Gurugram University Gurugram

Curriculum for UG Degree Course in Electronics and Communication Engineering

(Engineering &Technology)

Gurugram University Gurugram

GENERAL COURSE STRUCTURE & CREDIT DISTRIBUTION

STRUCTUREOFUNDERGRADUATEENGINEERINGPROGRAM

S.No.	Category	Breakup Of Credits
1	Humanities and Social Sciences including Management courses	11
2	Basic Science courses	21
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc	28.5
4	Professional core courses	68
5	Professional Elective courses relevant to chosen specialization/branch	12
6	Open subjects–Electives from other technical and/or emerging subjects	12
7	Project work ,seminar and internship in industry or elsewhere	16
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	Non-credit
9	**Total**	**168.5**

SEMESTER WISE SUMMARY OF THE PROGRAM

S.No.	Semester	No. of Contact Hours	Marks	Credits
1.	I	27	900	20.5 /19.5
2.	II	32	1000	23/24
3.	III	28	900	23
4.	IV	28	1000	22
5.	V	28	1100	23
6.	VI	28	900	22
7.	VII	27	900	21
8.	VIII	22	500	14
	Total	220	7200	168.5

COURSE CODE AND DEFINITIONS

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional core courses
OEC	Open Elective courses
LC	Laboratory course
MC	Mandatory courses
PROJ	Project

Gurugram University Scheme of Studies and Examination
Bachelor of Technology (Electronics & Communication Engineering)

SEMESTER VII

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Microcontroller & Embedded System	3	0	0	3	30	70	100
3	PEC		Program Elective-IV	3	0	0	3	30	70	100
4	OEC		Open Elective –III	3	0	0	3	30	70	100
5	OEC		Open Elective -IV	3	0	0	3	30	70	100
6	LC		Microcontroller & Embedded System Lab	0	0	2	1	50	50	100
7	HUM		Organizational Behaviors	3	0	0	3	30	70	100
8	PROJ		Project-II	0	0	6	3	100	100	200
9	PROJ		Practical Training-II	-	-	2	2	100	-	100
Total				25			21	400	500	900

NOTE:

1. Choose any one from Professional Elective Course-IV
2. Choose any one from each of the Open Elective Course-III and IV

PROFESSIONAL ELECTIVE- IV (Semester-VII)

Sr. No	Code	Subject	Credit
1.		Optical Fibre Communication	3
2.		Neural Networks & fuzzy logic	3
3.		Telecommunication and Switching Networks	3
4.		Data Communication Networking & Security	3
5.		Radar and Sonar	3
6		Error Correcting Codes	3
7		Digital Audio Processing	3

MICROCONTROLLER & EMBEDDED SYSTEMS

Course Code					
Category	**Professional Core Courses**				
Course title	Microcontroller & Embedded System				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VII**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective:

1. To introduce students to the microcontroller and embedded system and applications. .
2. To make understand the architecture of PIC and 8051 microcontrollers in detail.
3. To provide knowledge about the embedded system and interfacing.

UNIT I

Introduction to Embedded Systems: Definition, Processor embedded into a system, embedded hardware units and devices into a system, embedded software in a system, examples of Embedded systems, Embedded SOC and Use of VLSI Circuit Design Technology, Complex Systems Design and Processes, Design Process in Embedded System, Formalization of System Design, Design Process and Design Examples, Classification of Embedded Systems, Skills Required for an Embedded System Design.

UNIT II

Difference between Microprocessor and Microcontroller.
8051 Microcontroller: Architecture: CPU Block diagram, Memory Organization, Program memory, Data Memory, Interrupts.
Peripherals: Timers, Serial Port, I/O Port Programming: Addressing Modes, Instruction Set, Programming.
Microcontroller based System Design: Introduction, A microcontroller specification, microcontroller design, testing the design, timing subroutines and lookup tables. Interfacing of LCD and A/D to 8051.

UNIT III

Real World Interfacing, Introduction to Advanced Architectures: 80x86, ARM7, SHARC, DSP Processor and Memory Organization, Instruction Level Parallelism, Performance Metrics, Memory Types, Memory Maps and addresses, Processor and Memory Selection,
Device and Communication Buses for Device Network: I/O type examples, serial Communication Devices, Parallel Device Ports, Wireless Devices, Timer and Counting Devices, watchdog Timer, Real Time Clock, Networked Embedded Systems, Internet Enabled Systems.

