	70	100
2	20SH2T06	Differential Equations	3	0	0	3	30	70	100
3	20ME2T01	Engineering Graphics	1	0	4	3	30	70	100
4	20CS2T01	Python Programming	3	0	0	3	30	70	100
5	20EE2T01	Network Analysis	3	0	0	3	30	70	100
PRACTICAL									
6	20SH2L04	Applied Chemistry Lab	0	0	3	1.5	15	35	50
7	20CS2L01	Python Programming Lab	0	0	3	1.5	15	35	50
8	20CS2L02	IT Workshop	0	0	3	1.5	15	35	50
		Total Credits				**19.5**	**195**	**455**	**650**

Theory: BSC-2, ESC-3 Practical: BSC-1, ESC-2

ELECTRONICS AND COMMUNICATION ENGINEERING
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SEMESTER-III (II-I)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20SH3T03	Numerical Methods & Transformations	3	0	0	3	30	70	100
2	20EC3T01	Electronic Devices and Circuits	3	0	0	3	30	70	100
3	20EC3T02	Digital System Design	3	0	0	3	30	70	100
4	20EC3T03	Signals and Systems	3	0	0	3	30	70	100
5	20SH3T01	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
PRACTICAL									
6	20EC3L01	Electronic Devices and Circuits Lab	0	0	3	1.5	15	35	50
7	20EC3L02	Digital System Design Lab	0	0	3	1.5	15	35	50
8	20CS3L03	OOP's Through C++ Lab	0	0	3	1.5	15	35	50
9	20IT3S01	Skilloriented Course–I (**Basic level skill Oriented courses-I**)	1	0	2	2.0	…..	50	50
10	20GE3M01	Indian Constitution	2	0	0	0			
					Total Credits	**21.5**	**195**	**505**	**700**

Theory: BSC-1, PCC-3, ESC-1 Practical: PCC-2, ESC-1, SC-1, MC-1

SEMESTER-IV (II-II)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20EC4T01	Electronic Circuit Analysis	3	0	0	3	30	70	100
2	20EC4T02	Analog Communication	3	0	0	3	30	70	100
3	20EC4T03	Electro Magnetic Waves and Transmission Lines	3	0	0	3	30	70	100
4	20EE4T02	Control Systems	3	0	0	3	30	70	100
5	20CS4T04	Data Structures	3	0	0	3	30	70	100
PRACTICAL									
6	20EC4L01	Electronic Circuit Analysis Lab	0	0	3	1.5	15	35	50
7	20EC4L02	Analog Communication Lab	0	0	3	1.5	15	35	50
8	20CS4L04	Data Structures using Lab	0	0	3	1.5	15	35	50
9	20IT4S01	SkillOrientedCourse-II	1	0	2	2.0	----	50	50

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		(Basic level skill Oriented courses-II)							
Total Credits						**21.5**	**195**	**505**	**700**
11		**Honors/Minor Courses**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

Theory: PCC-4, HSMC-1 Practical: ESC-1, PCC-2, SC-1

Honors/MinorCourses-1

ELECTRONICS AND COMMUNICATION ENGINEERING
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SEMESTER-V (III-I)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20EC5T01	Microprocessor and Microcontrollers	3	0	0	3	30	70	100
2	20EC5T02	Linear IC applications	3	0	0	3	30	70	100
3	20EC5T03	Antennas and Wave Propagation	3	0	0	3	30	70	100
4	20EC5E04	Random Variable Stochastic Process	3	0	0	3	30	70	100
5	20ITXO01	Data Base Management System	3	0	0	3	30	70	100
6	20GE5M04	Intellectual Property Rights and Patents	2	0	0	0	…..	….	…..
PRACTICAL									
7	20EC5L01	Microprocessor and Microcontrollers Lab	0	0	3	1.5	15	35	50
8	20EC5L02	Linear IC applications Lab	0	0	3	1.5	15	35	50
9	20EC5S01	Advanced VLSI	1	0	2	2.0	----	50	50
10	20EC5I01	Summer Internship During 2 Year	0	0	0	1.5		50	50
Total Credits						**21.5**	**180**	**520**	**700**
11		**Honors/Minor Courses**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

Theory: PCC-3, OEC-1, PEC-1 Practical: PCC-2, SC-1, SI-1, MC-1
Honors/MinorCourses-1

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SEMESTER-VI(III-II)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20EC6T02	Digital Signal Processing	3	0	0	3	30	70	100
2	20EC6T03	VLSI Design	3	0	0	3	30	70	100
3	20EC6T04	Digital Communications	3	0	0	3	30	70	100
4	20EC6E--	**Professional Elective Course-II**	3	0	0	3	30	70	100
5	20CS6O--	Open Elective-II	3	0	0	3	30	70	100
6	20GE6M02	Professional Ethics and Human Values	2	0	0	0	…..	….	…..
PRACTICAL									
7	20EC6L02	Digital Signal Processing Lab	0	0	3	1.5	15	35	50
8	20EC6L03	VLSI Design Lab	0	0	3	1.5	15	35	50
9	20EC6L04	Digital Communication Lab	0	0	3	1.5	15	35	50
10	20EC6S01	Soft Skills	1	0	2	2.0	---	50	50
		Total Credits				**21.5**			
11		**Honors/Minor Courses**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

Theory: PCC-3, OEC-1, PEC-1 Practical: PCC-3, SC-1, MC-1

Honors/MinorCourses-1

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

SEMESTER-VII (IV-I)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20EC7E01	**Professional Elective Course-III**	3	0	0	3	30	70	100
2	20EC7E05	**Professional Elective Course-IV**	3	0	0	3	30	70	100
3	20EC7E09	**Professional Elective Course-V**	3	0	0	3	30	70	100
4	20XX7O--	**Open Elective-III**	3	0	0	3	30	70	100
5	20XX7O--	**Open Elective-IV**	3	0	0	3	30	70	100
6	20SH7E--	**Humanity Elective**	3	0	0	3	30	70	100
PRACTICAL									
7	20SH7S--	Soft Skill Courses	1	0	2	2.0	---	50	50
8	20EC7E--	Summer Internship During 3 Year	0	0	0	3	---	50	50
		Total Credits				**23**	**180**	**520**	**700**
9		**Honors/MinorCourses**	**3**	**1**	**0**	**4**	**30**	**70**	**100**

Theory: OEC-2, PEC-3,HSMEC-1 Practical: SC-1, SI-1
Honors/MinorCourses-1

SEMESTER-VIII (IV-II)

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
THEORY									
1	20EC8P01	Project Work/ Internship in Industry	0	0	0	12	60	140	200
		Total Credits				**12**	**60**	**140**	**200**
2		**Honors/MinorCourses (**MOOCS-I)	-	-	-	2	-	-	-
3		**Honors/MinorCourses**(MOOCS-II)	-	-	-	2	-	-	-

Practical: PROJ-1,

Honors/Minor Courses-2

MOOCS-I & II*

(*– Equivalent grades will be given by BOS)

ELECTRONICS AND COMMUNICATION ENGINEERING
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LIST OF PROFESSIONAL ELECTIVE COURSES

Elective-I (Semester V) (III-I)		
Track 1	20EC5E01	Electronic Measurements and Instrumentation.
Track 2	20EC5E02	Pulse and Digital Circuits.
Track 3	20EC5E03	Computer Architecture &Organisation.
Track 4	20EC5E04	Random Variable & Stochastic Process
Elective-II (Semester VI) (III-II)		
Track 1	20EC6E01	Embedded Systems.
Track 2	20EC6E02	Data Communications.
Track 3	20EC6E03	Telecommunication Switching Networks.
Track 4	20EC6E04	Digital IC applications.
Elective-III (Semester VII) (IV-I)		
Track 1	20EC7E01	Information Theory and Coding
Track 2	20EC7E02	Wireless Sensors and Networks.
Track 3	20EC7E03	Optical Communication.
Track 4	20EC7E04	Radar Engineering.
Elective-IV (Semester VII) (IV-I)		
Track 1	20EC7E05	Satellite Communication.
Track 2	20EC7E06	Low Power VLSI Design
Track 3	20EC7E07	Internet of Things.
Track 4	20EC7E08	Microwave Engineering.
Elective-V (Semester VII) (IV-I)		
Track 1	20EC7E09	Digital Image Processing
Track 2	20EC7E010	Photonics Devices
Track 3	20EC7E011	Cellular Mobile Communication.
Track 4	20EC7E012	Nano Electronics.

