Department of Electronics and Telecommunication Engineering

"Rectifying Ideas, Amplifying Knowledge"

VISION	MISSION	
"To be a Department providing high quality & globally competent knowledge of concurrent technologies in the field of Electronics and Telecommunication."	1. To provide quality teaching learning process through well-developed educational environment and dedicated faculties.	
	2. To produce competent technocrats of high standards satisfying the needs of all stakeholders.	

Scheme for B. Tech in Electronics and Telecommunication Engineering (w.e.f. 2024-25)

B. Tech Fifth Semester

Sr. No.	Category of Course	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credits
				L	T	P	CA	MSE	ESE	Total	
1	PCC	ET5T001	Digital Signal Processing	2	1	0	20	20	60	100	3
2	PCC	ET5T002	Introduction to IOT	3	0	0	20	20	60	100	3
3	PCC	ET5T003	Control System Engineering	3	0	0	20	20	60	100	3
4	PEC	ET5E004	Professional Elective Course-I	3	0	0	20	20	60	100	3
5	OEC	ET5O001	OPEN Elective Course-I	4	0	0	20	20	60	100	4
6	PCC	ET5L001	Digital Signal Processing Lab	0	0	2	60	0	40	100	1
7	ESC	ET5L005	Software Workshop Lab	0	0	2	60	0	40	100	1
8	Project	ET5P001	Field Training-2/ Industrial Visit	0	0	0	50	0	0	50	1
9	Project	ET5P002	Mini Project	0	0	2	30	0	20	50	1
10	MC	ET5T006	Consumer Affairs	2	0	0	10	15	25	50	Audit
			Total	**17**	**1**	**6**	**310**	**115**	**425**	**850**	**20**

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BoS ETC Board

Chairman
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Scheme for B. Tech in Electronics and Telecommunication Engineering (w.e.f. 2022-23)

B. Tech Sixth Semester

Sr. No.	Category of Course	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credits
				L	T	P	CA	MSE	ESE	Total	
1	HSMC	ET6T001	Education, Technology and Society	2	0	0	20	20	60	100	2
2	PCC	ET6T002	Antennas and Wave Propagation	3	0	0	20	20	60	100	3
3	PCC	ET6T003	Computer Networks and Cloud Computing	3	0	0	20	20	60	100	3
4	PEC	ET6E004	Professional Elective Course-II	3	0	0	20	20	60	100	3
5	OEC	ET6O002	OPEN Elective Course-II	4	0	0	20	20	60	100	4
6	PCC	ET6L003	Computer Networks and Cloud Computing Lab	0	0	2	60	0	40	100	1
7	PCC	ET6L005	Electronic Design Engineering Lab	0	0	2	60	0	40	100	1
8	Project	ET6P001	Campus Recruitment Training (CRT)	0	0	2	50	0	0	50	1
9	Project	ET6P002	Skill Development	0	0	2	15	0	35	50	1
10	Project	ET6P003	Mini Project	0	0	2	30	0	20	50	1
11	MC	ET6T007	Research Methodology	2	0	0	10	15	25	50	Audit
			Total	**17**	**0**	**10**	**325**	**115**	**460**	**900**	**20**

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Program: B.Tech Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5T001	Digital Signal Processing	2	1	0	3

Prerequisites for the course	
1	Basic knowledge of mathematical concepts like, Linear algebra, Calculus and multivariable calculus, mathematics on trigonometry, Complex number, Signal and system.

Prior Reading Material /useful links	
1	https://onlinecourses-archive.nptel.ac.in/noc17_ee05/announcements
2	https://nptel.ac.in/courses/117102060
3	https://www.digimat.in/nptel/courses/video/108105055/L01.html

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

Sr. No	Course outcome number	Co statement
1	CO1	Represent discrete-time signals analytically and visualize them in the time domain.
2	CO2	Understand and meet the requirement of theoretical and practical aspects of DSP with regard to sampling and reconstruction.
3	CO3	Apply the concepts of different transforms and analyze the discrete time signals and systems.
4	CO4	Realize the use of LTI filters for filtering different real world signals.
5	CO5	Justify the use of Filter design to estimate the wavelet transform.
6	CO6	Discuss the use of multi rate signal processing to estimate the wavelet transform.

Syllabus:

Course Contents	
Unit I	**DSP Preliminaries** Discrete time signals: Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals, Basic elements of DSP and its requirements, advantages of Digital over Analog signal processing. [5 Hours]
Unit II	**Discrete Fourier Transform** DTFT, Definition, Frequency domain sampling, DFT, Properties of DFT, circular convolution, linear convolution, Computation of linear convolution using circular convolution, FFT, decimation in time and decimation in frequency using Radix-2 FFT algorithm [5 Hours]
Unit III	**Z transforms** Need for transform, relation between Laplace transform and Z transform, between Fourier transform and Z transform, Properties of ROC and properties of Z transform, Relation between pole locations and time domain behaviour, causality and stability considerations forLTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations. [5 Hours]
Unit IV	**IIR Filter Design** Concept of analog filter design (required for digital filter design), Design of IIR filters from analog filters, IIR filter design by impulse invariance method, bilinear transformation method. Characteristics of Butterworth filters, Chebyshev filters, Butterworth filter design, IIR filter realization using direct form, cascade form and parallel form, Low pass, High pass, Bandpass and Bandstop filters design using spectral transformation (Design of all filters using Lowpass filter) [5 Hours]
Unit V	**FIR Filter Design** Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using windows and frequency sampling method. FIR filters realization using direct form, cascade form and lattice form. [5 Hours]
Unit VI	**Introduction to Multirate signal processing** Concept of Multirate DSP, Introduction to Up sampler, Down sampler and two channel filter bank, Sampling rate conversion by rational factor I/D, Application of Multirate signal processing in communication, Music processing, Image processing and Radar signal processing. [5 Hours]
Text Books	
1	J.G. Proakis, D.G. Manolakis "Digital Signal Processing: Principles, algorithms andapplications, Pearson Education.
2	. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH
3	S. salivahanan, A Vallavaraj, C. Gnanapriya , 'Digital Signal Processing', 2nd Edition McGraw Hill
Reference Books	
1	A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.
2	J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992.
3	L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.
4	D.J.DeFatta, J. G. Lucas andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, 1988

5	A. NagoorKani, 'Digital Signal Processing', 2nd Edition McGraw Hill.
Useful links	
1	https://nptel.ac.in/courses/117/102/117102060/
2	https://onlinecourses.nptel.ac.in/noc21_ee20/preview
3	https://www.tutorialspoint.com/digital_signal_processing/index.htm
4	https://lecturenotes.in/notes/15433-note-for-digital-signal-processing-dsp-by-vtu-rangers

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Program: B.Tech Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5T002	Introduction to IOT	3	0	0	3

Prerequisites for the course	
1	Fundamentals of computer networks, Network Security, internet technology.