UNIT IV

Real Time Operating Systems

OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device File and IO Subsystem Management, Interrupt Routines in RTOS Environment and Handling Interrupt Source Cells, Real-Time operating Systems, Basic Design using an RTOS, RTOS task Scheduling Models, Interrupt latency and Response of the Tasks as performance Metrics, OS Security Issues, Case study of Digital camera Hardware and Software Architecture.

COURSE OUTCOMES: After the completion of the course the student will be able to:
1. To gain the knowledge about Microcontroller and its need.
2. To learn and understand the basic architecture of different Microcontroller 8051.
3. Foster ability to write the programming using 8051 microcontrollers.
4. To learn and understand the internal architecture and interfacing of different peripheral devices.
5. Ability to understand the role of Embedded systems in the industry.
6. To understand the design concept of Embedded systems.

TEXT / REFERENCE BOOKS:

1. B. B. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
2. Design with PIC Microcontrollers by John B. Peatman , Pearson.
3. Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.
4. V. Udayashankara and M. S. Mallik arjunaswamy: 8051 Microcontroller, TMH, New Delhi
5. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education.
6. A. V. Deshmukh: Microcontroller (Theory and Application), TMH.
7. D. V. Hall: Microprocessors and Interfacing, TMH
8. Programming and Customizing the 8051 Microcontroller : Predko ; TMH.
9. Programming Embedded Systems in C and C++ : Michael Barr; SHROFF PUB. & DISTR

MICROCONTROLLER & EMBEDDED SYSTEM LAB

<table>
<tr><td>Course Code</td><td colspan="5"></td></tr>
<tr><td>Category</td><td colspan="5">Laboratory Courses</td></tr>
<tr><td>Course title</td><td colspan="5">Microcontroller & Embedded System Lab</td></tr>
<tr><td rowspan="2">Scheme</td><td>L</td><td>T</td><td>P</td><td>Credits</td><td rowspan="2">Semester: VII</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Class Work</td><td colspan="5">50 Marks</td></tr>
<tr><td>Exam</td><td colspan="5">50 Marks</td></tr>
<tr><td>Total</td><td colspan="5">100 Marks</td></tr>
<tr><td>Duration of Exam</td><td colspan="5">02Hrs</td></tr>
</table>

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

COURSE OBJECTIVES:

1. To impart the basic concepts of microcontroller programming and Architecture.
2. To program and interface PD with microcontroller.

LIST OF EXPERIMENTS:

1. To study development tools/environment for ATMEL/PIC microcontroller programme and Architecture.
2. Write an assembly language program to add, subtract, multiply, divide 16 bit data by Atmel microcontroller.
3. An assembly language program to generate 10 KHz frequency using interrupts on P1.2.
4. Study and analyze the interfacing of 16 x 2 LCD.
5. Study of implementation, analysis and interfacing of seven segment display.
6. Study of implementation of steeper motor angle control.
7. Study of implementation of DC Motor control using PWM method.
8. Study and observation of Position control of Servo Motor.
9. Study of Programming and Transmission and Reception of data through serial port.
10. To study implementation and programming of Pressure measurement.
11. To study implementation and programming of Temperature measurement.
12. Study and analysis of interfacing of graphical LCD using PIC Microcontroller.
13. To interface PWM based voltage regulator using PIC Microcontroller.
14. Study and interface of IR (RC5 Protocol) and RF Communication using PIC Microcontroller.

Course Outcomes: At the end of the course, students will demonstrate the ability to:

1. Do assembly language programming of a Microcontroller .
2. Do assembly language programming of microcontroller for interfacing of peripherals.

ORGANIZATIONAL BEHAVIOUR

Course Code					
Category	**Humanities & Management course**				
Course title	**Organizational Behaviour**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VII**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objectives:

1. The objective of Organizational Behaviour (OB) is to study human behaviour withinan organizational context.
2. The objective of Organizational Behaviour (OB) is to understand human behaviour withinan organizational context.
3. The course aims to provide students with knowledge and skills to analyze and explainindividual and group behaviour in organizations.
4. The course aims to provide students with knowledge and skills to influenceindividual and group behaviour in organizations.

UNIT-I

Introduction of Management: Meaning, definitions, nature of management; Managerial levels, skills and roles in an organization; Functions of Management: Planning, Organizing, staffing, Directing & Controlling, Interrelationship of managerial functions, scope of management &Importance of management. Difference between management and administration.

