UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

VIII SEMESTER

ELECTRONICS and COMMUNICATION ENGINEERING

SCHEME -2013

VIII SEMESTER

ELECTRONICS and COMMUNICATION ENGINEERING (T)

Course No	Name of subject	Credits	Weekly load, hours			C A Marks	Exam Duration Hrs	U E Max Marks	Total Marks
			L	T	D/ P				
13.801	Electrical Drives and Control (T)	4	3	1	-	50	3	100	150
13.802	Entertainment Electronics Technology (T)	4	3	1	-	50	3	100	150
13.803	Computer Communications (T)	4	3	1	-	50	3	100	150
13.804	Wireless Communications (T)	4	3	1	-	50	3	100	150
13.805	Elective V	4	3	1	-	50	3	100	150
13.806	Elective VI	4	3	1	-	50	3	100	150
13.807	Project and Viva – Voce (AT)	5	-	-	5	200	-	100	300
	Total	**29**	**18**	**6**	**5**	**500**		**700**	**1200**

13.805 Elective V

13.805.1	Entrepreneurship (AT)
13.805.2	Discrete Control and Navigation Systems (T)
13.805.3	Optical Integrated Circuits (T)
13.805.4	Nano Devices and Circuits (T)
13.805.5	Artificial Intelligence and Robotics (T)
13.805.6	Microwave Devices and Circuits (T)

13. 806 Elective VI

13.806.1	Management Information Systems (AT)
13.806.2	Biomedical Engineering (T)
13.806.3	Information Security (T)
13.806.4	Digital Instrumentation (T)
13.806.5	Nanophotonics (T)
13.806.6	Satellite Communications (T)

13.801 ELECTRICAL DRIVES AND CONTROL (T)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

- *To discuss the operation of power semi conductor devices.*
- *To design protection circuits for power semiconductor devices used in power converters.*
- *To understand the basics of industrial drives.*
- *To learn the implementation of power semi conductor devices in industrial drives applications.*
- *To know the design and selection of drives in industrial applications.*

Module – I

DC machines- Principle of operation of dc generator, constructional details, emf equation, types of generators. Principle of operation of dc motors. Electrical and mechanical characteristics of dc series and shunt motors. Applications of dc motors. AC motors- Principle of operation of single phase and three phase induction motors.

Module – II

Power devices- power BJT, power MOSFET and IGBT - Steady state and switching characteristics Drive requirements. Design of simple drive circuits for power BJT and power MOSFET. Principle of chopper operation. Two quadrant and four quadrant chopper circuits.

Module – III

Controlled rectifiers. Principle of phase control. Single phase half wave circuit with R and RL load. Single phase full wave bridge converter with R and RL load. Single phase dual converter. Applications of controlled rectifiers.

Module – IV

Basic configurations of switched mode inverter- Single phase inverters-half bridge and full bridge inverters. Pulse width modulated inverters-Single pulse modulation, multiple pulse modulation and sinusoidal pulse modulation. UPS-On line and offline UPS. Speed control of Induction motor by varying stator frequency and voltage.

References:

1. Gupta J. B., *Theory and Performance of Electrical Machines*, V. 2, S K Kataria and Sons.
2. Bimbhra P. S., *Power Electronics* ,4th Edition, Khanna,2007

3. Ned Mohan, *Power electronics Converters Application and Design*, 2e, John Wiley, 2009.
4. Theraja B. L. and A. K. Theraja, A *Textbook of Electrical Technology,* V.II, S Chand, 2012.
5. Mohammad H. Rashid, *Power Electronics Circuits Devices and Applications*, Pearson, 2011.
6. Krishnan R., *Electric Motor Drives, Modeling Analysis and Control*, PHI, 2001.
7. Shepherd, *Power Control and Motor Control*, Cambridge Universities Press, 2013.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two question from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

***Note:** Question paper should contain 10 % Analysis/Numerical Problems.*

Course Outcome:

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

- *explain the operation of power semi conductor devices.*
- *design power converter circuit*
- *understand the basics of industrial drives.*
- *design and selection of drives in industrial applications.*

13.802 ENTERTAINMENT ELECTRONICS TECHNOLOGY (T)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objectives:

- *To discuss different types of microphone and loud speakers*
- *To know different types of recording systems*
- *To get an idea of display devices used in TV system*
- *To discuss the working of TV systems*
- *To understand projection display systems.*

Module – I

Characteristics of a microphone, types of microphone moving coil, Ribbon, Crystal, condensor, Electret, Carbon, comparisons.
Characteristics of Loudspeakers, types moving coil cone type , Electro dynamic, Horn type Loudspeaker column , baffles and enclosures, multi-way speaker system (Woofers and Tweeters), crossover networks, mismatch between amplifier output and loudspeaker impedance.

Module – II

Optical recording of sound, methods of optical recording of sound on Film, reproduction of sound from Films, Compact Disc, Optical recording on disc, playback process.

Introduction to Blue ray technology, Introduction to High Fidelity systems, Introduction to public address systems, introduction to acoustic reverberation.

Audio as data, audio signal, digital audio processes, time compression and expansion, error correction and concealment, channel coding, audio Compression, disk based recording, rotary head digital recorders, digital audio broadcasting.

Introduction to USB Mp3 player

Module – III

Elements of TV , scanning, synchronization, aspect ratio, pixels, resolution, bandwidth, composite video signal, modulation of video and audio signals, monochrome and color cameras, compatibility, luminance and chrominance signal, solid state picture transducers, TV broadcasting systems, video monitors Digital video, RGB and YUV Representation of Video Signals, Need for Compression, compression formats for video - MPEG-x format, H.26x format

Digital Television, transmission and reception, Digital system hardware, Signal quantizing and encoding, digital satellite television, Direct-To-Home(DTH) , Digital TV receiver, Digital Terrestrial Television(DTT), Introduction to CCTV and CATV.