Prior Reading Material / useful links	
1	https://www.willward1.com/arduino-wifi-tutorial/
2	https://www.makeuseof.com/tag/pi-overdose-heres-5-raspberry-pi-alternatives/
3	https://www.electronicshub.org/arduino-project-ideas

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

Sr.No	Course outcome number	CO statement
1	CO1	Understand general concepts of Internet of Things (IoT).
2	CO2	Recognize various devices, sensors and applications.
3	CO3	Apply design concept to IoT solutions.
4	CO4	Analyze various M2M and IoT architectures.
5	CO5	Evaluate design issues in IoT applications.
6	CO6	Create IoT solutions using sensors, actuators and Devices.

Syllabus:

	Course Contents
Unit I	**Introduction to IoT Components** Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Characteristics. IoT Functional Blocks, Physical design of IoT, Logical design of IoT, Communication models & APIs. **[6Hours]**
Unit II	**M2M to IoT** The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics. Definitions,M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT. **[7Hours]**
Unit III	**M2M vs IoT an Architectural Overview** Building architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. Reference Architecture and Reference Model of IoT. **[7Hours]**
Unit IV	**IoT Reference Architecture** Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world- Introduction, Technical design Constraints. **[6Hours]**
Unit V	**Domain Specific Applications of IoT** Home automation, Industry applications, Surveillance applications, Other IoT application. **[5Hours]**
Unit VI	**Developing IoT Solutions** Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT. **[7Hours]**
	Text Books
1	Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Aves and, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2	Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on Approach)", 1st Edition, VPT, 2014.
	Reference Books
1	Francis da Costa, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
2	CunoPfister, Getting Started with the Internet of Things, O"Reilly Media,2011, ISBN: 978-1-4493- 9357-1
3	
	Useful links
1	https://www.udemy.com/course/internet-of-things-iot-for-beginners-getting-started/
2	https://playground.arduino.cc/Projects/Ideas/
3	https://www.megunolink.com/articles/arduino-garage-door-opener/
4	https://runtimeprojects.com/

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Program: B.Tech Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5T003	Control System Engineering	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of mathematics (Laplace transform), Accuracy, Timeline, Flexibility, stability, Acceptability, Integration, typesof Responses etc.

Prior Reading Material/useful links	
1	https://nptel.ac.in/courses/110104074
2	https://www.youtube.com/watch?v=FXbKYT1G6Xs
3	https://www.youtube.com/watch?v=Wi6xt7IyjA0

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

Sr.No	Course outcome number	CO statement
1	CO1	**Categorize** different types of system and **identify** a set of algebraic equations to represent and model a complicated system into a more simplified form.
2	CO2	**Characterize** any system in Laplace domain to illustrate different specification of the system using transfer function concept.
3	CO3	**Interpret** different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis
4	CO4	**Employ** time domain analysis to **predict** and **diagnose** transient performance parameters of the system for standard input functions.
5	CO5	**Formulate** different types of analysis in frequency domain to explain the nature of stability of the system
6	CO6	**Identify** the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.

Syllabus:

	Course Contents
Unit I	**Introduction to Control Problem**
	Industrial Control examples, Mathematical models of physical systems, Control hardware and their models, Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Feedback, Block diagram reduction techniques, Signal flow graph analysis.
	[7 Hours]
Unit II	**Time Response Analysis**
	Standard test signals, Time response of first and second order systems for standard test inputs. Application of initial and final value theorem, Design specifications for second-order systems based on the time-response
	[7 Hours]
Unit III	**Stability Analysis**
	Concept of Stability, Routh-Hurwitz Criteria, Relative Stability analysis, Root-Locus technique. Construction of Root-loci, Dominant Poles, Application of Root Locus Diagram,
	[7 Hours]
Unit IV	**Frequency-Response Analysis**
	Relationship between time and frequency response, Polar plots, Bode plots.Nyquist stability criterion, Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.
	[7 Hours]
Unit V	**Introduction to Controller Design**
	Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems, Application of Proportional, Integral and Derivative Controllers, Designing of Lag and Lead Compensator using Root Locus and Bode Plot.
	[6 Hours]
Unit VI	**State Variable Analysis**
	Concepts of state variables, State space model. Diagonalization of State Matrix, Solution of state equations, Eigen values and Stability Analysis, Concept of controllability and observability, Pole-placement by state feedback, Discrete-time systems, Difference Equations, State-space models of linear discrete-time systems. Stability of linear discrete time systems.
	[8 Hours]
	Text Books
1	N. J. Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition,2009.
2	Schaum's Outline Series, "Feedback and Control Systems" Tata McGraw-Hill, 2007.
3	John J. D"Azzo& Constantine H. Houpis, "Linear Control System Analysisand Design", Tata McGraw-Hill, Inc., 1995.
4	Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison–Wesley, 1999.
5	R. A. Barapate, "Feedback Control System" Tech Max Publication, 11th revised Edition

	Reference Books
1	Norman S Nise, "Control Systems Engineering", Wiley Publications, 6th Edition.
2	M. Gopal, "Control System – Principles and Design", Tata McGraw Hill,4th Edition, 2012.
3	Benjamin C. Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition,1995.
	Useful links
1	https://youtu.be/Cl23xQrvFhk
2	https://youtu.be/tbAMXgAVPn8
3	https://nptel.ac.in/courses/108106098

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Program: B.Tech Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5E004A	Introduction to Robotics and Computer Programming	3	0	0	3

Prerequisites for the course	
1	Basics of logical thinking and prior knowledge of programming, sensors & actuators, A microcontroller (brain), A study of mechanical design for the mount .

Prior Reading Material/useful links	
1	https://nptel.ac.in/courses/110104074
2	https://www.youtube.com/watch?v=FXbKYT1G6Xs
3	https://www.youtube.com/watch?v=Wi6xt7IyjA0

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

Sr. No	Course outcome number	CO statement
1	CO1	Know the basic components of robots.
2	CO2	Differentiate types of robots and robot grippers.
3	CO3	Explain robot programming methods
4	CO4	Understand the components of robot programming
5	CO5	Design simple program to simulate robot movements
6	CO6	Develop robot program for specific application.