UNIT-II

Introduction of organization: Meaning and process of Organization, Management v/s organization; Fundamentals of Organizational Behaviour: Concepts, evolution, importance and relationship with other Fields; Contemporary challenges and opportunities of OB. Individual Processes and Behaviour, Personality, Concept, determinants and applications; Perception, Concept, process and applications, Learning, Concept (Brief Introduction);Motivation, Concept, techniques and importance

UNIT-III

Interpersonal Processes, Teams and Groups, Definition of Group, Stages of group development, Types of groups, meaning of team, merits and demerits of team; difference between team andgroup, Conflict, Concept, sources, types, management of conflict; Leadership: Concept, function, styles & qualities of leadership. Communication – Meaning, process, channels of communication, importance and barriers of communication.

UNIT -IV

Organizational Processes: Organizational structure, Meaning and types of organizational structure and their effect on human behaviour; Organizational culture, Elements, types and factors affecting organizational culture. Organizational change: Concept, types & factors
affecting organizational change, Resistance to Change.

Course Outcomes: At the end of this course,

1. Students will be able to apply the managerial concepts in practical life.
2. Students will be able to understand the functions of management.
3. The students will be able to understand the concept of organizational behaviour at individual level and interpersonal level.
4. Students will be able to understand the behavioural dynamics in organizations.
5. Students will be able to understand the leadership.
6. Students will be able to understand the organizational culture and change

Text / References

1. Robbins, S.P. and Decenzo, D.A. Fundamentals of Management, Pearson Education Asia, New Delhi.
2. Stoner, J et. al, Management, New Delhi, PHI, New Delhi.
3. Satya Raju, Management – Text & Cases, PHI, New Delhi.
4. Kavita Singh, OrganisationalBehaviour: Text and cases. New Delhi: Pearson Education.
5. Pareek, Udai, Understanding OrganisationalBehaviour, Oxford University Press, New Delhi.
6. Robbins, S.P. & Judge, T.A., OrganisationalBehaviour, Prentice Hall of India, NewDelhi.

1. GhumanKarminder, Aswathappa K., Management concept practice and cases, Mc Graw Hilleducation.
2. Chhabra T. N., Fundamental of Management, Sun India Publications,New Delhi

PRACTICAL TRAINING-II

Course Code					
Category	**Project**				
Course title	**Practical Training-II**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VII**
	0	**0**	**2**	**2**	
Class Work	100 Marks				
Exam					
Total	100 Marks				
Duration of Exam					

The students are required to undergo practical training of duration not less than 1.5 months in a reputed organization or concerned institute. The students who wish to undergo practical training, the industry chosen for undergoing the training should be at least a private limited company. The students shall submit and present the midterm progress report at the institute. the presentation will be attended by a committee. alternately the teacher may visit the industry to get the feedback of the student.

The final Viva voice of the practical training will be conducted by an external examiner and one external examiner appointed by the institute. External examiner will be from the panel of examiners submitted by the concerned institute approved by the board of studies in engineering and technology. Assessment of industrial training will be based on seminar, viva-voice, report and certificate of practical training or institutional project work obtained by the student from the industry or institute.

The internal marks distribution for the students who have undergone industrial training consist of 100 marks internally.

PROJECT-II

<table>
<tr><td>Course Code</td><td colspan="5"></td></tr>
<tr><td>Category</td><td colspan="5">Project</td></tr>
<tr><td>Course title</td><td colspan="5">Project-II</td></tr>
<tr><td rowspan="2">Scheme</td><td>L</td><td>T</td><td>P</td><td>Credits</td><td rowspan="2">Semester: VII</td></tr>
<tr><td>0</td><td>0</td><td>3</td><td>2</td></tr>
<tr><td>Class Work</td><td colspan="5">100 Marks</td></tr>
<tr><td>Exam</td><td colspan="5">100 Marks</td></tr>
<tr><td>Total</td><td colspan="5">200 Marks</td></tr>
<tr><td>Duration of Exam</td><td colspan="5">3Hrs</td></tr>
</table>

Course objectives:

1. To allow students to demonstrate a wide range of the skills by workingon PROJECT-I that has passed through the design, analysis, testing and evaluation
2. To encourage problem solving skills.
3. To allow students to develop problem solving, synthesis and evaluation skills.
4. To encourage teamwork and leadership.
5. To improve students' communication skills by asking them to produce both a professional report and a professional poster and to give an oral presentation.

The students are required to undertake institutional project work.