Module – IV

Flat panel TV receivers, 3-Dimensional TV, HDTV, Advances in 3D TV technology, Extended Definition Television (EDTV), LCD technology, LCD matrix types and operation, LCD screens

for television, Plasma television screens, Signal processing in Plasma TV receivers, plasma colour receiver, LCD colour receivers, Introduction to LED TV, RGB dynamic LEDs, Edge-LEDs, Comparison of Plasma TV, LCD TV and LED TV, introduction to OLED TV.

Projection Display Systems, Home theatres, Direct View and rear projection systems, front projection TV system, Transmissive type projection systems, Reflective projection systems, Digital Light Processing (DLP) projection system.

References:

1. Gulati R. R., *Modern Television Practice*, New Age International , 2007
2. Gupta R. G., *Audio and Video Systems*, McGraw Hill , 2010
3. Dhake A. M., *Television & Video Engineering*, McGraw Hill, 1999.
4. Keith Jack, *Video Demystified*, Newnes, 2005.
5. *Self, Audio Engineering*, *Know it all series*, Newnes, 2009.
6. John Watkinson, *Essential Guide to Digital Video*, Snell & Wilcox Publication, 2010.
7. Bali and Bali, *Audio Video Systems Principles and Practices and Troubleshooting*, Khanna, 2010.
8. Bali S. P., *Consumer Electronics*, Pearson Education, 2008.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

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

- *know different types of microphone and loud speakers*
- *know different types of recording systems*
- *get an idea of display devices used in TV system*
- *explain the working of TV systems*
- *understand projection display systems.*

13.803 COMPUTER COMMUNICATIONS (T)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objectives:

- *To know use of computers in communication as well as in network formation.*
- *To examine mode of data transfer, layer and protocols related to networks.*
- *To understand about the functions and services of all 7 layers of OSI model.*
- *To get an idea of various network standards.*

Module – I

Network Architecture: Layering and Protocols, OSI Layering, TCP/IP Layering. Transport layer: Multiplexing and demultiplexing. Connectionless transport UDP and connection oriented transport TCP. Reliable Transmission, Stop and wait protocol, Sliding window protocols. Principles of congestion Control and TCP Congestion Control. Physical layer: Cables for Networking Coaxial cables, UTP, Fiber Optic cables.

Module – II

Network Layer: Network as graph. Forwarding and routing, virtual circuit and datagram networks. Routing Algorithms- Distance Vector Routing, Link State Routing, Hierarchical Routing and Inter Autonomous System Routing (BGP). Broadcast and Multicast routing. Address Resolution Protocols (ARP), Error Reply (ICMP), Global Internet, Sub netting, IP Version 6.

Module – III

Data link Layer: Error detection and correction techniques: parity checks, checksum and cyclic redundancy check. Link layer addressing: MAC addresses, Address resolution protocol. Ethernet: Frame structure, CSMA/CD, Ethernet technologies. ATM and MPLS. Wireless LAN, CSMA/CA. SONET and HDLC. Switching and Forwarding, Bridges and LAN Switches- Learning Bridges, Spanning Tree algorithm.

Module – IV

Network Security Issues, Multilevel Security models. Authentication Protocols, Message Integrity Proto cols, Message Digest5 (MD5), Access control: Firewalls and Packet filtering. Types of Attacks. Network Intrusion Detection System. Security in Layers - Application Layer: SSH, Transport Layer: TLS, SSL. Network Layer: IP Security (IPSec). Virtual Private Networks.

References:

1. Kurose J. F., *Computer Network A Topdown Approach Featuring the Internet*, 3/e, Pearson, 2002.

2. Larry Peterson and Bruce S Davie, Computer Network- A System Approach, 4/e, Elsevier India., 2007.
3. Keshav S., *An Engineering Approach to Computer Networking*, Pearson, 2005.
4. John R. Vacca, *Cabling Hand book*, Pearson, 2000.
5. Glen Kramer, *Ethernet Passive Optical Networks*, McGraw Hill, 2005.
6. Charlie Kaufman, *Network Security Private Communication In A Public World*, Pearson , 2002
7. Naganand Doraswamy and Dan Harkins, *IPSec The New Security Standard for the Internet*, Intranets and Virtual Private Networks, Prentice Hall, 2003

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the studying the course the students will be able to

- *know use of computers in communication as well as in network formation.*
- *examine mode of data transfer, layer and protocols related to networks.*
- *get an idea of various network*

13.804 WIRELESS COMMUNICATIONS (T)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

To understand and gain complete knowledge about:

- *Basic wireless, cellular concepts.*
- *Radio wave propagation and Mobile Channel models.*
- *Various performance analysis of mobile communication system*
- *Standards of 2G, 3G, 4G system.*

Module – I

Evolution of mobile radio communications, paging systems, Cordless telephone systems, comparison of various wireless systems, Modern Wireless Communication Systems, Second generation cellular networks, third generation wireless networks, fourth generation wireless technologies, wireless in local loop, wireless local area networks, Blue tooth and ZigBee, Over view of WiMAX Technologies, architecture, spectrum allocation.

Module – II

Introduction To Cellular Mobile Systems: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems, GSM system architecture. Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Module – III

Wireless propagation mechanism, free space propagation model, ground reflection model, knife edge diffraction model, path loss prediction in hilly terrain, introduction to fading and diversity techniques, Introduction to MIMO system, model of MIMO system, CSI, use of retro-directive antenna, effect of mutual coupling at the antenna arrays, MIMO channel capacity.