Syllabus:

	Course Contents
Unit I	**Robotics-Introduction** Robotics-Introduction-classification with respect to geometrical configuration (Anatomy), Controlled system & chain type: Serial manipulator & Parallel Manipulator. Components of Industrial robotics-prepossession of movement-resolution, accuracy & repeatability-Dynamic characteristics- speed of motion, load carrying capacity & speed of response-Sensors-Internal sensors: Position sensors,& Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors. Grippers – Mechanical Gripper-Grasping force--mechanisms for actuation, Magnetic gripper vacuum cup gripper-considerations in gripper selection & design. **[6 Hours]**
Unit II	**Industrial Robots Specifications** Selection based on the Application. Kinematics-Manipulators Kinematics, Rotation Matrix, Homogeneous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots. Differential Kinematics for planar serial robots Robot Applications: Material transfer and machine loading/unloading, processing operations assembly and inspection. Concepts of safety in robotics, social factors in use of robots, economics of robots. **[6 Hours]**
Unit III	**Introduction to Robot Programming** Robot programming-Introduction-Types- Flex Pendant- Lead through programming, Coordinate systems of Robot, Robot controller- major components, functions-Wrist Mechanism-Interpolation-Interlock commands Operating mode of robot, Jogging-Types, Robot specifications- Motion commands, end effector and sensors command. **[6 Hours]**
Unit IV	**Rapid Language** RAPID language basic commands- Motion Instructions-Pick and place operation using Industrial robot manual mode, automatic mode, subroutine command based programming. Move master command language- Introduction, syntax, simple problems. **[6 Hours]**
Unit V	**Robotics Based Industrial Automation** Fixed Automation: Automated Flow lines, Methods of Work part Transport, Transfer Mechanism - Continuous transfer, intermittent transfer, Indexing mechanism, Operator-Paced Free Transfer Machine, Buffer Storage, Control Functions, Automation for Machining Operations, Design and Fabrication Considerations. **[6 Hours]**
Unit VI	**Practical Study of Virtual Robot** Robot cycle time analysis-Multiple robot and machine Interference-Process chart-Simple problems-Virtual robotics, Robot studio online software- Introduction, Jogging, components, work planning, program modules, input and output signals-Singularities-Collision detection-Repeatability measurement of robot-Robot economics. **[7 Hours]**

	Text Books
1	N. J. Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2009.
2	Schaum's Outline Series, "Feedback and Control Systems" Tata McGraw-Hill, 2007.
3	John J. D"Azzo& Constantine H. Houpis, "Linear Control System Analysis and Design", Tata McGraw-Hill, Inc., 1995.
4	Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison – Wesley, 1999.

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2	https://youtu.be/tbAMXgAVPn8
3	https://nptel.ac.in/courses/108106098

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Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5E004B	Telecommunication Switching System	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of networks, switching and signaling, circuit switching, message switching and packet switching in telecommunication switching.

Prior Reading Material/useful links	
1	https://www.vssut.ac.in/lecture_notes/lecture1528107908.pdf
2	https://www.iare.ac.in/sites/default/files/IARE_TSTA_LECTURE%20NOTES_0.pdf

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

Sr.No	Course outcome number	CO statement
1	CO1	Know the main concepts of telecommunication network design.
2	CO2	Analyse and evaluate fundamental telecommunication traffic models.
3	CO3	Design basic modern signalling system.
4	CO4	Solve traditional interconnection switching system design problems.
5	CO5	Interpret concept of Network engineering.
6	CO6	Compare and Design telephone network, data network and integrated service digital network related to Cellular Telephone Concepts.

Syllabus:

	Course Contents
Unit I	**Telecommunication Switching Systems** Principles of manual switching system, electronic telephone, local and central battery system, trunk exchange, junction working. Automatic telephony: strowger exchange, line switches and selectors, ringing and tone circuit, subscriber uniselector circuit, trunking diagram, cross bar switching system Message switching, Circuit switching, manual switching and Electronic Switching. Digital switching: Switching functions, space division switching, time division switching, two dimensional switching, digital cross connect systems, digital switching in an analog environment. [7Hrs]
Unit II	**Telecommunication Traffic** Unit of Traffic, Traffic measurement, a mathematical model, Lost- call systems: Theory, traffic performance, loss systems in tandem. Queuing systems: Erlang Distribution, probability of delay, Finite queue capacity, systems with a single server, Queues in tandem, delay tables and application of Delay formulae. Analysis: Traffic Characteristics: Arrival Distributions, Holding time Distribution. Loss Systems: Lost calls cleared, lost calls returning, lost calls Held, lost calls cleared. [6Hrs]
Unit III	**Switching Networks** Single Stage Networks, Grading: Principle, Design of progressive grading, other grading, Traffic capacity of grading, Applications of grading. Link Systems: General, Two stage networks, three stage networks. Grades of service of link systems: General, Two stage networks, three stage networks, Call packing, Rearrangeable networks, Strict sense non blocking networks, Sectionalized switching networks Control of Switching Systems: Call processing Functions: Sequence f operations, Signal exchanges, State transition diagrams. Common Control, Reliability, Availability and security. [6Hrs]
Unit IV	**Network Synchronization and Management** Timing: Timing Recovery, Clock Instability, Elastic Stores, Jitter measurements, systematic jitter. Timing Inaccuracy: Slips, Asynchronous Multiplexing, Waiting time jitter. Network Synchronization: Plesiochronous, pulse stuffing, mutual synchronization, Network master, Master – Slave synchronization, Hierarchical synchronization Processes. Network management: Routing control, Flow control. [5 Hrs]
Unit V	**Networks** Data Networks: Data Transmission in PSTN, Data Communication Architecture, Link to link layers, End to End layers, Satellite based Data networks, LANs, MANs, Fiber optic networks, Data network Standards, Protocol stacks, Interworking. Integrated Services Digital Networks: ISDN, Network and protocol Architecture, Transmission Channels, User network interfaces, signaling, Numbering and Addressing, ISDN Standards, Broadband ISDN, Voice Data Integration. [7Hrs]
Unit VI	**Cellular Telephone Concepts** Mobile telephone services, cellular telephone, Frequency reuse, Interference, Cellular System topology, Roaming and handoffs, Cellular telephone network components, Cellular telephone calls processing. Cellular Telephone systems: Digital cellular telephone. [5Hrs]
	Text Books
1	J. E. Flood, "Telecommunications Switching, Traffic and Networks", Pearson