The final Viva voice of the institutional project work will be conducted by an external examiner and one external examiner appointed by the institute. External examiner will be from the panel of examiners submitted by the concerned institute approved by the board of studies in engineering and technology. Assessment of institutional project work will be based on seminar, viva-voice and report of institutional project work obtained by the student from the industry or institute.

The internal marks distribution for the students consists of 100 marks internally and 100 marks by an external examiner.

Course outcomes

On successful completion of the course students will be able to:

1. Demonstrate a sound technical knowledge of their selected projectsolution.
2. Undertake problem solution.
3. Design engineering solutions to complex problems utilising a systems approach.
4. Conduct the remaining engineering project.
5. Communicate with team members at large in written an oral form.
6. Demonstrate the knowledge, skills and attitudes of a professional engineer.

PROFESSIONAL ELECTIVE- IV (Semester-VII)

FIBER OPTIC COMMUNICATION

Course Code					
Category	**Professional Elective Courses**				
Course title	Fiber Optic Communication				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VII**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:
1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. To learn the various optical sources, materials and fiber splicing
3. To learn the fiber optical receivers and noise performance in photo detector, link budget, WDM.

UNIT I

Optical fiber communication Introduction ,general system, advantages, disadvantages, and applications .
Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model.

UNIT II

Different types of optical fibers, Modal analysis of a step index fiber. Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR.

UNIT III

Optical sources - LEDs and Lasers, Photo-detectors - pin-detectors, detector responsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.

Optical switches - coupled mode analysis of directional couplers, electro-optic switches.

UNIT IV

Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and solition based communication. Optical amplifiers - EDFA, Raman amplifier, Coherent communication and WDM systems.

Course outcomes: At the end of this course students will demonstrate the ability to
1. Understand different models of light and their limitations.
2. Understand propagation of light in different types of optical fibers and signal degradation.
3. Design analog and digital optical communication links and analyze their performance.
4. Understand, analyze and design high-capacity advanced optical communication systems.
5. Learn different types of amplifier used in optical fiber communication.
6. Learn the fiber optical network components.

Text/Reference Books :

1. J. Keiser, Fibre Optic communication, McGraw-Hill, 2nd Ed. 1992.
2. John M Senior," Optical Fiber Communications Principles and Practice", Pearson 3rd Edition
3. J.E. Midwinter, Optical fibers for transmission, John Wiley, 1979.
4. T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.
5. J. Gowar, Optical communication systems, Prentice Hall India, 1987.
6. G. Agrawal, Fiber optic Communication Systems, John Wiley and sons, New York, 1992

NEURAL NETWORKS & FUZZY LOGIC

<table>
<tr><td>Course Code</td><td colspan="5"></td></tr>
<tr><td>Category</td><td colspan="5">Professional Elective Courses</td></tr>
<tr><td>Course title</td><td colspan="5">Neural Networks & Fuzzy logic</td></tr>
<tr><td rowspan="2">Scheme</td><td>L</td><td>T</td><td>P</td><td>Credits</td><td rowspan="2">Semester: VII</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td></tr>
<tr><td>Class Work</td><td colspan="5">30 Marks</td></tr>
<tr><td>Exam</td><td colspan="5">70 Marks</td></tr>
<tr><td>Total</td><td colspan="5">100 Marks</td></tr>
<tr><td>Duration of Exam</td><td colspan="5">3Hrs</td></tr>
</table>

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objectives:
1. To learn various soft computing techniques
2. To gain understanding of Fuzzy logic and ANN.
3. To gain understanding of ANN based controller design.
4. To understand Evolutionary algorithm and hybrid system.

UNIT-I

Soft Computing: Introduction, requirement, different soft computing techniques and theircharacteristics, comparison with hard computing, applications.

UNIT-II

Fuzzy sets and Fuzzy logic: Introduction, Fuzzy sets versus crisp sets, properties of fuzzysets, operations on fuzzy sets, Extension principle, Fuzzy relations, Linguistic variables,linguistic terms, Linguistic hedges, Fuzzy reasoning, Mamdani and TSK fuzzy inferencesystems, Applications, fuzzy controllers, Theoretical and implementation issues.

UNIT-III

Artificial Neural Network: Introduction, comparison with biological neural network, basicmodels of artificial neuron, different architectures of ANN, learning techniques, ANN basedsystem modelling, ANN based controller design, theoretical and implementation issues,Applications.

UNIT -IV

Evolutionary algorithms and hybrid systems: Genetic Algorithm (GA), different operators ofGA, convergence of Genetic Algorithm, Particle swarm optimization algorithm, Neural-Network-Based Fuzzy Systems, Fuzzy Logic-Based Neural Networks, Genetic Algorithm forNeural Network Design, Fuzzy Logic design, other Applications of GA.