Module – IV

Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, CDMA, OFDM , Wireless Networking, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, Wireless standards, radio link aspects, network aspects, GPRS,EDGE,UMTS.

Introduction to satellite communication, advantages, concept of geo-stationary satellite, frequency bands used, satellite transponder, block diagram of earth station transmitter and receiver, principle of Global Positioning System (GPS).

References:

1. Theodore S. Rappaport, *Wireless Communications*, Pearson, 2010.
2. Singal, *Wireless communications*, McGraw Hill, 2010.
3. Nathan, *Wireless Communications*, PHI, 2012.
4. Mishra, *Wireless Communications and Networks*, McGraw Hill, 2/e, 2013.
5. Lee W. C. Y., *Mobile Cellular Telecommunication*, McGraw Hill, 2010.
6. Jochen Schiller, *Mobile Communications*, Pearson, 2008.
7. Dalal, Wireless communication, Oxford Universities Press, 2014.
8. Stallings, *Wireless Communications and Networks*, Pearson, 2009.
9. Schwartz, Mobile, *Wireless Communications*, Cambridge Universities Press, 2013.
10. Swamy Du., *Wireless Communication*, Cambridge Universities Press, 2010.
11. Goldsmith, *Wireless Communication*, Cambridge Universities Press, 2009.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the course the student will be able to

- *Explain the characteristic of wireless channel*
- *Design a cellular system*
- *Compare the various digital signaling techniques and multipath mitigation techniques*
- *Explain the concepts of multiple antenna techniques*

13.805.1 ENTREPRENEURSHIP (AT) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *To develop and strengthen entrepreneurial quality and motivation*
- *To impart basic entrepreneurial skills*
- *To run a business efficiently and effectively.*

Module – I

Entrepreneurship: definition, requirements to be an entrepreneur, entrepreneur and intrapreneur, entrepreneur and manager, growth of entrepreneurship in India, women entrepreneurship, rural and urban entrepreneurship.

Entrepreneurial Motivation, motivating factors, motivation theories-Maslow's Need Hierarchy Theory, McClelland' s Acquired Need Theory, government's policy actions towards entrepreneurial motivation, entrepreneurship development programmes.

Module – II

Types of Enterprises and Ownership Structure: small scale, medium scale and large scale enterprises, role of small enterprises in economic development; proprietorship, partnership, Ltd. companies and co-operatives: their formation, capital structure and source of finance.

Institutional Support and Policies: institutional support towards the development of entrepreneurship in India, technical consultancy organizations, government policies for small scale enterprises.

Module – III

Projects: identification and selection of projects; project report: contents and formulation, concept of project evaluation, methods of project evaluation: internal rate of return method and net present value method.

Module – IV

Management of Enterprises, objectives and functions of management, general and strategic management, introduction to human resource management, planning, job analysis, training, recruitment and selection, marketing and organizational dimension of enterprises, enterprise financing ,raising and managing capital, shares, debentures and bonds, cost of capital, break- even analysis, balance sheet analysis.

References:

1. Ram Chandran, *Entrepreneurial Development*, Tata McGraw Hill, New Delhi, 2009.

2. Saini J. S., *Entrepreneurial Development Programmes and Practices*, Deep & Deep, 2003.
3. Khanka, S. S., *Entrepreneurial Development*, S Chand, 2013.
4. Badhai B., *Entrepreneurial Development*, Dhanpat Rai, 2001.
5. Desai Vasant, *Project Management and Entrepreneurship*, Himalayan Publishing, 2002.
6. Gupta and Srinivasan, *Entrepreneurial Development*, S Chand, 2012.
7. Kuratko and Rao, *Entrepreneurship*, Cengage Learning, 2012.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the Completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

13.805.2 DISCRETE CONTROL & NAVIGATION SYSTEMS (T) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *To introduce analysis of discrete time systems in state variable form*
- *To understand and develop state space model for different systems*
- *To educate direct discrete design techniques*
- *To analyse the controllability and observability of a system and to design controllers and observers.*
- *To discuss the different types of Electronic Navigation system*

Module – I

Introduction to Digital control system. Z plane analysis of discrete control systems – Impulse sampling and data hold - pulse transfer function - Realization of digital controllers. Design of discrete time control systems by conventional methods - Mapping between the S plane and the Z plane, Stability analysis in the Z plane. Transient and steady state response analysis. Design based on the root locus and frequency response methods.

Module – II

State space analysis – State space representations – Solving discrete time state space equations – pulse transfer function matrix – Discretization of continuous time state space equations, Liapunov stability analysis. Pole placement and observer design, controllability, observability, Transformations in state space analysis and design – design via pole placement, state observers, servo systems.

Module – III

Electronic Navigation: Principle of depth measurement, principle of echo sounding, digitized and micro computer echo sounder. Principle of speed measurement using water pressure, electromagnetic induction, acoustics correlation technique, Doppler principle, Doppler speed logging system.

Module – IV

Introduction to Loran-C, Loran charts, position fixing using Loran-C, Loran receiver. Introduction to satellite navigation, GPS, dilution of precision, satellite pass predictions, DGPS, GPS antenna, GPS receiver architecture. Principle of radio finding system, RDF receiver.

Introduction to automatic steering, basic autopilot system, and manual operation controls.

References:

1. Ogata K., *Discrete-time Control Systems*, 2/e, Pearson Education 2006.
2. Kuo B. C., *Digital Control Systems,* 2/e, Oxford University press, 2003.
3. Tetley, Electronic navigation system, 3/e, Elsevier, 2008.
4. Gopal M., *Digital Control and State Variable Methods*, TMH, New Delhi, 2006.