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LIST OF OPEN ELECTIVE COURSES

S. No.	Course Code	Course Title	Offering Dept.
1	20CEXO01	Elements of Civil Engineering	CE
2	20CEXO02	Disaster Management	
3	20CEXO03	Intelligent Transport Systems	
4	20CEXO04	Remote sensing & Geographical Information systems	
5	20EEXO01	Electrical Safety Management	EEE
6	20EEXO02	Non-conventional Energy sources	
7	20EEXO03	Electrical and Hybrid Vehicle	
8	20EEXO04	Electrical Energy Conservation and Auditing	
9	20EEXO05	Industrial Robotics	
10	20MEXO01	Optimization Techniques	ME
11	20MEXO02	Robotics	
12	20MEXO03	Industrial Management Sciences	
13	20MEXO04	Automation in Manufacturing	
14	20ECXO01	Principles of Communication	ECE
15	20ECXO02	Digital image Processing	
16	20ECXO03	Bio Medical Engineering	
17	20ECXO04	Design of IOT System (IOT)	
18	20ECXO05	MEMS	
19	20ECXO06	Mechatronics	
20	20CSXO01	Computer Graphics	CSE
21	20CSXO02	Cloud Computing	
22	20CSXO03	Computer Networks	
23	20CSXO04	Cryptography and Network Security	
24	20ITXO01	Data Base Management systems (DBMS)	IT
25	20ITXO02	Java Programming	
26	20ITXO03	Principle of software Engineering (PSE)	
27	20ITXO04	Introduction to Machine Learning	
28	20CIXO01	Python Programming	CAI
29	20CIXO02	Fundamentals of Artificial Intelligence	
30	20CIXO03	Human Computer Interaction	
31	20CIXO04	Applications of AI	
32	20CDXO01	Object Oriented Programming (C++)	CSD
33	20CDXO02	Data Structures	
34	20CDXO03	Data warehouse and Mining	
35	20CDXO04	Big Data Analysis	

HUMANITIES AND SOCIAL SCIENCE ELECTIVE

S. No.	Course Code	**Course Title**
1	20SH7E01	Entrepreneurship Development
2	20SH7E02	Business Environment
3	20SH7E03	Digital Marking
4	20SH7E04	Human Resource development and OB

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LIST OF HONORS COURSES

Year/Sem: II-II (Pool-1)		
S. No	Course Code	Course Name
1	20EC4H01	Data Communications & Computer Networks
2	20EC4H02	Speech Signal Processing
3	20EC4H03	System on Chip
4	20EC4H04	Transducers & sensors
Year/Sem: III-I (Pool-2)		
1	20EC5H01	Global navigational satellite systems
2	20EC5H02	Adaptive Signal Processing
3	20EC5H03	CMOS Analog IC Design
4	20EC5H04	Process Control Instrumentation
Year/Sem: III-II (Pool-3)		
1	20EC6H01	Cognitive radio
2	20EC6H02	DSP Processors and Architectures
3	20EC6H03	CMOS Digital IC design
4	20EC6H04	Intelligent & Smart Instrumentation
Year/Sem: IV-I (Pool-4)		
1	20EC7H01	5G Communications
2	20EC7H02	Multirate Systems And Filter Banks
3	20EC7H03	Low Power VLSI Design
4	20EC7H04	Data Acquisition systems

ELECTRONICS AND COMMUNICATION ENGINEERING
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LIST OF MINORS COURSE (GENERAL)

S. No	Course Code	Course Name
1	20EC4M01	Electronics Devices and Basic Circuits
2	20EC5M01	Digital Electronics
3	20EC6M01	Principles of Communication
4	20EC7M01	Signal Analysis

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Course Code	Course Name	L	T	P	C
20EC7E01	**INFORMATION THEORY AND CODING**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Design an Application with Error-Control coding

CO2 : Use Compression and Decompression Techniques

CO3 : Perform source coding and channel coding

CO4 : Perform cyclic coding techniques

CO5 : Construction of convolution coding techniques

SYLLABUS

UNIT-I : INFORMATION THEORY AND SOURCE CODING

Uncertainty, information, entropy and its properties, entropy of binary memory less source and its extension to discrete memory less source, source coding theorem, data compression, prefix coding, Huffman coding, Lempel-Ziv coding, Source with memory and its entropy.

UNIT-II : DISCRETE CHANNELS

Binary Symmetric Channel, mutual information & its properties, Channel capacity, channel coding theorem and its application to BSC, Shannon's theorem on channel capacity, capacity of a channel of infinite bandwidth, bandwidth - S/N trade off, practical communication systems in light of Shannon's theorem, Fading channel, channels with memory.

UNIT-III : GROUPS, FIELDS AND LINEAR BLOCK CODES

Galois field and its construction in GF(2m) and its basic properties, vector spaces and matrices in GF(2), Linear block codes, systematic codes and its encoding circuit, syndrome and error detection, minimum distance, error detecting and correcting capabilities of block code, decoding circuit, probability of undetected error for linear block code in BSC, Hamming code and their applications.

UNIT-IV : CYCLIC CODES AND BCH CODES

Basic properties of Cyclic codes, Generator and parity check matrix of cyclic codes, encoding and decoding circuits, syndrome computation and error detection, cyclic Hamming codes, encoding and decoding of BCH codes, error location and correction.

UNIT-V : CONVOLUTIONAL CODES

Introduction to convolution code, its construction and Viterbi algorithm for maximum likelihood decoding. Automatic repeat request strategies and their throughput efficiency considerations.

Text Books:

1. Sklar, Digital Communication, Pearson Education Asia, 2nd Edition,2001.
2. Shu Lin and Costello, Error Control Coding: Fundamentals and Applications, 2ndEdition, Pearson,2004.

Reference Books:

1. Haykin Simon, Digital Communication, Wiley Publications,2013.
2. Information theory and coding, Muralidhar Kulkarni, KS AShiva prakash,2015.
3. JS Chithode, Information theory and coding, Technical publishers, 1st Edition,2014.

ELECTRONICS AND COMMUNICATION ENGINEERING
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Course Code	Course Name	L	T	P	C
20EC7E02	**WIRELESS SENSOR NETWORKS**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Explain the significance of sensor network mechanisms.

CO2 : Explain the various architectures of sensor network

CO3 : Describe the roles of supporting communication protocols as how they assist Wireless Sensor Networks.

CO4 : Compare the performance of different techniques applied for node positioning and localization in wireless sensor network.

CO5 : Explain how transport layer mechanisms applied to achieve the required QoS.

SYLLABUS

UNIT-I: OVERVIEW OF WIRELESS SENSOR NETWORKS

Definition, advantages, Applications with examples – Types of applications – Challenges for Wireless sensor networks – Characteristic requirements – required mechanisms – Comparison of Mobile ad hoc networks and wireless sensor networks.

UNIT-II : WIRELESS SENSOR NETWORK ARCHITECTURES

Single–Node Architecture – Hardware Components – Energy Consumption of Sensor Nodes – Operating Systems and Execution Environments – Network Architecture – Sensor Network Scenarios – Optimization Goals and Figures of Merit – Design Principles and service interfaces – Gateway Concepts.