Course Outcomes: At the end of this course, students will demonstrate the ability
1. To understand the concepts of soft computing vis-à-vis hard computing
2. To understand ANN.
3. To introduce the ideas of fuzzy logic, neural networks, genetic algorithm.
4. To introduce the concepts of evolutionary algorithms.
5. To introduce the concepts of hybrid intelligent systems.
6. To introduce application areas of soft computing and the criteria to select appropriate softComputing

Text / References Books:

1. Neuro Fuzzy & Soft Computing - J.-S.R.Jang, C.-T.Sun, E.mizutani, Pearson Education
2. Neural Networks and Fuzzy Systems: Dynamical Systems Application to Machine Intelligence -Bart Kosko, Prentice Hall
3. T.J. Ross, "Fuzzy Logic Control", TMH Publications.
4. S. Hekins, "Comprehensive Neural Networks", Pearson Publications.
5. S. Rajsekharan, Vijayalaxmi Pai, "Neural Networks, Fuzzy logic and Genetic Algorithms,Synthesis and applications", Prentice Hall
7. V. Kecman, "Learning and Soft Computing", MIT Press. B.Tech. (Electrical Engineering) BOS 24-05-2017
8. D. Ruan, "Intelligent Hybrid Systems", Kluwer Academic Publisher.

Telecommunication and Switching Networks

Course Code					
Category	**Professional Elective Courses**				
Course title	**Telecommunication and Switching Networks**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester : VII**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. Different components of telecommunication are explained.
2. Telecommunication traffic is measured by considering the mathematical model for network traffic.
3. Different signaling systems are explained.

UNIT I

Introduction: Evolution of Telecommunication, Switching System, Classification of Switching, Types of Telephone Switching Systems, Elements of Telecommunication, Telecommunication Standard. Telephone System: PSTN, Modern Telecom System, Telephone Network, Telephone Set, Telephone Network organization, Principles and examples of step by step, Cross bar and reed relay systems, Telephone numbering plan, Central Battery System, Transmission impairments, Two-four-wire transmission, Subscriber
Loop Design.

UNIT II

Telecommunication traffic: Telecommunication traffic, Traffic considerations, Erlang, Grade of Service, Traffic Measurement, Mathematical model for telecommunication traffic. Switching System: Resource sharing and need for switching, Need for Networks, Switching, Types of Switching, Circuit Switching, Message Packet Switching, Store & Forward Switching, Function of Switching System, Electronic Switching System, Multiplexing, IDM (E1/E2. TI), FDM, Implementation of Switching System, Blocking and Non-blocking Switches, Single & Multi stage Switches, Space Switching, Time Switching, Hybrid
Switching, Path finding, Complexity, Blocking Probability of Switch.

UNIT III

Telephone Exchange: Stored Program Controlled Exchange, Electronic Exchange, Electronic Switching & Stored Program Control Systems, Digital Switching Time, Space & Hybrid Switches, Example of Digital Exchanges, Example of Modern Exchanges (C-DOI exchange), Availability of Parallel Exchange.

UNIT IV

Signaling Systems: Signaling, Types of Signaling information, Forms of Signaling, Channel Associated Signaling (CAS), Common Channel Signaling, CCITT No-7 System, SS7 Signaling, Architecture Computer & Data Networks, ARPANET, ALOHA-Toke Protocols Network Topology, Multiple Access Schemes, Layered Architectures, Networks Protocols, Local Area Network, Evolution towards ISDN.

Course outcomes : At the end of this course students will demonstrate the ability to

1. To Understand basic concepts of telecommunication, networking and switching technologies
2. To learn in detail about time division switching.
3. To understand about various signaling in telecommunication systems
4. To analyze various telecommunication networks
5. To estimate the performance of telecommunication networks
6. Understands Multiple Access Schemes.

Text Book/Reference Books:

1. J. E. Flood,, Telecommunication and Switching Traffic & Networks, Pearson Education , 2001
2. Thiagarajan Viswanathan, Telecommunication Switching Systems & Networks, PHI , 2006

Reference Books:

1. John G. van Bose and Fabrizio u devetak, signaling in Telecommunication Networks, Wiley interscience. 2nd edition , 2007
2. Roger L. Freeman, Telecommunication System Engineering: Analog and Digital Network Design, John Wiley & Sons.

