UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2018 SCHEME)

SYLLABUS FOR

VIII SEMESTER

ELECTRONICS and COMMUNICATION ENGINEERING

SCHEME -2018

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				
18.801	Computer Communication(T)	3	3	1	-	50	3	100	150
18.802	Advanced Communication (T)	3	3	1	-	50	3	100	150
18.803	Elective IV	3	3	1	-	50	3	100	150
18.804	Elective V	3	3	1	-	50	3	100	150
18.805	Microwave and Optical Communication Lab	2			4	50	3	100	150
18.806	Project and Viva – Voce (T)	6	-	-	9	150	-	100	250
	Total	**20**	**12**	**4**	**13**	**400**		**600**	**1000**

18.803 Elective IV

18.803.1	Artificial Intelligence and Robotics (T)
18.803.2	Discrete Control and Navigation Systems (T)
18.803.3	Optical Integrated Circuits (T)
18.803.4	Nano Devices and Circuits (T)
18.803.5	Entrepreneurship (T)
18.803.6	Microwave Devices and Circuits (T)

18. 804 Elective V

18.804.1	Management Information Systems (AT)
18.804.2	Fuzzy Systems(T)
18.804.3	Information Security (T)
18.804.4	Digital Instrumentation (T)
18.804.5	Nanophotonics (T)
18.804.6	Satellite Communications (T)

18.801 COMPUTER COMMUNICATIONS (T)

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

Course Objectives:

- *To give the basic concepts of computer network and working of layers, protocols and interfaces in a computer network.*
- *To introduce the fundamental techniques used in implementing secure network communications and give them an understanding of common threats and its defences.*

Module – I

Introduction to computer communication: Transmission modes - serial and parallel transmission, asynchronous, synchronous, simplex, half duplex, full duplex communication.Switching: circuit switching and packet switching.Network Architecture: Layering and Protocols, OSI Layering, TCP/IP Layering. Connectionless transport UDP and connection oriented transport TCP. Reliable Transmission, Stop and wait protocol, Sliding window protocols. Physical layer: Cables for Networking Coaxial cables, UTP, Fiber Optic cables.Networking devices (Hubs, Bridges & Switches).Virtual LAN

Module – II

Routing: Routing and Forwarding, Static routing and Dynamic routing, Network Layer Logical addressing : IPv4 & IPV6. Routing Algorithms- Distance Vector Routing, Link State Routing(Dijkstra's algorithm.Address Resolution Protocols (ARP,RARP), Subnetting , Classless Routing(CIDR), ICMP, IGMP, DHCP,Routing Protocols: Routing Information protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), MPLS

Module – III

Data link Layer: Error detection and correction techniques: parity checks, checksum and cyclic redundancy check.Bit Stuffing,HDLC. Link layer addressing: MAC addresses, Ethernet: Frame structure, CSMA/CD, Wireless LAN, CSMA/CA. Application Layer – DNS, Remote Logging (Telnet), SMTP, FTP, WWW, HTTP, POP3, MIME, SNMP. Principles of congestion Control and TCP Congestion Control.

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 (E-MAIL, PGP and S/MIME), Transport Layer(TLS, SSL). Network Layer(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

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:

The students will have a thorough understanding of:

- *Different types of network topologies and protocols.*
- *The layers of the OSI model and TCP/IP with their functions.*
- *The concept of subnetting and routing mechanisms.*
- *The basic protocols of computer networks, and how they can be used to assist in network design and implementation.*
- *Security aspects in designing a trusted computer communication system*

18.802 ADVANCED COMMUNICATION SYSTEMS(T)

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

Course Objectives:

- *To impart the basic concepts of various communication system.*

Module – I

Microwave Radio Communications:Introduction,Advantages and Disadvantages,Analog vs digital microwave, frequency vs amplitude modulation. Frequency modulated microwave radio system, FM microwave radio repeaters.

Diversity, protection switching arrangements, FM microwave radio stations, microwave repeater station, line of sight path characteristics.

Module – II

Digital TV:Digitized video, Source coding of Digitized Video, Compression of Frames, DCT based (JPED), compression of moving Pictures(MPEG). Basic blocks of MPEG2 and MPE4,Digital Video Broadcasting(DVB).

Modulation:QAM(DVB-S, DVB-C), OFDM for Terrestial Digital TV(DVB-T). Reception of Digital TV Signals(Cable,Satellite and terrestial). Digital TV over IP, Digital terrestial TV for mobile.