UNIT-III : HARDWARE & SOFTWARE TOOLS

Hardware: Examples like mica2, micaZ, telosB, Imote2, tmote, btnode, and Sun SPOT, **Software (Operating Systems)**: tiny OS, MANTIS, Contiki, and RTOS.

Programming tools: C, nesC. Performance comparison of wireless sensor networks simulation and experimental platforms like open source (ns-2) and commercial (QualNet, Opnet).

UNIT-IV : LOCALIZATION AND POSITIONING

Properties of localization and positioning – Proximity – Trilateration and Triangulation – Single–hop localization – Positioning in multi–hop environments, Topology Control – Controlling topology in flat networks – Hierarchical networks by dominating sets and

clustering – Combining hierarchical topologies and power control – Adaptive node activity.

UNIT-V : TRANSPORT LAYER AND QUALITY OF SERVICE

Coverage and deployment – Reliable data transport – Single packet delivery – Block delivery – Congestion control and rate control – Advanced application support – Security and Application specific support.

TEXTBOOKS:

1. J. Millman and C.C. Halkias, "Electronic Devices and Circuits", 4th edition, Tata Mc-Graw Hill, 2015.
2. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits",pearson/Prentice Hall, 4th edition, 2015.

REFERENCEBOOKS:

1. Kazem Sohraby, Daniel Minoli, &Taieb Znati, "Wireless Sensor Networks Technology, Protocols and Applications", John Wiley, 2011.
2. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC7E03	**OPTICAL COMMUNICATIONS**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Understand the concepts of Optical fiber structure and Single and Multimode Fibers

CO2 : Study the properties of optical fiber that affect the performance of a communication link and types of fiber materials with their properties and the losses occur in fibers.

CO3 : Design the connection between two optical fibers and misalignments present in the fibers due to losses in fiber end separation.

CO4 : Analyze the operation of LEDs, laser diodes, PIN &APD photo detectors

CO5 : Analyze the Source to Fiber power coupling and design the optical system

SYLLABUS

UNIT-I : Optical Fiber Communications

Overview of optical fiber communication - Historical development, Block diagram of optical fiber communication, advantages of optical fiber communications, Applications of optical fiber, Ray theory transmission, Total Internal Reflection, Acceptance angle, Critical angle, Numerical Aperture, Meridional Rays & Skew rays, V-number, Mode coupling, Types of Optical Fibers: Step Index fibers, Graded Index fibers, Single mode fibers- Cut off wavelength, Mode Field Diameter, Related problems.

UNIT-II : Optical Fiber Materials

Fiber materials: Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers-Attenuation, Absorption, Scattering and Bending losses, Information capacity determination, Group delay, Types of Dispersion: Material dispersion, Wave-guide dispersion, Modal Birefringence, Polarization-Mode dispersion.

UNIT-III : Optical Fiber Connectors and Splicers

Optical fiber Connectors-Requirements, Connector types, Fiber Splicing, Splicing techniques, Losses in Fiber end Separation: Intrinsic, Extrinsic coupling loss and Reflection losses, Mis alignments of Single mode Fiber joints, Misalignments of Multimode fiber joints.

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UNIT-IV : Optical Sources and Detectors

Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Power bandwidth product, Injection Laser Diodes- Modes, quantum efficiency, Laser diode rate equations, Optical detectors- Physical principles of PIN and APD, Comparison of Photo detectors, Optical receiver operation, Digital signal transmission, Digital receiver performance: Probability of Error (BER), Quantum Limit, Related problems.

UNIT-V : Source to Fiber power launching& Optical system Design

Source to fiber power launching - Output patterns, Power coupling Calculation, Power launching Versus Wavelength, Equilibrium Numerical Aperture, Lensing Schemes for Coupling Improvement, Laser diode to fiber coupling.

Optical system design – System Design Considerations, Point-to- point link, Link power budget, Rise time budget, WDM: Principle, Types of WDM, Measurement of Dispersion, Eye pattern.

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

REFERENCES:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education,2005.
2. Text Book on Optical Fiber Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC7E04	**Radar Engineering**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Derive the Radar Range Equation and to solve some analytical problems.
CO2 : To Study the different types of Radars and its applications.
CO3 : Distinguish the fixed and moving targets in Radar systems.
CO4 : Understand the concept of tracking and different tracking techniques.
CO5 : Analyze the characteristics of a matched filter receiver and its performance; Identify the different types of display devices & Duplexers.

SYLLABUS

UNIT-I :

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, Transmitter Power, PRF and Range Ambiguities, System Losses, Illustrative Problems

UNIT-II :

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

UNIT-III : 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, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT-IV : 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 : Detection of Radar Signals in Noise

ELECTRONICS AND COMMUNICATION ENGINEERING
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Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise, Radar Receivers- Noise Figure and Noise Temperature, Displays – types, Duplexers – Branch type and Balanced type, Circulators as Duplexer, Radomes.

TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.

REFERENCE BOOKS:

1. Introduction to Radar Systems, 3rd edition – M.I. Skolnik, TMH Ed., 2005
2. Radar Principles – Peyton Z.Peebles, Jr.,Wiley India Pvt Ltd.,2009.
3. Radar Engineering – GSN Raju, IK International.

ELECTRONICS AND COMMUNICATION ENGINEERING
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Course Code	Course Name	L	T	P	C
20EC7E05	**SATELLITE COMMUNICATIONS**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Understand the basic concepts, applications, frequencies used and types of satellite communications.

CO2 : Understand the concept of look angles, launches and launch vehicles and orbital effects in satellite communications and the various satellite subsystems and its functionality.

CO3 : Understand the concepts of satellite link design and calculation of C/N ratio.

CO4 : Understand the concepts of multiple access and various types of multiple access techniques in satellite systems.

CO5 : Understand the concepts of satellite navigation, architecture and applications of GPS.

SYLLABUS

UNIT-I : INTRODUCTION, ORBITALMECHANICS AND LAUNCHERS

Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications Future Trends of Satellite Communications.

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

UNIT-II : SATELLITE SUBSYSTEMS

Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication sub systems, 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 : MULTIPLE ACCESS

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

UNIT-IV : EARTH STATION TECHNOLOGY

Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS [1] : Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs.

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COURSE STRUCTURE

UNIT-V : SATELLITE NAVIGATION & THE GLOBALPOSITIONINGSYSTEM

Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPSN avigation Message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

TEXTBOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy All nutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyder houd, 2nd Edition, Pearson Publications, 2003.

REFERENCEBOOKS:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC7E06	**Low Power VLSI Design**	3	0	0	3

Course Outcomes:

CO1 : Capability to recognize advanced issues in VLSI systems, specific to the deep-submicron silicon Technologies
CO2 : Students able to understand deep submicron CMOS technology and digital CMOS design styles
CO3 : To design chips used for battery-powered systems and high-performance circuits.
CO4 : Learn the design of various CMOS dynamic logic circuits
CO5 : Learn the design techniques low voltage and low power CMOS circuits for various applications and different types of memory circuits and their design

SYLLABUS

UNIT-I : Sources of Power Dissipation

Introduction, Short-Circuit Power Dissipation, Switching Power Dissipation, Dynamic Power for a Complex Gate, Reduced Voltage Swing, Switching Activity, Leakage Power Dissipation, p–n Junction Reverse-Biased Current, Band-to-Band Tunneling Current, Subthreshold Leakage Current, Short-Channel Effects

UNIT-II : Supply Voltage Scaling for Low Power

Device Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVS Voltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling

UNIT-III : Switched Capacitance Minimization

Probabilistic Power Analysis: Random logic signals, probability and frequency, probabilistic power analysis techniques, signal entropy, Bus Encoding: Gray Coding, One-Hot Coding, Bus-Inversion, T0 Coding, Clock Gating, Gated-Clock FSMs FSM State Encoding, FSM Partitioning, Precomputation, Glitching Power Minimization

UNIT-IV : Leakage Power Minimization

Fabrication of Multiple Threshold Voltages, Multiple Channel Doping, Multiple Oxide CMOS, Multiple Channel Length, Multiple Body Bias, VTCMOS Approach, MTCMOS Approach, Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management,

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Combining DVFS and Power Management

UNIT-V : Low power clock distribution& Simulation Power Analysis

Low power clock distribution: Power dissipation in clock distribution, single driver versus distributed buffers, Zero skew versus tolerable skew, chip and package co design for clock network. Simulation Power Analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, architecture level analysis, data correlation analysis of DSP systems, Monte Carlo Simulation Special Techniques: Power Reduction in Clock networks, CMOS Floating Node, Low Power Bus Delay balancing, and Low Power Techniques for SRAM.