	Education
2	John C. Bellamy, "Digital Telephony", Third Edition; Wiley Publications
3	Thiagarajan Vishwanathan, "Telecommunication Switching Systems and Networks"; PHI Publications.
4	Wayne Tomasi, "Electronic Communications Systems"; 5th Edition; Pearson Education
Reference Books	
1	P.Gnanasivam, "Telecommunication Switching and Networks "
2	Rappaport, "Wireless communication"
3	Tannenbaum "Data communication and networks" 4th Edition,TMH
Useful links	
1	https://nptel.ac.in/content/storage2/courses/117105076/pdf/1.1%20Lesson%201.pdf
2	https://sites.google.com/a/mvn.edu.in/telecomm-switching-system/products-services
3	https://onlinecourses.nptel.ac.in/noc19_ee52/preview

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Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5L001	Digital signal processing lab	0	0	2	1

Prerequisites for the course	
1	Basic knowledge of MATLAB or SCILAB software.
2	Object Oriented Programming & data Structures

Prior Reading Material/useful links	
1	https://www.analog.com/en/design-center/landing-pages/001/beginners-guide-to-dsp.html
2	https://www.softwaretestinghelp.com/digital-signal-processing-tutorial/

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

Sr.No	Course outcome number	CO statement
1	CO1	Acquire the basic concepts of various digital signals by plotting them.
2	CO2	Analyse and process the signals in the discrete domain.
3	CO3	Apply the techniques, skills, and modern engineering tools like MATLAB and digital processors.
4	CO4	Write and simulate the MATLAB/SCILAB program for various applications.
5	CO5	Design the filters to suit requirements of specific applications.

Syllabus:

Course Contents	
EXPT.1	Introduction to SCILAB. (Spoken tutorial)
EXPT.2	To plot and represent following basic discrete time signals using MATLAB functions. : Unit impulse, unit step, ramp, real and complex exponential and its representations.
EXPT.3	To plot linear convolution of discrete signals using MATLAB functions.
EXPT.4	Write a program to compute cross-correlation and auto-correlation of the given sequences with corresponding plot.
EXPT.5	Write a program to test stability of given discrete- time system.
EXPT.6	To find Z transform of discrete time signal and its ROC with corresponding plot.
EXPT.7	To find inverse Z transform of given discrete time signal.
EXPT.8	Write a program to find frequency response of given system.
EXPT.9	To compute DFT and IDFT of discrete time signals.
EXPT.10	Write a program to find FFT and IFFT of given sequences.
EXPT.11	Compute linear and circular convolution using DFT / IDFT method.
EXPT.12	Designing of Digital IIR filter using MATLAB functions.
EXPT.13	Designing of Digital FIR filter using window.
EXPT.14	Designing of Digital FIR filter using GUI tool box.
EXPT.15	To perform linear convolution and circular convolution on Processor kit.
Text Books	
1	A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.
2	J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, 1992.
3	
Reference Books	
1	J.G. Proakis, D.G. Manolakis "Digital Signal Processing: Principles, algorithms and applications, Pearson Education.
2	. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH
Useful links	
1	http://users.ece.utexas.edu/~bevans/courses/rtdsp/handouts/CourseReaderSpring2014.pdf
2	https://peer.asee.org/teaching-advanced-digital-signal-processing-with-multimedia-applications-in-engineering-technology-programs.pdf
3	https://www.sensear.com/blog/the-value-of-digital-signal-processing

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Session 2024-25

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Program: B.Tech Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5L005	Software workshop lab	0	0	2	1

Prerequisites for the course	
1	Basic knowledge of computer programming and Analog and Digital Electronics.

Prior Reading Material/useful links	
1	https://www.vssut.ac.in/lecture_notes/lecture1528107908.pdf
2	https://www.iare.ac.in/sites/default/files/IARE_TSTA_LECTURE%20NOTES_0.pdf

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

Sr.No	Course outcome number	CO statement
1	CO1	Write MATLAB program for any given problem.
2	CO2	Plot various functions using different graphical techniques.
3	CO3	Make mathematical analysis for the given problem.
4	CO4	Get the complete expert hand on pSpice Software.
5	CO5	Draw, analyse and plot the electronic circuits using pSpice Software.

Syllabus:

	Course Contents
EXPT.1	Introduction to SCILAB Environment
EXPT.2	To study simple matrix and array manipulations using SCILAB
EXPT.3	Programming using SCILAB
EXPT.4	Calculus using SCILAB
EXPT.5	To plot signals: discrete and continuous using SCILAB
EXPT.6	Function programming and SCILAB
EXPT.7	Signal Manipulation using SCILAB
EXPT.8	Design and simulation of resistive circuit
EXPT.9	Plotting of VI characteristics of diode
EXPT.10	Plotting of VI characteristics of BJT/FET
EXPT.11	Plotting of VI characteristics of UJT/SCR
EXPT.12	Design and simulation of half wave & full wave rectifier
EXPT.13	Design and simulation of clipper and clamper circuits
EXPT.14	Simulation of frequency response of a transistorized RC coupled amplifier.
	Text Books
1	Raghuwanshi. B,S, ""Workshop Technology"". Vol. I & II, Dhanpat Rai and Sons, 1998
2	Chaudhary , Hajra "Elements of Workshop Technology", Media Promotors & publishers, 1998
3	Chapman W.A.J and Arnold, E "Workshop Technology" Vol I & III, Viva Low priced student Edition 1998
	Reference Books
1	Perrine Mathieu, Philippe Roux 2016 ISBN: 978-2-8227-0293-5
2	Philippe Roux 2013 ISBN: 978-2822700191
3	Dr. M. Affouf 2012 ISBN: 978-147920344
	Useful links
1	https://mars.uta.edu/mae3183/simulation/introscilab_baudin.pdf
2	https://www.youtube.com/watch?v=UlgN4UHWvmU
3	https://www.techradar.com/best/best-open-source-software

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Program: B.Tech Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5T006	Consumer Affairs	2	0	0	Audit

Prerequisites for the course	
1	Basic knowledge of Marketing Management, products and services: Quality, Quantity, Reliability and Performance.