5. Walter R Fried, Myron Kayton, *Avionic Navigation Systems*, Wiley.
6. Nagaraja N. S., *Elements of Electronic Navigation*, TMH. 2008.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

***Note:** Question paper should contain minimum 20% Analysis/Numerical Problems*.

Course Outcome:

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

- *analyse discrete time systems in state variable form*
- *understand and develop state space model for different systems*
- *educate direct discrete design techniques*
- *analyse the controllability and observability of a system and to design controllers and observers.*
- *explain the different types of Electronic Navigation system.*

13.805.3 OPTICAL INTEGRATED CIRCUITS (T) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

The course shall provide

- *Compare optical ICs and electrical ICs*
- *Discuss the dielectric wave guide fabrication techniques.*
- *Explain the working of optical IC components.*
- *Analyze different types of optical modulators*

Module – I

Introduction , advantages, comparison of optical IC with electrical IC, applications of integrated optics, substrate materials for optical IC, Optical wave guide mode, modes in a planar wave guide, ray optic approach to optical mode theory, basic three layer waveguide, symmetric and asymmetric wave guide, rectangular waveguides, channel and strip loaded wave guides.

Module – II

Wave guide fabrication technique, deposited thin film, substitution dopant atoms, carrier concentration reduction wave guide, epitaxial growth, electro optic wave guides, Polymer and fiber integrated optics, types of polymers, polymer processing, applications, polymer wave guide devices, optical fiber wave guide devices.

Module – III

Losses in optical wave guide, types, measurement of losses. Wave guide input and output couplers, types of couplers, coupling between wave guides, coupled mode theory, wave guide modulator, electro-optic effect, principle of electro optic modulator, single channel electro optic modulator, principle of acousto optic modulator, Raman-Nath and Bragg types modulators.

Module – IV

Principle of Integrated semiconductor laser, integrated semiconductor optical amplifier, monolithical integrated direct modulator, direct modulation of QD laser, integrated optical detectors, structures, factors affecting the performance, principle of micro optical devices and applications.

References:

1. Robert Hunsperger, *Integrated optics: Theory and technology,* 6/e, Springer, 2009.

2. Keico Iizuka, *Elements of photonics*, John Wiley, 2002.
3. Lifante, *Integrated Photonics: Fundamentals*, John Wiley, 2003.
4. Azzedine B., Photonic Waveguide, Wiley, 2006.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

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

- *Compare optical ICs and electrical ICs*
- *explain the dielectric wave guide fabrication techniques.*
- *Explain the working of optical IC components.*
- *Analyze different types of optical modulators.*

13.805.4 NANO DEVICES AND CIRCUITS (T) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *To develop broader aspects in understanding the role of nano electronics and its application.*
- *To understand the basic concepts involve in this technology for device architecture and interface engineering at atomic.*
- *To give a general introduction to different types of conventional and novel nanoelectronic devices for different applications*
- *To discuss the underlying physical processes governing the operation of spintronic devices.*

Module – I

Challenges going to sub-100 nm MOSFETs – Oxide layer thickness, tunneling, power density, non-uniform dopant concentration, threshold voltage scaling, lithography, hot electron effects, sub-threshold current, velocity saturation, interconnect issues, fundamental limits for MOS operation. High-K gate dielectrics, effects of high-K gate dielectrics on MOSFET performance.

Module – II

Novel MOS-based devices – Multiple gate MOSFETs, Silicon-on-nothing, Silicon-on-insulator devices, FD SOI, PD SOI, FinFETs, vertical MOSFETs, strained Si devices.

Module – III

Hetero structure based devices – Type I, II and III Heterojunction, Si-Ge heterostructure, hetero structures of III-V and II-VI compounds - resonant tunneling devices, MODFET/HEMT.

Module – IV

Carbon nanotubes based devices – CNFET, characteristics, Spin-based devices – spinFET, characteristics

Quantum structures – quantum wells, quantum wires and quantum dots, Single electron devices – charge quantization, energy quantization, Coulomb blockade, Coulomb staircase, Bloch oscillations.

References:

1. Mircea Dragoman and Daniela Dragoman, *Nanoelectronics – Principles & devices*, Artech House Publishers, 2005.
2. Karl Goser, *Nanoelectronics and Nanosystems: From Transistors to Molecular and Quantum Devices*, Springer 2005.

3. Mark Lundstrom and Jing Guo, *Nanoscale Transistors: Device Physics, Modeling and Simulation*, Springer, 2005.
4. Vladimir V Mitin, Viatcheslav A Kochelap and Michael A Stroscio, *Quantum Heterostructures*, Cambridge University Press, 1999.
5. Sze S. M. (Ed), *High Speed Semiconductor Devices*, Wiley, 1990.
6. Manijeh Razeghi, *Technology of Quantum Devices*, Springer,
7. Huff H. R. and D.C. Gilmer, High Dielectric Constant Materials for VLSI MOSFET Applications, Springer 2005.
8. Nag B. R., *Physics of Quantum Well Devices*, Springer 2002.
9. Kasper E., D. J. Paul, *Silicon Quantum Integrated Circuits Silicon-Germanium Heterostructures Devices: Basics and Realisations*, Springer 2005.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

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

- *understand the role of nano electronics and its application.*
- *explain the basic concepts involve in this technology for device architecture.*
- *explain the working of different types of conventional and novel nanoelectronic devices for different applications discuss physical processes governing the operation of spintronic devices.*

13.805.5 ARTIFICIAL INTELLIGENCE AND ROBOTICS (T) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *Study the concepts of Artificial Intelligence.*
- *Learn the methods of solving problems using Artificial Intelligence*
- *Introduce the concepts of Expert Systems and machine learning.*
- *Discuss basic building block of automation*
- *Discuss robot design, controllers.*

Module – I

Fundamental Concepts **-** Agents, environments, general model; Problem solving techniques. Search Techniques **-** Uninformed search, heuristic search, adversarial search and game trees; Solution of constraint satisfaction problems using search.