TEXT BOOKS:

1. Low-Power VLSI Circuits and Systems, Ajit Pal, SPRINGER PUBLISHERS
2. PRACTICAL LOW POWER DIGITAL VLSI DESIGN , Gary Yeap Motorola, SPRINGER SCIENCE, BUSINESS MEDIA, LLC.

REFERENCE BOOKS:

1. Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998.
2. Massoud Pedram, Jan M. Rabaey , “Low power design methodologies “, Kluwer Academic Publishers.
3. Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC7E07	**INTERNET OF THINGS**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Explain Internet of Things and its hardware.

CO2 : Explain Components of Internet of Things.

CO3 : Interface I/O Devices, Sensors, and Communication modules.

CO4 : Monitor data and control devices.

CO5 : Implement real time IoT based applications.

SYLLABUS

UNIT-I : Introduction to IoT

Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gate ways, Data management, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.

UNIT-II : Elements of IoT

Hardware Computing Components- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, Arm Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.

UNIT-III : IoT Application Development

Communication, IoT Applications, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth. Bluetooth Smart Connectivity, Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.

UNIT-IV : Solution framework for IoT applications

Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT-V : IoT Case Studies

IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

TEXTBOOKS:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education,2017.
2. The Definitive Guide to the ARM Cortex-M0 by JosephYiu,2011 3. Vijay Madisetti, Arshdeep Bahga, Internet of Things, "A Hands-on Approach", UniversityPress,2015

REFERENCEBOOKS:

1. Cypress Semiconductor/PSoC4 BLE (Bluetooth Low Energy) Product Training Modules.
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press,2017

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC7E08	**MICRO WAVE ENGINEERING**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Identify various applications and measurement schemes for micro wave circuits

CO2 : Comprehend the performance of different micro wave sources and ferrite devices

CO3 : Analyze micro wave circuits using scattering parameters

CO4 : Design and analyze power dividers and couplers at micro wave frequencies

CO5 : Design and analyze low pass filters at micro wave frequencies.

SYLLABUS

UNIT-I : Microwave introduction &Types of waveguides

Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides - TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics - Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Impossibility of TEM mode. Introduction to circular waveguides, Microstrip lines and cavity resonators basics, Related Problems

UNIT-II : Microwave Sources

Microwave Tubes: TWT, Klystron amplifier, Reflex Klystron, Magnetron. Semiconductor Devices: Gunn diode, Tunnel diode, IMPATT-TRAPATT-BARITT diodes, PIN Diode.

UNIT-III : Microwave Network Analysis

Scattering matrix-reciprocal networks and lossless networks, generalized S-parameters-signal
flowgraph–decomposition of signal flow graphs.

UNIT-IV : Power dividers

S-matrix analysis of E-Plane Tee, H-Plane Tee, Magic Tee, Multi-hole directional coupler. Introduction to Micro strip lines. Tjunction and resistive power divider, Wilkinson power divider,

UNIT-V : Microwave measurements

Description of Microwave Bench - Different Blocks and their Features, Precautions; Microwave Power Measurement - Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q. Impedance Measurements.

Textbook(s)

1. D.M.Pozar, Microwaveengineering,2012,4thedition,JohnWiley&Sons,USA
2. Microwave Devices and Circuits - Samuel Y. Liao, PHI, 3rdEdition,1994.

Reference Books

1. Robert, E.Collin, Foundations of Microwave Engineering, 2014 (Reprint), 2nd edition, John Wiley & Sons, USA
2. Annapurna Das and S. K .Das, MicrowaveEngineering,2017,3rdedition,TataMcGraw-Hill, India.

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COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC7E09	**DIGITAL IMAGE PROCESSING**	**3**	**0**	**0**	**3**

CO1 : Perform image manipulations and different digital image processing techniques
CO2 : Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
CO3 : Analyze pseudo and full color image processing techniques.
CO4 : Apply various morphological operators on images
CO5 : Compress digital image and video by applying digital image and video compression algorithm

SYLLABUS:

UNIT-I : Digital Image Fundamentals

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

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

UNIT-II : Intensity Transformations and Spatial Filtering

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, Combining spatial enhancement methods Filtering in the Frequency Domain: Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters.

UNIT-III : Image Restoration

Image compression: Fundamentals, Basic compression methods: Huffman coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding.

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb

coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding.

UNIT-IV : Image segmentation

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation. **Morphological Image Processing:** Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

UNIT-V : Color image processing

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

TEXTBOOKS:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.

2. Jayaraman, S. Esakkirajan, and T. Veera kumar," Digital Image Processing", Tata McGraw-Hill Education, 2011.

REFERENCEBOOKS:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.

2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC7E10	**PHOTONIC DEVICES**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Explain fundamentals of optoelectronics

CO2 : Explain basics of light emitting diodes.

CO3 : Acquire knowledge on optical Devices Structures

CO4 : Develop knowledge on opto electronic Integrated Circuits.

CO5 : Construct Photonic devices applications.

SYLLABUS

UNIT-I : Optoelectronics

Review of Semiconductor device Physics, Semiconductor Opto electronics- Solid State Materials, Emitters, Detectors and Amplifiers, Semiconductor Emitters- LEDs, Diodes, SLDs, CCDs, Semiconductor lasers- basic Structure, theory and device characteristics, DFB, DBR, Quantum well lasers, Laser diode arrays, VCSEL etc.

UNIT-II : Semiconductor photo diodes

Materials - Si, Hg Cd Te, InGa As, Al Ga As for different wavelengths, Photoconductors, photo diodes, PIN, APD, Photo transistors, solar cells, CCDs, IR and UV detectors

UNIT-III : Optical Devices Structures

Band gap Engineering, Quantum well structures, size effects, Hetero and nano structures. Fabrication techniques [MBE, CVD, Lithography, Thin films technology and Device characterization. Integrated Optics Optical wave guide theory, wave guide structures. Fiber optic interconnects- Fiber lasers and amplifiers, fiber sensors.

UNIT-IV : Optoelectronic Integrated Circuits

Directional couplers, Dividers, Multiplexers, Phase and Amplitude Modulators, Polarization and polarization controllers, etc. Photonics Signal processing, Nonlinear optics- Frequency Converters, Phase conjugation, optical Correlation etc

UNIT-V : Photonic devices and applications

Intensity, phase and polarization-based Fiber optic sensors for measurement of temperature, pressure, stress etc., for space craft health monitoring, Hydrogen leakage sensing in cryo engines. Fiber Optic Gyroscope for navigation application. Optical Intra Satellite links using

ELED's, VCSELs. Fiber Bragg gratings for health monitoring and smart materials.