Data Communication Networking & Security

Course Code					
Category	**Professional Elective Courses**				
Course title	**Data Communication Networking & Security**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester : VII**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. Understand the working principles of Data Communication.
2. Understand the Data link layer .
3. Understand the network security.

UNIT I

Overview of Data Communication and Networking: Data communications, Uses of computer Networks, The Internet, Protocols and standards, Layered tasks, OSI model, TCP/IP model. Data and Signals, Analog and Digital, Periodic Analog Signals, Digital Signals, Transmission impairment, Data Rate Limits, Performance, Digital Transmission, Digital-to-Digital Conversion, Analog-to-Digital Conversion, Analog Transmission, Digital-to-analog Conversion, Analog-to analog Conversion

UNIT II

Physical layer: Bandwidth utilization: Multiplexing, FDM, WDM, TDM, Transmission Media, Guided Media, Unguided Media: Wireless, Switching, Circuit-Switched Networks, Datagram Networks. Modulation of digital data, Telephone Network,

Data Link Layer: Data link layer design issues, Error Detection and Correction, Data Link Control and Protocols, Types of errors, Detection, Error correction, Flow and error control.

UNIT III

Network Layer: Internetworks, Addressing: IP Address Classes, Subnet, CIDR, Routing, ARP, IP, ICMP, IPV6, Unicast routing, Unicast routing protocol, Multicast routing, Multicast routing protocols.

Transport layer: Process to process delivery, Elements of transport protocols, User datagram protocol (UDP), Transmission control protocol (TCP), Data traffic, Congestion, Congestion control, Quality of service, Techniques to improve QOS, Integrated services, Differentiated services, QOS in switched networks.

UNIT IV

Application layer: DNS-Domain Name System, Electronic mail, File transfer, HTTP, World wide web (WWW), Digitizing audio and video, Audio and video compression, Voice over IP.

Network Security: Cryptography, Symmetric key Algorithms (DES, AES), Public key Algorithms-RSA, Digital Signatures, Firewall

Course Outcomes:

1. Describe the technical aspects of data communications on the Internet
2. Analyze error detection/correction and flow control of data in the data network
3. Configure the network component and assign IP address
4. Perform computations and solve numerical problems on different FDMA techniques.
5. Assess how softwarization of network functions helps in scalability and ease of operations.
6. Evaluate the use of advanced techniques in cellular communications.

Text Books/Reference Books:

1. Data Communication and Networking by Behrouz A. Forouzan (Fourth Edition), Tata McGraw Hill
2. Computer Networks by Andrew S. Tanenbaum (Fifth Edition), Pearson Education
3. Introduction to Data communications and Networking ,W.Tomasi, Pearson education
4. Stallings William, Data and Computer Communication, Pearson Education (2000) 7th ed.

Radar and Sonar

Course Code					
Category	**Professional Elective Courses**				
Course title	**Radar and Sonar**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester : VII**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. Understand the working principles of the Radar and Sonar .
2. Understand the types of Radars and their applications.
3. Understand limitations and latest development in Radar technology.

UNIT I

Introduction: Radar basic block diagram, operation, working principle, frequency used. Evolution of Radar technology and its application in various fields with historical prospective

UNIT II

Radar Equation: Simple form of Radar equation, prediction of range, performance, minimum detectable signal, Receiver Noise, Signal to Noise Ration. Transmitter power, Pulse repetition frequency, range ambiguity, system losses and propagation effects. CW and Frequency Modulated Radars: Basic block diagram of CW and FMCW radar. Working principle, application and limitations.

UNIT III

MTI and Pulse Doppler Radar: Introduction, Delay Line Cancellors, Multiple or staggered, Pulse repetition frequencies, range-Gated Doppler Filters, Digital Signal Processing, Other MTI delay line, Limitation of MTI performance, Non-coherent MTI, Pulse Doppler Radar, MTI from a moving platform. Tracking in Radar: Tracking with Radar, Sequential Lobbing, Conical Scan, Monopulse Tracking Radar, Tracking in range, Acquisition.

UNIT IV

Receivers, Display & Duplexers: Radar Receivers, Noise Figure, Mixer, Low-noise Front ends, Displays, Duplexer, Receiver protectors. Introduction to SONAR: Working principle, propagation, transmission and reception of signals. Signal to Noise Ration, types of Sonar and their applications

Course Outcome: At the end of the course, students will demonstrate the ability to:
1. Explain working principles of the Radar and Sonar .
2. Explain availability of various types of Radars and their applications.
3. Explain optimum utilization of Radar and Sonar technology.
4. Understand the principle and working of SONAR.