Knowledge Representation - Propositional and predicate calculus, semantics for predicate calculus, inference rules, unification, semantic networks, conceptual graphs, structured representation, frames, scripts.

Module – II

Prolog **-** Basic constructs, answer extraction. Bayesian Reasoning - Bayesian networks, dynamic Bayesian networks. Planning - State-space search, planning graphs. Learning - Inductive learning, decision tree learning.

Robotics - Basic concepts, definition and origin of robotics, different types of robots, robot classification, applications, robot specifications.

Module – III

Introduction to automation - Components and subsystems, basic building block of automation, manipulator arms, wrists and end-effectors.

Transmission elements - Hydraulic, pneumatic and electric drives. Gears, sensors, materials, user interface, machine vision, implications for robot design, controllers.

Module – IV

Kinematics, dynamics and control - Object location, three dimensional transformation matrices, inverse transformation, kinematics and path planning, Jacobian work envelope, manipulator dynamics, dynamic stabilization, position control and force control, present industrial robot control schemes.

References:

1. Russell S., Norvig, P, *Artificial Intelligence: A Modern Approach*, Pearson Education, 2009.
2. Spong and Vidyasagar, *Robot Dynamics and Control*, John Wiley & Sons, 1989.
3. Rich E., Knight, K., *Artificial Intelligence*, TMH, 2006.
4. Asfahl C.R, *Robots and Manufacturing Automation*, John Wiley & Sons, 1992.

5. Nilsson N. J., *Artificial Intelligence: A New Synthesis*, Morgan Kaufmann.1998
6. Bratko I., *Prolog Programming for Artificial Intelligence*, **3/e**, Pearson Education.2001.
7. Klafter, Chmielewski and Negin, *Robotic Engineering An Integrated Approach*, PHI, 2007.
8. Schilling R. J., *Fundamental of Robotics: Analysis and Control*, PHI, 2007.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

***Note:** Question paper should contain minimum 20 % Analysis/Numerical Problems*.

Course Outcome:

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

- *Identify problems that are amenable to solution by AI methods.*
- *Identify appropriate AI methods to solve a given problem.*
- *Formalise a given problem in the language/framework of different AI methods.*
- *Implement basic AI algorithms.*
- *Discuss basic building block of automation*
- *Design robot and controllers.*

13.805.6 MICROWAVE DEVICES AND CIRCUITS (T) (Elective V)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *To understand various microwave components.*
- *To understand various microwave active and passive devices*

Module – I

Modal analysis of rectangular and circular metallic waveguides– TE and TM modes, guide wavelength, cut-off, mode excitation, re-entrant cavity, Microwave Resonators – analysis, Q factor of resonators, Strip lines and microstrip lines – analysis, filter implementation with transmission lines and strip lines.

Module – II

Passive microwave components – S matrix formalism, directional coupler, waveguide tees, isolator, circulator, phase shifter, impedance matching – single stub and double stub.

Module – III

Semiconductor microwave devices, tunnel diode, Gunn diode, IMPATT diode, TRAPATT diode, hetero-junction bipolar transistors, principle, characteristics, noise figure, Principle of MESFET and characteristics. Principle of high mobility transistor and characteristics.

Module – IV

Low noise microwave amplifiers and oscillators – masers – stimulated emission, noise figure, parametric amplifiers – Manley Rowe relations, up, down and negative resistance parametric amplifier.

References:

1. Liao, *Microwave Devices and Circuits*, Pearson, 2010.
2. Collin. R E, *Foundations for Microwave Engineering*, Second Ed, IEEE-Wiley, 2000.
3. David M Pozar, *Microwave Engineering*, Third edition, John Wiley, 2004.
4. Roy, Mitra, *Microwave Semiconductor Devices*, PHI, 2008.
5. Rizzi. P A, *Microwave Engineering*, Prentice Hall, 1988.
6. Sigfrid Yngyesson, *Microwave Semiconductor Devices*, Kluwer Academic, 1991.
7. Bhartia P., I. J. Bahl, *Millimetre Wave Engineering and Applications*, Wiley & Sons, 2005.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

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

- *explain working of various microwave components .*
- *know the principle of operation various microwave active and passive devices.*

13.806.1 MANAGEMENT INFORMATION SYSTEMS (AT) (Elective VI)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *To equip students with skills to analysis information requirements for managerial decision making.*

Module – I

Data and Information, MIS- need and concepts, factors influencing MIS, characteristics of MIS. Technology of MIS. Structure of MIS. Decision Making and role of MIS. Data communication, Channel features and concept of Distributed Data bases, Decision Support System: Overview, components and classification, steps in constructing a DSS, role in business, group decision support system.

Module – II

Information system for strategic advantage, strategic role for information system, breaking business barriers, business process reengineering, improving business qualities.

Module – III

Planning for MIS; System Development Methodologies; Conceptual and detailed designs of MIS. Information system analysis and design, information SDLC, hardware and software acquisition, system testing, documentation and its tools, conversion methods.

Module – IV

System implementation Strategies and process; System Evaluation and Maintenance. Applications – cross –functional MIWS; ERP; CRM; SCM; Transaction Processing; Artificial Intelligence technologies in business: neural network, fuzzy logic, virtual reality; Executive information system.