TEXTBOOKS:

1. Physics of Semiconductor devices-S.M.Sze& Kwok K Ng, Third edition,Wiley-2007[parts I, II and
2. Fundamentals of Photonics, by Bahaa E. A. Saleh and Malvin Carl Teich, Wiley Series in Pure and Applied Optics

REFERENCEBOOKS:

1. Physics of Opto-electronic Devices- Shun Lien Chuang-Wiley, John&Sons-2009
2. Infrared Photon detectors-Antoni Rogalski [Ed]-SPIE Optical Engineering Press-1995
3. CCD arrays, Cameras & Displays-Gerald C Hoist 1998 [2nd Ed], JCD Publishing-SPIE Optical Engg.Press
4. Photonic Devices By Jia-Ming Liu Cambridge University Press, 2005
5. Photonic Devices and Systems –by Robert G. Hunsperger, Taylor & Francis, 1994

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC7E11	**CELLULAR MOBILE COMMUNICATION**	3	0	0	3

Course Outcomes:

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

CO1 : Understand the basic cellular concepts and various cellular systems.

CO2 : Summarize different types of interferences influencing cellular and mobile communications.

CO3 : Understand the frequency management, channel assignment and various propagation effects in cellular environment.

CO4 : Summarizing the different types antennas used at cell site and mobile.

CO5 : Estimate the architectures of GSM and 3G cellular systems

UNIT-I : CELLULAR MOBILE RADIO SYSTEMS

Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems.

UNIT-II : CELLULAR CONCEPTS

Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

UNIT-III : INTERFERENCE

Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in a omni-directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

UNIT-IV : 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, channel sharing and borrowing, overlaid cells.

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation, antenna height gain, form of a point-to-

point model.

UNIT-V : HANDOFF STRATEGIES

Concept of Handoff, types of handoffs, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, soft and hard hand offs, vehicle locating methods, dropped call rates and their evaluation.

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access schemes; TDMA, CDMA, OFDMA.3G and 4G Wireless Standards GSM, GPRS , WCDMA , LTE , Wi-MAX, Introduction to 5G standards

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2 nd Edition, 2007.
3. Advanced Wireless Communications-4G By. Savo G Glisic, John Wiley & Sons Publication 2nd Edition

REFERENCES:

1. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn.,2002.
2. Fundamentals of Wireless Communication By. David Tse and Pramod Viswanath, Cambridge University Press

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC7E12	**NANO ELECTRONICS**	**3**	**0**	**0**	**3**

COURSE OUTCOMES:

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

CO1 : Explain fundamentals of Nano Technology
CO2 : Explain basics of Nano structures
CO3 : Acquire knowledge on Fabrication of Nano Layers
CO4 : Report Characteristics of Nano Structures.
CO5 : Explain about Nano electronic Devices.

SYLLABUS

UNIT-I : Introduction to Nano Technology

Introduction to nanotechnology, Impacts, Limitations of conventional microelectronics, Trends in microelectronics and optoelectronics. Mesoscopic physics, trends in microelectronics and optoelectronics, characteristic lengths in mesoscopic systems, Quantum mechanical coherence

UNIT-II : Nano Structures

Classification of Nano structures, Low dimensional structures Quantum wells, wires and dots, Density of states and dimensionality. Basic properties of two-dimensional semiconductor nanostructures, square quantum wells of finite depth, parabolic and triangular quantum wells, Quantum wires and quantum dots, carbon nano tube.

UNIT-III : Fabrication of Nano Layers

Introduction to methods of fabrication of nano-layers, different approaches, physical vapour deposition, chemical vapour deposition. Molecular Beam Epitaxy, Ion Implantation, Formation of Silicon Dioxide- dry and wet oxidation methods. Fabrication of nano particle- grinding with iron balls, laser ablation, reduction methods, sol gel, self-assembly, precipitation of quantum dots.

UNIT-IV : Characteristics of Nano Structures

Introduction to characterization of nanostructures, tools used for of nano materials characterization, microscope-optical, electron, and electron microscope. Principle of operation of Scanning Tunnelling Microscope, Atomic Force Microscope, Scanning Electron microscope, Specimen interaction. Transmission Electron Microscope, X-Ray Diffraction analysis, PL & UV Spectroscopy, Particle size analyser.

UNIT-V : Nano Electronic Devices

Nanoelectonic devices- MODFETS, heterojunction bipolar transistors. Resonant tunnel effect, RTD, RTT, Hot electron transistors, Coulomb blockade effect and single electron transistor, CNT transistors, Heterostructure semiconductor laser, Quantum well laser, quantum dot LED

TEXTBOOKS:

1. J.M. Martinez-Duart, R.J. Martin Palma, F. Agulle Rueda Nanotechnology for Microelectronics and optoelectronics, Elsevier, 2006
2. W.R. Fahrner, Nanotechnology and Nano elctronics, Springer, 2005

REFERENCEBOOKS:

1. Chattopadhyay, Banerjee, Introduction to Nanoscience & Technology, PHI, 2012
2. George W. Hanson, Fundamentals of Nanoelectronics, Pearson Education, 2009.
3. K. Goser, P. Glosekotter, J. Dienstuhl, Nanoelectronics and nano systems, Springer 2004.
4. Murty, Shankar, Text book of Nanoscience and Nanotechnology, Universities Press, 2012.
5. Poole, Introduction to Nanotechnology, John Wiley, 2006.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC7M01	**MANAGEMENT SCIENCE**	**3**	**0**	**0**	**3**

COURSE OUTCOMES:

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

CO1 : To familiarize with the process of management and to provide basic insight into organizational behaviour

CO2 : To provide conceptual knowledge on functional management and project management

UNIT-I : Introduction to Management

Concept –nature and importance of Management —Generic Functions of Management- Administration vs. Management – Evolution of Management thought- Decision making process- organization structure: Principles of organization & its types.

UNIT-II : Operations Management

production & its types, plant layout, Work study- method study and work measurement - Statistical Quality Control- Control charts -Simple problems

Material Management: Need for Inventory control- EOQ (simple problems), ABC analysis and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT-III :

Human Resource Management: Concept of HRM, HRD - Functions of HR Manager- types of Wage payment plans – Job Evaluation and Merit Rating- Grievance & redressal mechanism.

Marketing Management: Functions of Marketing – Marketing Mix-Marketing strategies based on product Life Cycle, Channels of distribution.

UNIT-IV : Project Management

(PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

UNIT-V : Organisational behaviour

Attitude & behaviour; Leadership styles; motivation- significance, theories; Perception- Perceptual process-Group Dynamics: Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors.

Text Books

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, '*Management Science'* Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, *Management Science'* TMH 2011.
3. L. M. Prasad, '*Organisational Behavior'* Sultan Chand Publications.

References:

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COURSE STRUCTURE

1. Koontz & Weihrich: 'Essentials *of management'* TMH 2011
2. Anil Bhat& Arya Kumar : Principles of Management, Oxford University Press, New Delhi,2015.
3. Robbins: Organizational Behaviour, Pearson publications, 2011
4. Kanishka Bedi: Production & Operations Management, Oxford Publications, 2011
5. Philip Kotler & Armstrong: Principles of Marketing, Pearson publications
6. K. Aswatappa: 'Human Resource Management – text & cases', TMH.

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ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20ECXO01	**PRINCIPLES OF COMMUNICATIONS**	3	0	0	3

Course outcomes:

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

CO1 : Analyze the performance of analog modulations schemes in time and frequency domains

CO2 : Analyze the performance of angle modulated signals.

CO3 : Characterize analog signals in time domain as random processes and noise.

CO4 : Characterize the influence of channel on analog modulated signals.

CO5 : Determine the performance of analog communication systems in terms of SNR.

UNIT-I : Amplitude modulation:

Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector.