Prior Reading Material/useful links	
1	www.consumereducation.in
2	www.consumer-voice.in
3	www.cercindia.org

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

Sr.No	Course outcome number	Co statement
1	CO1	Understand the genesis of consumer protection laws in India .
2	CO2	Identify and explain factors which influence consumer behaviour.
3	CO3	Demonstrate how knowledge of consumer behaviour can be applied to marketing.

Syllabus:

	Course Contents
Unit I	**Conceptual Framework** **Consumer and Markets**: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, GST, and Digital consumer issues **Experiencing and Voicing Dissatisfaction**: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000suite **[6Hours]**
Unit II	**The Consumer Protection Law in India** **Objectives and Basic Concepts**: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, and restrictive trade practice. **[6 Hours]**
Unit III	**Grievance Redressal Mechanism under the Indian Consumer Protection Law** Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. **[6 Hours]**
Unit IV	**Role of Industry Regulators in Consumer Protection** Banking: RBI and Banking Ombudsman Insurance: IRDA and Insurance Ombudsman Telecommunication: TRAI Food Products: FSSAI Electricity Supply: Electricity Regulatory Commission Real Estate Regulatory Authority **[6 Hours]**
	Text Books
1	Khanna,SriRam,SavitaHanspal,SheetalKapoor,andH.K.Awasthi.(2007)Consumer Affairs,Universities Press.
2	Choudhary,RamNareshPrasad(2005).ConsumerProtectionLawProvisionsandProcedure,Deep and Deep Publications Pvt Ltd.
3	SureshMisraandSapnaChadah(2012).ConsumerProtectioninIndia:IssuesandConcerns,IIPA,NewDelhi
4	Rajya laxmiRao(2012),Consumers King,Universal Law Publishing Company
5	Empowering Consumerse-book,www.consumeraffairs.nic.in
	Reference Books
1	Misra Suresh, (Aug 2017) "Is the Indian Consumer Protected? One India One People.
2	RamanMittal,SonkarSumitandParineetKaur(2016)RegulatingUnfairTrade Practices: An Analysis of the Past and Present Indian Legislative Models,Journal

	of Consumer Policy.
3	Chakravarthy, S. (2014). MRTP Act metamorphoses into Competition Act. CUTS Institute for Regulation and Competition position paper. Available online atwww.cuts-international.org/doc01.doc.
Useful links	
1	www.ncdrc.nic.in
2	www.consumeraffairs.nic.in
3	www.iso.org
4	www.bis.org.in

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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name ofthecourse	L	T	P	Credits
VI	ET6T001	Education, Technology and Society	2	0	0	2

Prerequisites for the course	
1	Basic knowledge of educational organizations, quality systems, their processes, products, and services. standard, existing approaches, methodology andits advantages. reference model etc.

Prior Reading Material/usefullinks	
1	https://www.j-ets.net/
2	https://en.wikipedia.org/wiki/Educational_Technology_%26_Society

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Integrate their technical education for betterment of society as well motivates them to lead a good
2	CO2	Plan, design, and assess effective learning environments and experiences
3	CO3	Develop technology-enabled assessment and evaluation strategies
4	CO4	Compare and contrast social, ethical, and legal issues surrounding technology
5	CO5	Compare and contrast social, ethical, and legal issues surrounding technology

Syllabus:

Course Contents	
Unit I	**Necessity of Education** Necessity of education for human life, Impact of education on society **[5Hours]**
Unit II	**Nature and Scope of Education** Nature and scope of education(Gurukul to ICT driven),Emotional intelligence Domains of learning,Approaches to learning,Learning outcomes. **[5Hours]**
Unit III	**Role of Education in Technology** Role of education in technology advancement. **[5Hours]**
Unit IV	**Technology and Society** Technology and society; management of technology; technology transfer **[5Hours]**
Unit V	**Ethical and Value Implications** Ethical and value implications of education and technology on individual and society **[6Hours]**
Text Books	
1	Education and Social order by Bertrand Russel
2	Theories of learning by Bower and Hilgard
Reference Books	
1	Technology and Society by Jan L Harrington
Useful links	
1	https://www.j-ets.net/
2	https://en.wikipedia.org/wiki/Educational_Technology_%26_Society

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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6T002	Antennas and Wave Propagation	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of Analog Communication Systems, Network Analysis, Electromagnetic Engineering.

Prior Reading Material/useful links	
1	https://nptel.ac.in/courses/108/101/108101092/
2	https://nptel.ac.in/courses/117/107/117107035/

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Formulate the wave equation and solve it for uniform plane wave.
2	CO2	Describe transmission line characteristics
3	CO3	Analyze and design antenna arrays.
4	CO4	Analyze the given wire antenna and its radiation characteristics
5	CO5	Describe the operation of aperture and reflector antennas.
6	CO6	Identify the suitable antenna for a given communication system.

Syllabus:

Course Contents	
Unit I	**UniformPlaneWaves** Maxwell Equations in phasor form, Wave Equation, Uniform Plane wave in Homogeneous, free space, dielectric, conducting medium. Polarization: Linear, circular & Elliptical polarization, unpolarised wave. Reflection of plane waves, Normal incidence, oblique incidence, Electromagnetic Power and Poynting theoremandvector. **[6Hours]**
Unit II	**Transmission Lines** Transmission line equations and their solution, Transmission line parameters, Characteristics impedance, Propagation constant, Attenuation constant and Phase constant, waveform distortion, Distortionless transmission lines, Loading of transmission lines, Reflection coefficient and VSWR, Equivalent circuits of transmission lines, Transmission lines at radio frequency, Open and short circuited lines, Smith chart,Stubmatching. **[6Hours]**
Unit III	**Wave Propagation & Antenna Fundamentals** Fundamental equations for free space propagation, Friis Transmission equation, Ground, sky & space wave propagations, Structure of atmosphere, Characteristics of ionized regions, Space link geometry, Characteristics of Wireless Channel: Fading, Multipath delay spread, Coherence Bandwidth, and CoherenceTime. Introduction, Types of Antenna, Radiation Mechanism, Antenna Terminology: Radiation pattern, radiation power density, radiation intensity, directivity, gain, antenna efficiency, half power beam width, bandwidth, antenna polarization, input impedance, antenna radiation, efficiency, effective length, effective area, reciprocity. **[8Hours]**
Unit IV	**Wire Antennas** Analysis of Linear and Loop antennas: Infinitesimal dipole, Small dipole and Finite length dipole, Half wave length dipole, Small circular loop antenna. Complete Analytical treatment of alltheseelements. **[4Hours]**
Unit V	**Antenna Arrays** Antenna Arrays: Two element array, Pattern multiplication N-element linear array, Uniform amplitude and spacing, Broad side and End-fire array, N-element array: Uniform spacing, Non-uniform amplitude, Array factor, Binomial and DolphTchebyshev array, Planar Array, Circular Array, Log Periodic Antenna, Yagi UdaAntennaArray. **[6Hours]**
Unit VI	**Antennas and Applications** Structural details, dimensions, radiation pattern, specifications, features and applications of following Antennas: Hertz & Marconi antennas, V- Antenna, Rhombic antenna. TW antennas. Loop antenna, Whip antenna, Biconical, Helical, Horn, Slot, Microstrip, Turnstile, Super turnstile & Lens antennas. Antennas with parabolic reflectors, Apertureantenna. **[6Hours]**
Text Books	
1	C. A. Balanis, "Antenna Theory - Analysis and Design", John Wiley.
2	K. D. Prasad, "Antenna & Wave Propagation", Satya Prakashan, New Delhi.
3	MathewNOSadiku,"ElementsofElectromagnetics"3rdedition,Oxford University Press.
4	John D Kraus, Ronald J Marhefka, Ahmad S Khan, Antennas for All Applications, 3rd Edition, the McGraw Hill Companies
5	John D Kraus, "Antenna& Wave Propagation", 4th Edition, McGraw Hill, 2010.
6	Vijay K Garg, Wireless Communications and Networking, Morgan Kaufmann Publishers, An Imprint of Elsevier, 2008.