Display Technologies:basic working of Plasma, LCD and LED Displays.

Satellite Communication Systems, introduction,Kepler's laws, orbits, orbital effects, orbital perturbations. Satellite sub systems, Antennas, Transponders, earth station technology, Link calculation.

Satellite Systems-GEO systems, NON-GEO communication systems, Satellite Applications-Global Positioning System, Very Small Aperture Terminal System, Direct to Home Satellite Systems.

Module – III

Evolution of mobile radio communications, paging systems, Cordless telephone systems, comparison of various wireless systems.

Introduction to 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 Personal Area networks, Over view of WIMAX technologies, architecture, spectrum allocation.

Cellular concept, hand off strategies, Interference and system capacity:Cell splitting, Sectoring, Repeaters and Microcells.

Cellular System Design Fundamentals: Frequency reuse, channel assignment strategies, handoff strategies, handoff strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity.

Module – IV

Wireless propagation mechanism, free space propagation model, grond reflection model, knife edge diffraction model, path loss prediction in hilly terrain, introduction to fading and diversity

techniques, Introduction to MIMO system. Introduction to Multiple Access, space division multiple access, CDMA, OFDM. wireless networking, Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, Wireless standards.
GSM system architecture, radio link aspects, network aspects Introduction to new data services like High Speed Circuit Switched data(HSCSD),General Packet Radio Servicr(GPRS),Digital Enhanced Cordless Communicationd(DECT), Enhanced Data Rate for Global Evolution(EDGE), Ultra wideband systems(UWB), Push to Talk(PTT) technology, Mobile IP.

References:

1. Dennis Roody, Satellite communication, 4/e, McGraw Hill, 2006.
2. Herve Benoit, Digital Television Satellite, Cable, Terrestrial, IPTV, Mobile TV in the DVB Framework, 3/e, Focal Press, Elsevier, 2008
3. Simon Haykin, Michael Mohar, Modern wireless communication, Pearson Education, 2008
4. Theodore S. Rappaport: Wireless communication principles and practice,2/e, Pearson Education, 1990
5. Mishra, Wireless communications and Networks, McGraw Hill, 2/e, 2013.
6. Tomasi, Advanced Electronic Communication Systems, 6/e, Pearson, 2015.
7. W.C.Y. Lee, Mobile Cellular Telecommunication, McGraw Hill, 2010.

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:3hours *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 20marks.

Course Outcome:

The students will have a thorough knowledge of the basics and technology of advanced communication systems.

18.803.1 ARTIFICIAL INTELLIGENCE AND ROBOTICS (T) (Elective IV)

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

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.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as homework, 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.*

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18.803.2 DISCRETE CONTROL & NAVIGATION SYSTEMS (T) (Elective IV)

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

Course Objectives:

- *To introduce analysis of discrete time systems in state variable form*
- *To impart knowledge about 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*
- *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.*

18.803.3 OPTICAL INTEGRATED CIRCUITS (T) (Elective IV)

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

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.*

18.803.4 NANO DEVICES AND CIRCUITS (T) (Elective IV)

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

Course Objectives:

- *To develop broader aspects in understanding the role of nano electronics and its applications.*
- *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,

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

- *Explain the basic concepts involved 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.*

18.803.5 ENTREPRENEURSHIP (T) (Elective IV)

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

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.

cInternal 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.

18.803.6 MICROWAVE DEVICES AND CIRCUITS (T) (Elective IV)

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

Course Objectives:

- *To study microwave semiconductor devices & applications.*
- *To study microwave sources and amplifiers.*
- *To analyse microwave networks.*
- *To introduce microwave integrated circuits.*

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.

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:

The Students will be able to understand with active & passive microwave devices & components used in microwave communication systems and analyse microwave networks.

18.804.1 MANAGEMENT INFORMATION SYSTEMS (T) (Elective V)

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

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 Marks50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as homework, 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 students will be equipped with skills to analyze information for managerial decision making.

18.804.2 FUZZY SYSTEMS AND APPLICATIONS (Elective V)

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

Course Objectives:

- *To develop a deep knowledge about the concepts and terminologies of fuzzy systems.*
- *To study the concepts of crisp sets, fuzzy sets and fuzzy networks.*
- *To study various applications of fuzzy systems.*

Module – I

Introduction to fuzzy sets and systems-crispness, vagueness, uncertainty and fuzziness. Basics of fuzzy sets, membership functions, support of a fuzzy set height, normalized fuzzy set, alpha cuts.
Type- 2 fuzzy sets. Operation on fuzzy set-complement, intersection, union, Demorgan's Law Equality & subset hood. Law of excluded middle and contradiction, concentration, dilation, contrast intensification.