UNIT-II :

Double side band-suppressed carrier modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

Single side–band and vestigial sideband methods of modulation: SSB Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB, Transmission of Analog and Digital Television

UNIT-III :

Angle modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing,

Phase–Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver

UNIT-IV : Noise in analog modulation:

Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM.

UNIT-V : Digital representation of analog signals

Introduction, Why Digitize Analog Sources. The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise,

Pulse Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing

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COURSE STRUCTURE

Text books:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007, 3rdEdition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

References:

1. Principles of Communication Systems - Simon Haykin, John Wiley,2nd Edition.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20ECXO02	**DIGITAL IMAGE PROCESSING**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Perform image manipulations and different digital image processing techniques

CO2 : Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.

CO3 : Analyze pseudo and full color image processing techniques.

CO4 : Apply various morphological operators on images

CO5 : Compress digital image and video by applying digital image and video compression algorithm

SYLLABUS:

UNIT-I : Digital Image Fundamentals

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

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

UNIT-II : Intensity Transformations and Spatial Filtering

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

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

UNIT-III : Image Restoration

Image compression: Fundamentals, Basic compression methods: Huffman coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding.

Image compression: Fundamentals, Basic compression methods: Huffman coding, Golomb

coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding.

UNIT-IV : Image segmentation

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

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

UNIT-V : Color image processing

Color image processing: color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

TEXTBOOKS:

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

REFERENCEBOOKS:

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Edition, Indian Reprint, 2002.
2. B.Chanda, D.Dutta Majumder, "Digital Image Processing and Analysis", PHI, 2009.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6O03	**BIO-MEDICAL ENGINEERING**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Distinguish and describe the Various bio electric potentials provoked by living system

CO2 : Predict and produce the suitable transducer for bio medical application

CO3 : Distinguish the cardio and respiratory instruments and its prosecution

CO4 : Recognize the minor and major instruments in ICU and take curative steps

CO5 : Apply the various electronics signals to know the structure of the body and convert the information of patient as image or Signal

SYLLABUS

UNIT-I : INTRODUCTION TO BIOMEDICAL INSTRUMENTATION

Age of Biomedical Engineering, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG.

UNIT-II : ELECTRODES AND TRANSDUCERS

Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Transducers with Digital Output.

UNIT-III : CARDIOVASCULAR SYSTEM AND RESPIRATORY SYSTEM

The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement ofHeart Sound, Plethysmography, Pulse Sensors, The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiration Sensor, Respiratory Therapy Equipment.

UNIT-IV : PATIENT CARE AND MONITORING

Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use. Physiological Effects and Electrical Current, Shock Hazards from Electrical. Equipment, Methods of Accident Prevention

UNIT-V : DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY

Principles of Ultrasonic Measurement, Ultra sonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT

Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring

Text Books:

1. "Bio-Medical Electronics and Instrumentation", Onkar N. Pandey, Rakesh Kumar, Katson Books.
2. "Bio-Medical Instrumentation", Cromewell ,Wiebell, Pfeiffer

References:

1. "Introduction to Bio-Medical Equipment Technology", 4th Edition, Joseph J. Carr, John M. Brown,
Pearson Publications.
2. "Hand Book of Bio-Medical Instrumentation", Khandapur. McGrawHill

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20EC6O04	**Design of IoT Systems**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Explain Internet of Things and its hardware.
CO2 : Explain Components of Internet of Things.
CO3 : Interface I/O Devices, Sensors, and Communication modules.
CO4 : Monitor data and control devices.
CO5 : Implement real time IoT based applications.

SYLLABUS

SYLLABUS

UNIT-I : Introduction to IoT

An Overview of Internet of things, IoT Conceptual Frame Work, Architectural Overview, M2M Communication, Technology Behind IoT, Major Components of IoT System, Role of Cloud in IoT, Examples of IoT.

UNIT-II : Design Standards of IoT

Hardware Computing Components- Arduino, Raspberry Pi, Device Management, Data Enrichments and Consolidation at Gate ways, Business Models for Business Processes in the Internet of Things. IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities. Communication Technologies, Ease of Designing and Affordability.

UNIT-III : IoT Application Development

IoT Applications, Internet Connectivity for Communication, Sensing, Wireless Sensor Network, RFID, Actuation, I/O Interfaces. Connectivity and Communication Protocols: MQTT, SOAP, CoAP, UDP, TCP, Bluetooth, HTTP, HTTPS, FTP, TELNET, REST and Restful Environment in IoT.

UNIT-IV : Business Models and Processing Solution Framework

Business Models and Business Models Innovation, Business Model Scenarios for IoT, Implementation of Device integration, Data Acquisition, Integration, Storage and Analytics. Cloud Computing Paradigm for Data Collection, Storage and Computing, IoT Cloud Based Services using the Xively and Nimbits, Everything as a Service and Cloud Service Models.

UNIT-V : IoT Case Studies

IoT case studies and mini projects based on Industrial Automation, Transportation, Agriculture, Healthcare, Home Automation, Environment Monitoring and other.

TEXT BOOKS:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017.
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

REFERENCEBOOKS:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley.
2. Getting Started with the Internet of Things CunoPfister , Oreilly.
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies,Platforms, and Use Cases", CRC Press,2017.
4. Cypress Semi conductor /PSoC4 BLE (Bluetooth Low Energy) Product Training Modules.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20ECXO05	**MEMS**	**3**	**0**	**0**	**3**

COURSE OUTCOMES:

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

CO1 : Understand the basic overview of MEMS and Microsystems with broad category of MEMS& Micro system applications.

CO2 : Understanding the working principles of Microsystems

CO3 : Understand the Scaling Laws in Miniaturization and Materials for MEMS and Microsystems

CO4 : Understand the Micro system Fabrication Process and Analyze the different Micro manufacturing process and Applications.

CO5 : Study and analyze the different types of RF switches, Various Switching Mechanism and their applications

SYLLABUS

UNIT-I : Overview of MEMS and Microsystems

MEMS and Microsystems, Typical MEMS and Micro-system products, Evolution of Micro-fabrication, Micro-system and Microelectronics, The Multidisciplinary nature of micro-system design and manufacture, Micro-system and Miniaturization. Application of Microsystems in the automotive industry, **Application of Microsystems in other industries**: Health care industry, Aerospace industry, Industrial products, Consumer products, Telecommunications. Markets for Microsystems.

UNIT-II :

Working Principles of Microsystems: Introduction, Micro-sensors: Acoustic Wave Sensors, Biomedical sensors and Biosensors, Chemical sensors, Pressure sensors, Thermal sensors.

Micro actuation: Actuation using thermal forces, shaped memory alloys, Piezoelectric crystals, Electrostatic forces. MEMS with Micro actuators: Micro-grippers, Micro-motors, Microvalves, Micro-pumps.

UNIT-III :

Scaling Laws in Miniaturization: Introduction to scaling, Scaling in Geometry, Scaling in Rigid-Body Dynamics, Scaling in Electrostatic Forces, Scaling in Electromagnetic

Forces, Scaling in Electricity, Scaling in Fluid Mechanics, Scaling in Heat Transfer.

Materials for MEMS and Microsystems: Introduction, Substrates and wafers, Active substrate materials, Silicon as a substrate material. Silicon compounds, Silicon piezo resistors, Gallium Arsenide, Quartz, Piezoelectric crystals, Polymers, Packing materials.

UNIT-IV : Micro system Fabrication Process:

Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition, Physical Vapour Deposition, Deposition by Epitaxy, Etching.

Overview of Micro manufacturing and Application: Bulk Micro manufacturing- any one example of application, LIGA Process- any one example of application

UNIT-V : Applications of MEMS-Switching

Introduction, Switch parameters, Basics of switching, Mechanical switches, Electronic switches for RF and microwave applications, Mechanical RF switches, PIN diode RF switches.