TEXT BOOK/ REFERENCE BOOK:

1. Introduction to Radar Systems: Merrill I. Skolnik, ; MGH
2. Electronic Communication Systems : Kennedy; TMH

Error Correcting Codes

Course Code		Semester : VII
Category	Professional Elective Courses	
Course title	Error Correcting Codes	
Scheme	L: 3, T: 0, P: 0, Credits: 3	
Class Work	30 Marks	
Exam	70 Marks	
Total	100 Marks	
Duration of Exam	3Hrs	

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:
1. Understand the encoding and decoding concept of the various codes.
2. Understand that using coding techniques how we improve the efficiency of communication system.
3. Understand various properties of different codes and how implements on different application.

UNIT I

Concept of information and entropy, Shannon theorem, Relation among Different entropies, Mutual information and self-information, channel capacity of different channels ,Basic conception of coding , Advantage of coding ,Source encoding and channel coding.

UNIT II

Linear block codes: introduction to linear block code. Syndrome and error detection Minimum distance of block code, Error detecting and error correcting capabilities of a block code, Hamming codes. Application of block codes for error control in data storage system.

UNIT III

Cyclic Codes: Description, Generator and parity check matrices, encoding, Syndrome computation and error detection, decoding, cyclic hamming codes, Shortened cyclic codes, error trapping decoding for cyclic codes. BCH codes, Decoding of BCH codes. Idempotent and Mattson-Solomon polynomials; Reed-Solomon codes, MDS codes,

UNIT IV

Convolution codes ; Encoding of convolutional codes, state diagrams, Trellis Diagram, structural and distance properties, Maximum likelihood decoding, sequential decoding algorithm, Application of convolutional codes in ARQ system. Introduction to Space time codes, Diversity, orthogonal space –time block codes.

Course Outcomes: At the end of the course, students will demonstrate the ability to:
1. Understand the sources of errors
2. Understand error control coding applied in digital communication
3. Understand the encoding and decoding concept .
4. Understand the coding techniques to improve the efficiency of communication system.
5. Understand various properties and their implements on different application.

Text/Reference Books:

1. F.J. McWilliams and N.J.A. Slone, The theory of error correcting codes, 1977.
2. R.E. Balahut, Theory and practice of error control codes, Addison Wesley, 1983.

Digital Audio Processing

Course Code					
Category	**Professional Elective Courses**				
Course title	**Digital Audio Processing**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester : VII**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

NOTE: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To provide students with information about essential simulation methods and implementation procedures in the area of digital audio signal processing.
2. Considerable attention is devoted to the present trends in the area of general audio signal with focus on musical signals.

UNIT I

Audio Signal Characteristics, Production model, Hearing and Auditory model, Acoustic characteristic of speech, Speech production models, Linear Separable equivalent circuit model, Vocal Tract and Vocal Cord Model , Audio signal acquisition, Representation and Modelling, Enhancement of audio signals: Spectral Subtraction, Weiner based filtering, Neural nets

UNIT II

Audio/ Speech Analysis and Synthesis Systems: Digitization, Sampling, Quantization and coding, Spectral Analysis, Spectral structure of speech, Autocorrelation and Short Time Fourier transform, Window function, Sound Spectrogram, Mel frequency Cepstral Coefficients, Filter bank and Zero Crossing Analysis, Analysis –by-Synthesis, Pitch Extraction., Linear Predictive Coding Analysis.

UNIT III

Psychoacoustics, Multi-microphone audio processing: Room acoustics, Array beamforming. Acoustic sound source localization and tracking

UNIT IV

Applications: Principles of Automatic Speech Recognition (ASR),Theory and implementation of Hidden Markov Model (HMM) for ASR, Speaker Recognition, Evolution of Speech APIs, Natural Language Processing, Sound source separation models.

Course Outcomes: At the end of this course, the students should be able to

1. Understand different characteristics of Audio signals.
2. Analyze different speech analysis and synthesis systems.
3. Write an algorithm for automatic speech recognition system
4. Design models and algorithms for audio and speech processing applications.