	Reference Books
1	Antenna & Wave Propagation , Sisir K Das, Mc Graw Hill.
2	Harish A. R., Antenna and wave Propagation, Oxford University Press.
3	Antennas and Radio Propagation, R.E. Collins, Mc Graw –Hill.
	Useful links
1	https://nptel.ac.in/courses/108/101/108101092/
2	https://nptel.ac.in/courses/117/107/117107035/

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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6T003	Computer Networks and Cloud Computing	3	0	0	3

	Prerequisites for the course
1	Basic knowledge of Programming Skills, Familiarity with Databases, Basics of Security and Privacy , Knowledge of Agile Development , Familiarity with Operating Systems, Understanding of Virtualization, Basics of Networking, Basic Understanding of Different Types of Cloud

	Prior ReadingMaterial/usefullinks
1	https://onlinecourses.swayam2.ac.in/cec21_cs04/course
2	https://onlinecourses.nptel.ac.in/noc21_cs14

Course Outcomes:

Sr. No	Course outcome number	CO statement
1	CO1	**Know** the terminology and concepts of the OSI reference model and the TCP-IP reference model.
2	CO2	**Analyze** the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks and Remember the wireless networking concepts
3	CO3	**Understand** the contemporary issues in networking technologies and Apply network tools and network programming
4	CO4	**Analyze** a given requirement of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) and design it based on the market available component

5	CO5	**Apply** the network programming for a given problem related TCP/IP protocol.
6	CO6	**Create** DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Syllabus:

Course Contents	
Unit I	**Physical Layer** Data Communications, Networks, Network types, Protocol layering, OSI model, Layers in OSI model, TCP / IP protocol suite, Addressing, Guided and Unguided Transmission media. Switching: Circuit switched networks, Packet Switching, Structure ofa switch. **[5Hours]**
Unit II	**Data Link Layer** Introduction to Data Link Layer, DLC Services, DLL protocols, HDLC, PPP, MediaAccessControl:RandomAccess,ControlledAccess,Channelization. Wired LAN: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Giagabit Ethernet, 10GigabitEthernet. **[5Hours]**
Unit III	**Wireless LANS & Virtual Circuit Networks** Introduction, Wireless LANS: IEEE 802.11 project, Bluetooth, Zigbee, Connecting devices and Virtual LANS: Connecting devices, VirtualLANS. **[5Hours]**
Unit IV	**Network Layer** Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols. **[5Hours]**
Unit V	**Transport Layer** Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm. **[5Hours]**
Unit VI	**Application Layer** Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography,InternetProtocols. **[5Hours]**
Text Books	
1	Data Communication and Networking, 5th Edition, Behrouz A.Forouzan, McGraw-Hill.
2	TCP/IP Protocol Suite, 4th Edition, Behrouz A. Forouzan, Tata McGraw-Hill.
3	Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
Reference Books	
1	Data and Computer Communication, 8th Edition, William Stallings,Pearson Prentice Hall India.
2	Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall ofIndia.
3	TCP/IPIllustrated,Volume1,W.RichardStevens,Addison-Wesley,United States of America.
4	CloudComputing:PrinciplesandParadigms,Editors:RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wiley,2011
Useful links	
1	https://onlinecourses.swayam2.ac.in/cec21_cs04/course
2	https://onlinecourses.nptel.ac.in/noc21_cs14

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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6E004A	Professional Elective Course-II Embedded Processor & it's Interfacing with RTOS	3	0	0	3

Prerequisites for the course	
1	Basics of Digital Electronics, Basics of Analog Electronics, Good C Programming skills, Understanding of at least one Micro-controller or Micro-processor, Linux OS.

Prior Reading Material/useful links	
1	https://nptel.ac.in/courses/108/103/108103157/

Course Outcomes:

Sr. No	Course outcome number	CO statement
1	CO1	DefineandClassifyEmbeddedSystemandunderstandroleofeach element of embedded system. State special requirements and constraints (such as sustainability, reliability) that are imposed on embeddedsystems.
2	CO2	Design example for interfacing Keys, LED/LCD Displays, ADC and DAC.
3	CO3	Conversant with Assembly and C language programming for 8051.Formulate and Develop efficient assembly/C code forembedded system
4	CO4	Describe ARM processor, its modes, exception handling, instruction pipelining and basic programming.
5	CO5	Understand concepts of RTOS and its functionalities. Model system tasks using specification techniques such as FSM, State chart, UML
6	CO6	Build a typical cost-effective real-world embedded system in team with appropriate hardware components and software algorithms.