Text Books:

1. MEMS, Nitaigour Prem chand Mahalik, TMH Publish ong co.
2. Tai-Ran Hsu, “MEMS and Microsystems: Design and Manufacture”, Tata McGraw Hill, (2002).
3. Gabriel M. Rebeiz, “RF MEMS Theory, Design and Technology”, Wiley India Pvt Ltd.

Reference Books:

1. Stephen D. Senturia, “Microsystem Design”, Springer International Edition, (2010).
2. Mohamed Gad-el-Hak, “The MEMS Handbook”, CRC Press, (2002).
3. Chang Liu, “Foundations of MEMS”, Second Edition, Pearson Publication.

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COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20ECXO06	**MECHATRONICS**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Describe the various mechatronics systems devices and Design components in the design of electro mechanical systems.

CO2 : Demonstrate Basic electronic devices used in mechatronics design process

CO3 : Explain the Different Controllers and write the Assembly language program.

CO4 : Differentiate Hydraulic and pneumatic actuating systems and Construct a system based on requirement

CO5 : Compose simple ALP and PLC programs for different applications

SYLLABUS

UNIT-I : MECHATRONICS SYSTEMS

About Mechatronics, Elements & levels of mechatronics system, Need of Mechatronics, Mechatronics design process, Definition of system, measurement systems and control systems, advantages and disadvantages of mechatronics systems. Dynamic models and analogy, Design of mechatronics systems & future trends.

UNIT-II : Basic Electronic Devices and Sensors

PN Junction Diode, Zener Diode, Transistor, FET, Amplifiers, Filters, Op-Amp as Adder, Subtractor, Differential Amplifier, Logarithmic Amplifier, Comparator, Filter and instrumentation Amplifier. Sensors and transducers, types, displacement, position, motion, force, flow, liquid level, temperature and light sensors.

UNIT-III : Digital Electronics

Digital systems, Basic Gates, Digital logic control, Analog to Digital and Digital to Analog conversions, Microprocessors and micro controllers programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control.

UNIT-IV : Hydraulic and pneumatic actuating systems

Hydraulic and pneumatic actuating systems - Fluid systems, Hydraulic systems, and pneumatic systems, components, control valves, electropneumatic, hydro-pneumatic, electro-hydraulic servo systems. Mechanical actuating systems and electrical actuating systems – basic principles and elements.

UNIT-V : Programming

Types of Languages (High level, Assembly level and Low level) Assembly language Program examples (Addition, Subtraction, Multiplication, Division, Ascending numbers, descending numbers, finding smallest number, largest number, even number and odd number in given numbers, interfacing motor, interfacing Seven segment display and LCD)
Ladder Programming: Ladder programming basic Symbols, Ladder Logic Programming Rules, Skip, Jump, Timers, Counters, data Registers, PLC program for realization of logic gates, PLC program for Elevator Control, PLC program for Bottle filling Plant, PLC

program for water level control, PLC program for with timers and counter

TEXTBOOKS:

1. MECHATRONICS Integrated Mechanical Electronics Systems/KP Ramachandran, GK Vijaya Raghavan & MS Balasundaram/WILEY India Edition.
2. Mechatronics – Smaili A, Mrad F, Oxford Higher Education, Oxford University Press.
3. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3 rdEdition,1994

REFERENCEBOOKS:

1. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
2. Mechatronics – N. Shanmugam / Anuradha Agencies Publishers.
3. Mechatronics System Design / Devdas shetty /Richard/Thomson.
4. Mechatronics/M.D.Singh /J.G.Joshi /PHI.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20ITXO01	**DATA BASE MANAGEMENT SYSTEM**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Describe a relational database and object-oriented database

CO2 : Create, maintain and manipulate are relational data base using SQL

CO3 : Describe ER model and normalization for data base design

CO4 : Examine issues in data storage and query processing and can formulate appropriate solutions.

CO5 : Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

SYLLABUS

UNIT-I : Introduction

Database system, Characteristics (Database Vs File System), Database Users(Actors on Scene, Workers behind the scene), Advantages of Data base systems, Data base applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence.

UNIT-II : Relational Model

Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance

BASICSQL: Table definitions (create, alter), different DML operations(insert, delete, update),basic SQL querying(select and project) using where clause, arithmetic & logical operations, SQL functions: Date, Time, Numeric and String conversion

UNIT-III : Entity Relationship Model

Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams**.** ER Diagrams for Bus reservation system. Banking system and Library information system, Aggregation functions.

UNIT-IV : Schema Refinement (Normalization)

Purpose of Normalization or schem are finement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NFand3NF),Boyce-codd normal form(BCNF), 4NF and 5NF

UNIT-V :

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COURSE STRUCTURE

Transaction Concept: Introduction of Transaction Processing, DBMS Buffers, Types of Failures, Transaction states and Operations, System log, Transaction Properties, Schedules and Types of Schedules.

File Organizations and Indexing: File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes.

TEXTBOOKS:

1. Data base Management Systems,3/e, Raghurama Krishnan, Johannes Gehrke,TMH
2. Data base System Concepts,5/e, Silber schatz, Korth, TMH

REFERENCEBOOKS:

1) IntroductiontoDatabaseSystems,8/e CJDate,PEA.
2) Data base Management System,6/eRamez Elmasri, Shamkant B.Navathe,PEA
3) Data base Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

1) https://nptel.ac.in/courses/106/105/106105175
2) https://www.geeksforgeeks.org/introduction-to-nosql

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20ITXO03	**Principles of Software Engineering**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Transform an Object-Oriented Design into high quality, executable code

CO2 : Skills to design, implement, and execute test cases at the Unit and Integration level

CO3 : Compare conventional and agile software methods

SYLLABUS:

UNIT-I

The Nature of Software, The Unique Nature of Web Apps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths, How It All Starts. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT-II

Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements. Requirements Analysis

UNIT-III

Scenario-Based Modelling, UML Models That Supplement the Use Case, Data Modelling Concepts, Class-Based Modelling, Requirements Modelling Strategies, Flow-Oriented Modelling, Creating a Behavioural Model, Requirements Modelling for WebApps.

UNIT-IV

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Styles, Architectural Mapping Using Data Flow, Conducting Component-Level Design, Component-Level Design for Web Apps, Designing Traditional Components, Component-Based Development, The Golden Rules

UNIT-V

A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for WebApps, Validation Testing, System Testing, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing and Black Box Testing.

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COURSE STRUCTURE

TEXTBOOKS:

1. Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
2. Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

REFERENCE BOOKS:

1. Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
2. Software Engineering, UgrasenSuman, Cengage.

E-REFERENCES:

1. https://nptel.ac.in/Courses/SoftwareEngineering
2. https://www.Coursera.org/Courses?query=softwareeni

neering

.https://www.udemy.com/Courses/development/software-engineering

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20ITXO04	**Introduction to Machine Learning**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : Identify the characteristics of data sets and compare the trivial data and big data for various applications.
CO2 : Understand machine learning techniques and computing environment that are suitable for the applications under consideration.

CO3 : Solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
CO4 : Developscalingupmachinelearningtechniquesandassociatedcomputingtechniquesandtechnologiesforvariousapplications.
CO5 : Implement various ways of selecting suitable model parameters for different machine learning techniques.