Text/References Books :

1. Sen, Soumya, Dutta, Anjan Dey, Nilanjan, Audio Processing and Speech Recognition,1st edition, 2019, Springer
2. Gold, B.; Morgan, N.; Ellis, D. Speech and audio signal processing: processing and perception of speech and music. 2nd rev. ed. Wiley-Blackwell, 2011.
3. Bali & Bali, Audio Video Systems, Khanna Book Publishing.
4. Sadaoki Furui, "Digital Speech Processing, Synthesis and Recognition" 2/e.
5. Rabiner and Schafer, "Digital Processing of Speech Signals", Pearson Education

Gurugram University Scheme of Studies and Examination

Bachelor of Technology (Electronics & Communication Engineering)

Semester VIII

S. No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	ESC		MOOC –I (Essential)	3	0	0	3	25	75	100
2	ESC		MOOC-II (Essential)	3	0	0	3	25	75	100
3	PROJECT		Project – III/Industrial Training	0	0	16	8	150	150	300
Total				**22**			**14**	**200**	**300**	**500**

NOTE: At the end of the 8th semester, each student has to submit the certificate of MOOCs (Essential).

MOOC-1(ESSENTIAL)

Course Code					
Category	**Engineering Science Course**				
Course title	**MOOC-1 (Essential)**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VIII**
	3	**0**	**0**	**3**	
Class Work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

A student has to complete NPTEL/SWAYAM Courses of 12 Weeks respectivelythrough MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL/SWAYAM Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL/SWAYAM directly as per the course offering in Odd/Even Semesters at NPTEL/SWAYAM. These NPTEL/SWAYAM courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MOOCS courses the students, shall, provide their successful completion NPTEL/SWAYAM status/certificates to the University (COE) through their college of study only.

MOOC-2(ESSENTIAL)

Course Code					
Category	**Engineering Science Course**				
Course title	**MOOC-2(Essential)**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: VIII**
	3	**0**	**0**	**3**	
Class Work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

A student has to complete NPTEL/SWAYAM Courses of 12 Weeks respectively through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL/SWAYAM Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL/SWAYAM directly as per the course offering in Odd/Even Semesters at NPTEL/SWAYAM. These NPTEL/SWAYAM courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MOOCS courses the students, shall, provide their successful completion NPTEL/SWAYAM status/certificates to the University (COE) through their college of study only.

INDUSTRIAL PROJECT/PROJECT-III

<table>
<tr><td>Course Code</td><td colspan="5"></td></tr>
<tr><td>Category</td><td colspan="5">Project</td></tr>
<tr><td>Course title</td><td colspan="5">Industrial Project/Project-III</td></tr>
<tr><td rowspan="2">Scheme</td><td>L</td><td>T</td><td>P</td><td>Credits</td><td rowspan="2">Semester: VIII</td></tr>
<tr><td>0</td><td>0</td><td>16</td><td>8</td></tr>
<tr><td>Class Work</td><td colspan="5">150 Marks</td></tr>
<tr><td>Exam</td><td colspan="5">150 Marks</td></tr>
<tr><td>Total</td><td colspan="5">300 Marks</td></tr>
<tr><td>Duration of Exam</td><td colspan="5">3Hrs</td></tr>
</table>

Course objectives:

1. To allow students to demonstrate a wide range of the skills learned during their course of study by asking them to deliver a product that has passed through the design, analysis, testing and evaluation
2. To encourage multidisciplinary research through the integration learned in a number of courses.
3. To allow students to develop problem solving, analysis, synthesis and evaluation skills.
4. To encourage teamwork.
5. To improve students' communication skills by asking them to produce both a professional report and a professional poster and to give an oral presentation

The students are required to undergo industrial training or institutional project work of duration not less than 4 months in a reputed organization or concerned institute. The students who wish to undergo industrial training, the industry chosen for undergoing the training should be at least a private limited company. The students shall submit and present the midterm progress report at the institute. the presentation will be attended by a committee. alternately the teacher may visit the industry to get the feedback of the student.

The final Viva voice of the industrial training or institutional project work will be conducted by an external examiner and one external examiner appointed by the institute. External examiner will be from the panel of examiners submitted by the concerned institute approved by the board of studies in engineering and technology. Assessment of industrial training or institutional project work will be based on seminar, yiva-voice, report and certificate of industrial training or institutional project work obtained by the student from the industry or institute.

The internal marks distribution for the students who have undergone industrial training consist of 150 marks internally and 150 marks buy an external examiner.

Course outcomes

On successful completion of the course students will be able to:

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation and solution.
3. Design engineering solutions to complex problems utilising a systems approach.
4. Conduct an engineering project.
5. Communicate with engineers and the community at large in written an oral form.
6. Demonstrate the knowledge, skills and attitudes of a professional engineer.