Syllabus:

Course Contents	
Unit I	**Introduction to 8-Bit Microcontroller** 8051 Architecture, I/O Pins, Ports, External Memory, Counters & Timers, Serial Data Input/Output, Interrupts Moving Data, Logical Operations, Arithmetic Operations, Jump And Call Instructions, Embedded "C" PIC, AVR Microcontroller Architecture OverviewWithApplications. **[6Hours]**
Unit II	**Applications of 8051** 8051 Microcontroller Design, Applications Like Keys, Switched And LED/LCD Displays, Pulse Measurement, ADC And DAC, Serial Data Communication, CAN, I2C And SPI SerialBusProtocols. **[6 Hours]**
Unit III	**Real Time Operating Systems** Hard and Soft Real Time Systems, Introduction To RTOS, Process And Thread, System Call, Process Scheduling And Scheduling Algorithms, Resource Access Control, Deadlock And Its Prevention RTOS CaseStudy: RT-Linux And Win-CE, DeviceDriverProgramming. **[6Hours]**
Unit IV	**RTOS Porting on ARM Board** ARM processor architecture and programming ARM Processor Architecture, Pipeline Characteristics, ARM Addressing Modes, ARM Instruction Set, Programming Techniques, Exception Modes and Handling, Thumb Instructions, CortexArchitectureOverview. **[6Hours]**
Unit V	**ARM Processor Architecture and Programming** **A**RM Processor Architecture, Pipeline Characteristics, ARM Addressing Modes, ARM Instruction Set, Programming Techniques, Exception Modes and Handling, Thumb Instructions, Cortex Architecture Overview**. [6Hours]**
Unit VI	**Embedded Software Design Techniques** Embedded Software Requirements, Software Modelling With FSM, State Charts And Petri- Nets, Examples Of Software Modelling, Various Data Structure (FIFO, LIFO AndStack)Handling. **[6 Hours]**
Text Books	
1	Kenneth J. Ayala and Dhananjay V. Gadre, "The 8051 Microcontroller& Embedded System Using Assembly And C", Cenage Learning, India Edition, 2nd impression,2010.
2	Mazidi A. M., Mazidi J. G. and McKinley R. D., "The 8051 MicrocontrolierAnd Embedded Systems-Using Assembly And C", Pearson Education, 2nd Ed.,2008.
3	Raj Kemal, "Embedded Systems: Architecture, Programming andDesign", Tata McGraw-Hill Publications, 2nd Ed., 2008
4	SlossA.N.,SymesD.andWrightC.,"ARMSystemDeveloper'sGuide", Morgan Kaufmann Publishers, 1st Ed., 3rd Reprint, 2006.
Reference Books	
1	JonathanW.Valvano,"EmbeddedMicrocomputerSystems:RealTime Interfacing"; Thomson Learning, INDIA Edition, 2nd Reprint, 2007
2	AlexDobollandEdwardH.Currie,"IntroductionToMixed-Signal Embedded Design"; Springer, 131 Ed., 2007.
3	Shibu K. V., "Introduction To Embedded System"; TMH, 1st Ed., 2009.
Useful links	
1	https://www.coursera.org/lecture/embedded-software-hardware/4-interacting-with-memory-hUTQp
2	https://nptel.ac.in/courses/117/106/117106111/
3	https://nptel.ac.in/courses/108/103/108103157/

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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6E004B	Professional Elective Course-II AI: Knowledge Representation& Reasoning	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of Data Structures, Mathematics, Some exposure toformal languages, logic and programming.

Prior Reading Material/useful links	
1	https://www.journals.elsevier.com/artificial-intelligence/
2	https://www.technologyreview.com/2015/02/11/169210/our-fear-of-artificial-intelligence/
3	https://www.courses.com/

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Understand the basic principles of Artificial Intelligence and challenges involved in designing intelligent systems by exploring human intelligence nature and its role in problem solving.
2	CO2	Representgivenproblemusingstatespacerepresentationandapply informed and uninformed search techniques on it.
3	CO3	Analyze the issues in the design of search programs andapply appropriate search algorithms.
4	CO4	Apply knowledge representation techniques and problem solving strategies to common AI applications.
5	CO5	Use Prolog Programming language using Predicate Logic.
6	CO6	Design Knowledge Based Systems.

Syllabus:

Course Contents	
Unit I	**Introduction** What is AI? : The AI Problems, The Underlying Assumption, What Is An AI Techniques,TheLevelOfTheModel,CriteriaForSuccess,SomeGeneral References, OneFinalWord. **[3Hours]**
Unit II	**Search Techniques** Problems, State Space Search & Heuristic Search Techniques, Defining The Problems As A State Space Search, Production Systems, Production Characteristics, Production System Characteristics, And Issues In The Design Of Search Programs, Additional Problems. Generate-And-Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-EndsAnalysis. **[3Hours]**
Unit III	**Expending Predicate Logic** Representation Simple Facts in Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution. **[5 Hours]**
Unit IV	**Representing Knowledge Using Rules** Procedural versus Declarative Knowledge, Logic Programming, Forward VersusBackwardReasoning. **[5Hours]**
Unit V	**Game Playing** Overview, And Example Domain : Overview, MiniMax, Alpha-Beta Cut-off, Refinements, Iterative deepening, The Blocks World, Components Of A Planning System, Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning, Reactive Systems, Other Planning Techniques. **[5Hours]**
Unit VI	**Introduction to Prolog** Syntax and Numeric Function, Basic List Manipulation Functions In Prolog, Functions, Predicates and Conditional, Input, Output and Local Variables, Iteration and Recursion, Property Lists and Arrays, Miscellaneous Topics, LISP and Other AIProgrammingLanguages. **[5Hours]**
Text Books	
1	Artificial Intelligence – A Modern Approach (3rd Edition)By – StuartRussell and Peter Norvig
2	ArtificialIntelligenceEngines:ATutorialIntroductiontotheMathematicsof Deep Learning By – James V Stone
3	Artificial Intelligence By Example By – Denis Rothman
4	Artificial Intelligence and Machine Learning By – Chandra S.S.V
Reference Books	
1	"Artificial Intelligence" -By Elaine Rich And Kevin Knight (2ndEdition) Tata Mcgraw-Hill
2	Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig, PHI
3	Introduction to Prolog Programming By Carl Townsend.
4	"PROLOG Programming For Artificial Intelligence" -By IvanBratko(Addison-Wesley)
5	"Programming with PROLOG" –By Klocksin and Mellish
Useful links	
1	https://www.journals.elsevier.com/artificial-intelligence/
2	https://www.technologyreview.com/2015/02/11/169210/our-fear-of-artificial-intelligence/
3	https://www.coursera.org/
4	https://www.courses.com/

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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6L003	Computer Networks and Cloud Computing Lab	0	0	2	1

	Prerequisites for the course
1	Basic knowledge of Semiconductor Physics and theoretical knowledge about the Familiarity with Databases, Basics of Security and Privacy, Familiarity with Operating Systems practical's.