SYLLABUS

UNIT-I : Brief Introduction to Machine Learning

What is Machine learning, Machine learning models, Machine learning applications, Challenges. Major advantages and drawbacks Types of Machine learning, Supervised Learning, Unsupervised Learning, Reinforcement Learning

UNIT-II : Statistics basics

Mean, median, mode, Variance, standard deviation and correlation, Statistical Decision Theory, Regression & Classification Bias, Types of regression, Linear Regression, Multiple Regression

UNIT-III : Dimensionality Reduction

Subset Selection, Shrinkage Methods, Principal Components Regression Linear Classification, Logistic Regression, Linear Discriminant Analysis Optimization, Classification-Separating Hyperplanes Classification

UNIT-IV :

Artificial Neural Networks (Early models, Back Propagation, Initialization, Training & Validation) Parameter Estimation (Maximum Likelihood Estimation, Bayesian Parameter Estimation) Decision Trees Evaluation Measures, Hypothesis Testing Ensemble Methods, Graphical Models

UNIT-V :

Clustering, Gaussian Mixture Models, Spectral Clustering Ensemble Methods Learning Theory, Reinforcement Learning

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COURSE STRUCTURE

Text Book

1. T. Hastie, R.Tibshirani, J.Friedman. TheElementsofStatisticalLearning,2e, 2008.
2. Christopher Bishop. PatternRecognitionandMachineLearning.2e.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20CSXO02	**Cloud Computing**	3	0	0	3

COURSE OUTCOMES:

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

CO1 : To implement Virtualization

CO2 : To implement Task Scheduling algorithms
CO3 : Apply Map-Reduce concept to applications
CO4 : To build Private Cloud
CO5 : Broadly educate to know the impact of engineering on legal and societal issues involved

SYLLABUS:

UNIT-I : Introduction

Network centric computing, Network centric content, peer-to –peer systems, cloud computing delivery models and services, Ethical issues, Vulnerabilities, Major challenges for cloud computing. Parallel and Distributed Systems: introduction, architecture, distributed systems, communication protocols, logical clocks, message delivery rules, concurrency, and model concurrency with Petri Nets.

UNIT-II : Cloud Infrastructure

At Amazon, The Google Perspective, Microsoft Windows Azure, Open-Source Software Platforms, Cloud storage diversity, Inter cloud, energy use and ecological impact, responsibility sharing, user experience, Software licensing, Cloud Computing: Applications and Paradigms: Challenges for cloud, existing cloud applications and new opportunities, architectural styles, workflows, The Zookeeper, HPC on cloud.

UNIT-III : Cloud Resource virtualization

Virtualization, layering and virtualization, virtual machine monitors, virtual machines, virtualization- full and para, performance and security isolation, hardware support for virtualization, Case Study: Xen, vBlades, Cloud Resource Management and Scheduling: Policies and Mechanisms, Applications of control theory to task scheduling, Stability of a two-level resource allocation architecture, feedback control based on dynamic thresholds, coordination, resource bundling, scheduling algorithms, fair queuing, start time fair queuing, cloud scheduling subject to deadlines, Scheduling Map Reduce applications, Resource

management and dynamic application scaling

UNIT-IV : Storage Systems

Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore (text book 1), Amazon Simple Storage Service(S3) (Text book 2), Cloud Security: Cloud security risks, security – a top concern for cloud users, privacy and privacy impact assessment, trust, OS security, Virtual machine security, Security risks.

UNIT-V : Cloud Application Development

Amazon Web Services: EC2 – instances, connecting clients, security rules, launching, usage of S3 in Java, Cloud based simulation of a Distributed trust algorithm, Cloud service for adaptive data streaming (Text Book 1), Google: Google App Engine, Google Web Toolkit (Text Book 2), Microsoft: Azure Services Platform, Windows live, Exchange Online, Share Point Services, Microsoft Dynamics CRM (Text Book 2)

Text Books:

1. Cloud Computing, Theory and Practice,1st Edition, Dan C Marinescu, MK Elsevier publisher ,2013
2. Cloud Computing, A Practical Approach, 1st Edition, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH, 2017

Reference Books:

1. Mastering Cloud Computing, Foundations and Application Programming,1st Edition, Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi, TMH,2013
2. Essential of Cloud Computing, 1st Edition, K Chandrasekharan, CRC Press, 2014.
3. Cloud Computing, A Hands on Approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2014.

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
R20GE5M04	INTELLECTUAL PROPERTY RIGHTS AND PATENTS (IPR& P)	2	0	0	0

Course Objectives:

- To know the importance of Intellectual property rights, which plays a vital role in Advanced Technical and Scientific disciplines.
- Imparting IPR protections and regulations for further advancement, so that the Students can familiarize with the latest developments.

COURSE OUTCOMES:

CO 1: Identify different types of intellectual property rights may be prescribed by an output with supporting agencies internationally.
CO 2: Explain the ways to protect literary and artistic works of the authors.
CO 3: Illustrate the process of registering innovative products i.e., Patents
CO 4: Analyze the ways to maintain of Trade Marks
CO 5: Suggest the ways to protect trade secrets in the organizations Explain different laws available related to cybercrimes.

UNIT – I: Introduction to Intellectual property:

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II: Law of Copyrights:

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

UNIT – III: Law of Patents:

Foundation of patent law, patent searching process, ownership rights and transfer. Patent litigation. Dilution of patent rights, patent registration.

UNIT – IV: Trade Marks:

Purpose and function of trademarks, acquisition of trade mark rights, protectable matter (strength and categories of trade marks), selecting, and evaluating trade mark, trade mark registration processes.

UNIT - V: Trade Secrets and Cyber law:

Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, and protection for submission, trade secretes litigation. Introduction to Cyber Law – Information Technology Act 2000 & Cyber Crimes & its types.

Real time examples must be added to the concepts requires.

REFERENCES:

1. Intellectual property right, Deborah, E. Bouchoux, Cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, Tata Mc- Graw Hill Publishing Company Ltd.
3. Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
4. Cyber Law - Texts & Ca

ELECTRONICS AND COMMUNICATION ENGINEERING
COURSE STRUCTURE

Course Code	Course Name	L	T	P	C
20GE6M02	**Professional Ethics and Human Values**	2	0	0	0

COURSE OBJECTIVES:

- To give basic insights and inputs to the student to inculcate Human values to growas a responsible human being with proper personality.
- Professional Ethics instills the student to maintain ethical conduct and dischargetheir professional duties.

COURSE OUTCOMES:

CO 1: Student can be able to Define, Civic Values, Ethics, Behavior, Honesty, Co-Operation& Commitment
CO 2: Student can be able to Discuss Engineering Ethics and Social Experimentation for the benefit of stakeholders
CO 3: Analyze the responsibilities of Engineers towards Safety & risk, to improve the Safety and minimize the risk.
CO 4: Present the duties & rights of Engineers
CO 5: Elucidate the role of Engineers in the ever changing the global Marketing

UNIT I: Human Values & Principles for Harmony: Morals, Values and Ethics – Integrity - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value Time – Co-operation – Commitment– Self-confidence – Spirituality- Character. Truthfulness – Customs and Traditions -Value Education –Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence.

UNIT II: Engineering Ethics and Social Experimentation:

History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism —Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg's Theory - Gilligan's Argument –Heinz's Dilemma - Comparison with Standard Experiments — Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT III: Engineers' Responsibilities towards Safety and Risk:

Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/s Involuntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/s Immediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT IV: Engineers' Duties and Rights:

Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality - Professional and Individual Rights –Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving- Occupational Crimes- Industrial Espionage- Price Fixing-Whistle Blowing.

UNIT V: Global Issues:

Globalization and MNCs –Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics -Intellectual Property Rights.

References:

1. Professional Ethics, R. Subramaniam – Oxford Publications, New Delhi.
2. Professional Ethics and Morals, A. R. Aryasri, Dharanikota Suyodhana - Maruthi Publications.
3. Engineering Ethics, Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
4. Engineering Ethics & Human Values, M. Govindarajan, S. Natarajan and V. S.Senthil Kumar- PHI Learning Pvt. Ltd – 2009.
5. Professional Ethics and Human Values, A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
6. Professional Ethics and Human Values, D. R. Kiran-Tata McGraw-Hill - 2013