References:

1 Jawadekar, *Management Information Systems*, McGraw Hill, 2008.
2 Brien, James, *Management Information System*, McGraw Hill, 2008.
3 Stair, *Principles of Management System*, Thomson Learning, 2012.
4 Kanter, J., *Management Information System*, PHI, 2005.
5 Oz, *Management Information Systems*, Cengage, 2009.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the successful completion of the course the student will be able to equip students with skills to analysis information requirements for managerial decision making.

13.806.2 BIOMEDICAL ENGINEERING (T) (Elective VI)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits**: 4

Course Objective:

- *To know the Origin of Bioelectric potential and their measurements using appropriate electrodes and Transducers.*
- *To understand how to measure various biochemical and nonelectrical parameters of human system.*
- *To understand the Electro-physiology of various systems and recording of the bioelectric signals.*
- *To discuss the working principles of various Imaging techniques.*
- *To understand the design aspects of various Assist and Therapeutic Devices.*

Module – I

Origins of Bioelectric signals, Electrocardiogram (ECG), Electromyogram (EMG); Recording Electrodes- Silver-silver Electrodes, Electrodes for ECG, EEG and EMG; Physiological Transducers- Pressure Transducers, Temperature sensors, Pulse sensors; Sources of bioelectric potential, resting potential, action potential, propagation of action potentials in nerves; rhythmic excitation of heart.

Module – II

The Cardiovascular System and Cardiovascular Measurements, The Heart, Blood Pressure,

Characteristics of Blood Flow, Heart Sounds Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds –phonocardiography.

Module – III

Image operations, Radiography and CT: X-rays - interaction of X-ray beam with tissue, ray detection, data acquisition in CT, Images reconstruction, computed axial tomography, generation of CT, spiral CT, mammography, principle of MRI, MRI instrumentation, image acquisition and reconstruction techniques, Application of MRI.

Ultra Sound in Medicine, ultrasonic transducers and types, transmitter and detector principles, probe design, principles of image formation.

Display system: principles of A-mode, B mode and M-mode display.

Module – IV

Biomedical instruments-Haemodialysis Machine, Heart-Lung Machine, Ventilator, Defibrillators, Anaesthesia Machine, Oxymeter.

Introduction to biotelemetry, physiological parameters adaptable to biotelemetry, the components of biotelemetry system, implantable units, applications of telemetry in patient care.

References:-

1. Cromwell, *Biomedical Instrumentation and Measurement*, Pearson, 2009.
2. Khandpur R. S., *Handbook of Biomedical Instrumentation*, 2/e, TMH, 2003.
3. Isaac N. Bankman, *Handbook of Medical Imaging*, Academic Press, 2000.
4. Cho and Manbir Singh, *Foundations of Medical Imaging*, John Wiley, 1993.
5. Raja Rao and Guha, *Medical Electronics and Biomedical Instrumentation*, Universities Press, 2009.
6. Singh, *Biomedical Instrumentation*, PHI, 2014.
7. Arumugam, *Biomedical Instrumentation*, Anuradha Publications, 2008.
8. John Enderele, Susan Blanchard and Joseph Bronzino, *Introduction to Biomedical Engineering,* Academic Press, Elsevier, 2005.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

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

- *Design instruments useful to the medical community.*
- *Evaluate alternate assumptions, approaches, procedures, tradeoffs, and results related to engineering and biological problems.*
- *Design a variety of electronic and computer based devices*
- *Design software for biomedical instrumentation, medical imaging, physiological measurement.*

13.806.3 INFORMATION SECURITY (T) (Elective VI)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *To define information security*
- *To recount the history of computer security and how it evolved into information security*
- *To define key terms and critical concepts of information security*
- *To enumerate the phases of the security systems development life cycle*
- *To describe the information security roles of professionals within an organization*
- *To discuss the Virus and Firewalls*

Module – I

Information Security: Introduction, History of Information security, What is Security?, CNSS Security Model, Components of Information System, Balancing Information Security and Access, Approaches to Information Security Implementation, The Security Systems Development Life Cycle.

Module – II

Cryptography: Concepts and Techniques, symmetric and asymmetric key cryptography, steganography, Symmetric key Ciphers: DES structure, DES Analysis, Security of DES, variants of DES, Block cipher modes of operation , AES structure, Analysis of AES , Key distribution Asymmetric key Ciphers**:** Principles of public key cryptosystems, RSA algorithm, Analysis of RSA, Diffie-Hellman Key exchange.

Module – III

Message Authentication and Hash Functions: Authentication requirements and functions, MAC and Hash Functions**,** MAC Algorithms**:** Secure Hash Algorithm, Whirlpool, HMAC, Digital signatures, X.509, Kerberos.

Module – IV

Security at layer, IPSec, Secure Socket Layer(SSL), Transport Layer Security(TLS), Secure Electronic Transaction(SET), Pretty Good Privacy(PGP), S/MIME Intruders, Virus and Firewalls**:** Intruders, Intrusion detection, password management, Virus and related threats, Countermeasures, Firewall design principles, Types of firewalls.

References:

1 Michael E. Whitman, Herbert J. Mattord, *Principles of Information Security*, CENGAGE, 4/e, 2012.

2 William Stallings, *Cryptography and Network Security*, Pearson Education, 4/e, 2005.

3 Forouzan Mukhopadhyay, *Cryptography and Network Security*, McGraw Hill, 2/e, 2010.

4 Shyamala C. K., N. Harini and T. R. Padmanabhan, C*ryptography and Network Security*, Wiley India, 2011.

5 Bernard Menezes, *Network Security and Cryptography*, CENGAGE, 2010.

6 Atul Kahate, *Cryptography and Network Security,* McGraw Hill, 2/e, 2009.

7 Arthur Conklin W. M. and Greg White, *Principles of Computer Security*, TMH, 4/e, 2015.

8 Neal Krawetz, *Introduction to Network Security*, CENGAGE, 2007.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, problems based on MATLAB / any other software packages covering the syllabus etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

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

- *define information security*
- *recount the history of computer security and how it evolved into information security*
- *define key terms and critical concepts of information security*
- *enumerate the phases of the security systems development life cycle*
- *describe the information security roles of professionals within an organization*
- *identify Virus and Firewalls.*

13.806.4 DIGITAL INSTRUMENTATION (T) (Elective VI)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

To facilitate the students with a large class of industrial processes and methods to include automation in them.