Module – II

Extension Principle and its application. Fuzzy relation- operations, projection, max-min , min-max composition, cylindrical extension. Reflexivity, symmetry and transitivity of fuzzy relations. Fuzzy prepositions, fuzzy connectives, linguistic variables, hedges, Approximate reasoning or fuzzy inference, Fuzzy rule based system. Fuzzification and defuzzification using centroid, centre of sums.

Module – III

Applications-Fuzzy logic controllers, Types of FLC- Types of Fuzzy rule formats. Block diagram of fuzzy logic controller. Multi input multi output control system. FLC with different case studies. PID controller. Air Conditioner controller using Fuzzy logic.

Module – IV

Introduction to Neural Fuzzy Controller- Neural Fuzzy controller with hybrid structure, Parameter learning for Neural fuzzy controllers – Neural Fuzzy controller with Fuzzy singleton Rules. Introduction to ANFIS- Structure of an ANFIS – Neural Fuzzy controller with TSK fuzzy rules.

References:

1. Ross T. J., Fuzzy Logic with Engineering Applications, Wiley, 3/e, 2010.
2. Lin C. T. and C.S. G. Lee, Neural Fuzzy Systems, Prentice Hall, 1996.
3. Ibrahim A. M., Introduction to Applied Fuzzy Electronics, PHI, 2013.
4. Rajasekaran and Pai, Neural Networks Fuzzy Logic and Genetic Algorithms, PHI, 2003. 15

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 know the concepts of fuzzy system and applications.

18.804.3 INFORMATION SECURITY (T) (Elective V)

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

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.

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.*

18.804.4 DIGITAL INSTRUMENTATION (T) (Elective V)

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

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.

Internal Continuous Assessment *(Maximum Marks-50*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as homework, 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.

18.804.5 NANOPHOTONICS (T) (Elective V)

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

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.*

18.804.6 SATELLITE COMMUNICATIONS (T) (Elective V)

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

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.

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.*

18.805 MICROWAVE & OPTICAL COMMUNICATION LAB (T)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 2

Course Objective:

To provide practical experience in design, testing, and analysis of few electronic devices and circuits used for microwave and optical communication engineering.

List of Experiments:

A. Microwave Experiments:

1. GUNN diode characteristics.
2. Reflex Klystron Mode Characteristics
3. VSWR and Frequency measurement.
4. Verify the relation between Guide wave length, free space wave length and cut off wave length for rectangular wave guide.
5. Measurement of E-plane and H-plane characteristics.
6. Directional Coupler Characteristics.
7. Unknown load impedance measurement using smith chart and verification using transmission line equation.
8. Measurement of dielectric constant for given solid dielectric cell.
9. Antenna Pattern Measurement.

B. Optical Experiments:

1. Measurement of Numerical Aperture of a fiber, after preparing the fiber ends.
2. Study of losses in Optical Fiber
3. Setting Up of Fiber Optic Digital link
4. Power Vs Current (P-I) characteristics and measure slope efficiency of Laser Diode.
5. Voltage Vs Current (V-I) characteristics of Laser Diode.
6. Power Vs Current (P-I) characteristics and measure slope efficiency of LED.
7. Voltage Vs Current (V-I) characteristics of LED.
8. Characteristics of Photodiode and measure the responsivity.
9. Characteristics of Avalanche Photo Diode (APD) and measure the responsivity.

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test
40% - Class work and Record
20% - Regularity in the class

University Examination Pattern:

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

Questions based on experiments prescribed in the list.

The following guidelines should be followed regarding award of marks

25% - Design and Implementation

50% - Result

25% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

After completion of the course student will be able to

- *Have a deep knowledge about all basic Microwave and Optical devices and components.*
- *Learn few microwave measurements and analyze parameters.*
- *Understand the principles of fiber-optic communications and the signal degradation factors.*
- *Assess the performance of optical communication components*

18.806 PROJECT AND VIVA – VOCE (T)

Teaching Scheme: 0(L) - 0(T) - 9(P) **Credits**: 6

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-150)

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 - 50Marks.

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