Module – I

Digital instruments - the basics of digital instruments, digital measurement of time interval, phase, frequency, Digital LCR meter, voltmeter and multimeter. Working principle and applications of Wave form analyzer, harmonic distortion meter, harmonic analyser and Spectrum analyzer. Logic state analyser, IEEE - 488 General Purpose Interface Bus (GPIB) Instruments with application.

Module – II

Telemetry- Basic scheme of telemetry, Sources of error, line or transmission error, DC voltage and current telemetry schemes, Radio telemetry, PWM and digital telemetry schemes.

Virtual Instrumentation, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Real-time systems.

Module – III

Embedded Controller, OPC, HMI / SCADA software, Active X programming. VI programming techniques - VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

Module – IV

Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements. VI Chassis requirements. Common Instrument Interfaces - Current loop, RS 232C/ RS485, GPIB. Bus Interfaces - USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI.

References:

1. Bell D. A., *Electronic Instrumentation and Measurements*, PHI, 2009.
2. Helfrick and Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, PHI, 2008.

3. Gary Johnson, *LabVIEW Graphical Programming*, 2/e, McGraw Hill, 2006.
4. Kevin James, *PC Interfacing and Data Acquisition,* Elsevier, 2000.
5. Gupta S. and J. P. Gupta, *PC Interfacing for data acquisition and Process control*, Instrument Society of America.
6. National Instruments Inc. & Bishop, *Lab View 8 Student Edition*, Prentice Hall, 2007.
7. Rangan C. S., G. R. Sarma and V. S. V. Mani, *Instrumentation Devices and Systems*, 2/e, TMH, 2008.
8. Sanjay Gupta, Joseph John*, Virtual Instrumentation Using LabVIEW*, TMH, 2006.
9. *LabVIEW Basics-I Manual*, National Instruments, 2005.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of the course, students will be able to facilitate with a large class of industrial processes and methods to include automation in them.

13.806.5 NANOPHOTONICS (T) (Elective VI)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *To introduce the basic principles of Nanophotonics.*
- *To make the students acquainted with the concepts of Nanophotonics.*
- *To describe the effects of quantization on the optical properties of semiconductors and metals.*
- *To determine the areas of opportunity in nanophotonic research*

Module – I

Introduction Nanophotonics, Photons and Electrons: Similarities and Differences, Free-Space Propagation, Confinement of Photons and Electrons, Propagation Through a Classically Forbidden Zone, Tunneling , Localization Under a Periodic Potential: Bandgap Cooperative Effects for Photons and Electrons, Nanoscale Optical Interactions, Axial Nanoscopic Localization, Lateral Nanoscopic Localization, Nanoscale Confinement of Electronic Interactions, Quantum Confinement Effects, Nanoscopic Interaction, Dynamics, New Cooperative Electronic Energy Transfer, Cooperative Emission.

Module – II

Near-Field Interaction and Microscopy Near-Field Optics. Theoretical Modeling of Near-Field Nanoscopic Interactions Near-Field Microscopy, Study of Quantum Dots Single-Molecule Spectroscopy, Study of Nonlinear Optical Processes, Apertureless Near-Field Spectroscopy and Microscopy, Nanoscale Enhancement of Optical Interactions, Time- and Space-Resolved Studies, Nanoscale Dynamics, Quantum-Confined Materials, Inorganic Semiconductors , Quantum Wells, Quantum Wires Quantum Dots Quantum Rings, Manifestations of Quantum Confinement, Optical Properties, Nonlinear Optical Properties, Quantum-Confined Stark Effect, Dielectric Confinement Effect, Core-Shell Quantum Dots, Dot-Quantum Wells , Quantum-Confined Structures.

Module – III

Plasmonics, Metallic Nanoparticles and Nanorods, Metallic Nanoshells Local Field Enhancement Subwavelength, Aperture Plasmonics, Plasmonic Wave Guiding Applications of Metallic Nanostructures, Nanocontrol of Excitation, Dynamics Nanostructure and Excited States, Rare-Earth Doped Nanostructures, Up-Converting, Nanophores, Photon Avalanche Quantum Cutting, Site Isolating Nanoparticles, Nanochemistry, Nanostructured Molecular Architectures, Nanostructured Polymeric Media Molecular Machines, Dendrimers, Supramolecular Structures, Monolayer and Multilayer Molecular Assembly, Photonic Crystals, Basics Concepts Theoretical Modeling of Photonic Crystal, Features of Photonic Crystals, Nonlinear Photonic Crystals , Photonic Crystal Sensors.

Module – IV

Nanocomposite Waveguides, Random Lasers, Laser Paints, Nanocomposites for Optoelectronics, Polymer-Dispersed Liquid Crystals, Nanocomposite Metamaterials, Nanolithograph, Biomaterials and Nanophotonics, Bioderived Materials, Bioinspired Materials, Bacteria as Biosynthesizers, Nanophotonics for Biotechnology and Nanomedicine, Near-Field Bioimaging Nanoparticles for Optical Diagnostics, Semiconductor Quantum Dots for Bioimaging, Up-Converting Nanophores for Bioimaging, Biosensing, Nanoclinics for Optical Diagnostics and Targeted Therapy, Nanoclinic Gene Delivery, Nanoclinics for Photodynamic Therapy, Optical Nanomaterials, Nanoparticle Coatings, Sunscreen Nanoparticles, Self-Cleaning Glass Fluorescent QD, Nanobarcodes, Quantum-Confined Lasers.

References:

1. Paras N. Prasad, *Nanophotonics*, Wiley, 2004.
2. Paras N. Prasad, *Introduction to Biophotonics*, Wiley, 2003.
3. Sergey V. Gaponenka, *Nanophotonics*, Cambidge University Press, 2010.
4. Motoichi Ohtsu, *Principles of Nanophotonics*, CRC Press, 2008.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

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

- *know the basic principles of Nanophotonics.*
- *acquainted with the concepts of Nanophotonics.*
- *describe the effects of quantization on the optical properties of semiconductors and metals.*
- *determine the areas of opportunity in nanophotonic research.*

13.806.6 SATELLITE COMMUNICATIONS (T) (Elective VI)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits:** 4

Course Objectives:

- *To know the fundamentals of satellite communications and its applications*
- *To discuss various orbits of the satellite*
- *To analyze the satellite links*
- *To understand the satellite subsystems*
- *To know the multiple access methods*
- *To study the earth station design.*

Module – I

Kepler's Law, Newton's law, orbital parameters, orbital perturbations, geo stationary and non geo stationary orbits, station keeping, frequency allocation, frequency coordination and regulatory services, sun transit outages, limit of visibility Launching vehicles and propulsion.

Module – II

Space craft configuration, communication payload and supporting subsystems, satellite uplink, down link, space Link, Link power budget, System Noise, C / N Ratio, G/T, noise temperature, propagation factors, rain and ice effects, polarization.

Module – III

Modulation and multiplexing: Voice, data, Video, Analog – digital transmission system, Digital Video Broadcast. Multiple Access: FDMA, TDMA, CDMA, assignment methods, spread spectrum communication.

Module – IV

Transmitters, receivers, terrestrial Interface, design consideration, antenna and feed system, earth station equipment ,measurements on G/T, C / N, EIRP, antenna Gain.

Applications of satellite system, weather Service, remote sensing, mobile satellite services, GPS, satellite navigational system, direct broadcast satellites, DTH, VSAT, telemedicine.

References:

1. Mutagi, *Satellite Communication*, Oxford University Press, 2016
2. Dennis Roddy, *Satellite Communications*, McGraw Hill, 2001
3. Dharma Raj Cheruku, *Satellite communication* , IK International ,2012,
4. Agrawal B. N., *Design of Geosynchronous Spacecraft*, Prentice Hall, 1986.
5. Miya K., *Satellite Communications Technology*, KDD ENGG and Company,1981.
6. Fthenakis E., *Manual of Satellite Communications*, McGraw Hill, 2004.
7. Pratt T. and C.W. Bostian, *Satellite Communication*, Wiley India, 2003.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Ten Short answer questions of 2 marks each. All questions are compulsory. There should be at least two questions from each module and not more than three questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

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

- *explain the fundamentals of satellite communications.*
- *discuss various orbits of the satellite*
- *analyze the satellite links*
- *understand the satellite subsystems*
- *know the multiple access methods*
- *design earth station.*

13.807 PROJECT AND VIVA – VOCE (AT)

Teaching Scheme: 0(L) - 0(T) - 5(P) **Credits**: 5

Course Objective

- *To simulate real life situations related to Electronics and Communication Engineering and impart adequate training so that confidence to face and tackle any problem in the field is developed in the college itself.*
- *To culminate in gaining of major design experience in the related area of specialization.*
- *To realize constraints like that related to economic, environmental, social, political, ethical, health & safety, manufacturability and sustainability.*

Internal Continuous Assessment (Maximum Marks-200)

Each student shall complete the project work assigned to him/her and submit the project report by the end of the semester. This report (consisting of problem statement, design, implementation, results and analysis) shall be of a hard bound type. The report shall be endorsed by the Guide, Project co-ordinator and the Professor/HOD. Evaluation of report, results, presentation and viva will be conducted by a committee consisting of the **Project co-ordinator, Guide and a senior faculty.** The number of students in a project batch shall be limited to a **maximum of four**.

Marks shall be awarded as follows:

1. Mid semester evaluation by the committee - 50 Marks.
2. End semester evaluation & Viva by the committee - 50 Marks.
3. Evaluation of the report and results by Guide - 100 Marks.

University Examination (Maximum Marks-100)

Examiners shall be faculty members having minimum of five years teaching experience. Viva-Voce examination shall be based only on the subjects studied in the B. Tech course. Students shall submit the following while attending the viva-voce

1. Seminar Report (Certified during 7th Semester)
2. Project Design Report (Certified during 7th Semester)
3. Project Report (Certified during 8th Semester)

External Examiner shall endorse all the Reports. Marks shall be awarded as follows:

1. Questions based on subjects in the B. Tech course : 70 Marks
2. Questions based on Project : 20 Marks
3. Questions based on Seminar : 10 Marks

Note: Students shall not be permitted to attend the Viva-Voce examination if he/she does not submit the certified Project reports and Seminar report to the External Examiner for endorsing

Course Outcome:

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

- *acquire better communication skills and improve their leadership quality as well as the ability to work in groups, and thus aid them in building a successful career as an engineer*
- *simulate real life situations related to Electronics and Communication Engineering and impart adequate training so that confidence to face and tackle any problem in the field is developed in the college itself.*
- *gain major design experience in the related area of specialization.*
- *realize constraints like that related to economic, environmental, social, political, ethical, health & safety, manufacturability and sustainability.*