	Prior Reading Material/useful links
1	https://sjce.ac.in/wp-content/uploads/2018/01/CCNA-lab-Manual.pdf
2	https://www.ibm.com/topics/networking

Course Outcomes:

Sr. No	Course outcome number	CO statement
1	CO1	**Know** the terminology and concepts of Networking.
2	CO2	**Analyze** the concepts of network interfaces and design/performance issues in local area networks and wide area networks.
3	CO3	**Understand** the contemporary issues in networking technologies andApply network tools.
4	CO4	**Analyze** a given requirement of wide-area networks (WANs), local area networks(LANs)andWirelessLANs(WLANs)anddesignitbasedonthe market available component
5	CO5	**Apply** the network programming for a given problem related TCP/IP protocol.
6	CO6	**Create** DNS, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Firewalls using open source available software andtools.

Syllabus:

	List of Experiment
Expt.1	To study network hardware components – Cables, NIC, Repeaters,Hubs, Bridges, Switches, Routers and Gateway.
Expt.2	To practice the color code for different cables and Observe the Lan Tester.
Expt.3	To demonstrate data transmission using Ping protocol, tracert, IP configuration
Expt.4	To understand IP Address of the system and configure dhcp server.
Expt.5	To construct Peer to Peer Topology.
Expt.6	To connect the computers in Local Area Network using Star Topology
Expt.7	To give IP Address of different classes in given Network id
Expt.8	To give IP Address of different classes in given Network id and Subnet (IPv4 Subnetting)
Expt.9	To share a folder from a computer and access the shared folder from another computer (Windows File Sharing)
Expt.10	To understand the domain name server (DNS Server).
Expt.11	To implement FTP protocol.
Expt.12	To implement HTTP protocol

	Text Books
1	A Top-Down Approach: Computer Networking, *James F Kurose and Keith W Ross*
2	Andrew Tanenbaum, "Computer Networks" 4th /5th Edition ,Prentice Hall Publications

	Reference Books
1	JamesF.Kuross,KeithW.Ross,"ComputerNetworking,ATop-DownApproach FeaturingtheInternet",3rdEdition,AddisonWesley,2004
2	Nader F. Mir, "Computer and Communication Networks", Pearson Education, 2007
3	Comer, "Computer Networks and Internets with Internet Applications", 4th Edition, Pearson Education, 2003
4	WilliamStallings,"DataandComputerCommunication",6thEdition,Pearson, Education,2000

	Useful links
1	https://minerva.nitc.ac.in/?q=cloud-computing-lab
2	https://www.rmkcet.ac.in/cse-cloud-computing-lab.php

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Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6L005	Electronic Design Engineering Lab	0	0	2	1

Prerequisites for the course	
1	Basic knowledge of electronics components identification, testing,Trouble shooting etc.

Prior Reading Material/useful links	
1	https://ycetnnl.yaduvanshigroup.edu.in/Lab-Manual-ECE.aspx
2	https://ldce.ac.in/laboratories

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Use DSO and Spectrum Analyzer.
2	CO2	Interface peripherals with computer
3	CO3	Design PCB using PCB designing software
4	CO4	Design & fabricate mini project.

Syllabus:

	List of Experiment
Expt.1	Study of Functioning of Spectrum Analyzer and Digital Storage oscilloscope
Expt.2	Study of different Electronic components
Expt.3	Printed Circuit Boards (PCB) Types, Layout procedure, artwork, Fabrication (In this, fabrications of small circuit Using discrete component on single side PCB isexpected).
Expt.4	Interfacing of displays (LCD, LED, 7 Segment) with PCs
Expt.5	Hardware Mini Project • Hardware Mini project should consist of Circuitdesign, PCB fabrication, assembling & testing of small digital or analog applicationcircuit. • Mini Project work should be carried out by group ofmaximum threestudents. • Student should use standard software available for drawingcircuit schematic, simulating the designand PCB (single/double sided) layout of circuit. • Project report should consist of details of work carried out including layouts, circuits, datasheets, list of components,cost.

	Text Books
1	https://www.allaboutcircuits.com/textbook/
2	https://www.phindia.com/Books/BookDetail/9788120351424/electronics-lab-manual-navas

	Reference Books
1	Electronic Instruments and Instrumentation Technology
2	A course in Electrical and Electronics Measurements and Instrumentation-A.K. Sawhney - Dhanpat Rai & Co.
3	Electronic Components and Materials - Dr. Madhuri A. Joshi - Shroff Publications Third Edition
4	Electrical and Electronic Measurements –Banerjee,PHI
5	Introduction to Measurements and Instrumentation, 4th edition- Ghosh PHI
6	Electronic Instrumentation and Measurement Techniques, W.D.Copper,PHI Web Resources: Refer online datasheets
7	PrintedCircuitBoards:DesignandTechnology;Bosshart;TataMcGraw-Hill Education.
8	Integrated circuit fabrication technology; David J. Elliott; McGraw-Hill.

	Useful links
1	https://www.vlab.co.in/broad-area-electronics-and-communications
2	https://newhorizoncollegeofengineering.in/digital-electronic-circuits-lab/

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Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6P001	Campus Recruitment Training	0	0	2	1

	Prerequisites for the course
1	Basics ofknowledge of recruitment pattern of companiesthrough on campus placementprocesses,offcampusplacementprocesses,nationallevelrecruitment processes.

	Prior Reading Material/useful links
1	https://neat.aicte-india.org/course-details/NEAT2020593_PROD_2
2	https://www.campusrecruitment.co.in/CampusRecruitmentBook.pdf
3	https://www.ibtindia.com/campus-recruitment-test-crts

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	SolvetheproblemseasilybyusingShort-cutmethodwithtime management which will be helpful to them to clear the competitive exams for better job opportunity.
2	CO2	Analyze the Problems logically and approach the problems in a different manner.
3	CO3	Apply mathematical analysis of data to make connections, draw conclusions and solve problems.
4	CO4	Learnaseriesoftechniquesthroughpracticalactivitiestodeveloppresenting skills and enhance confidence to expand the potential of the individual.
5	CO5	Students can produce a resume that describes their education, skills, experiencesandmeasurableachievementswithpropergrammar,format and brevity.
6	CO6	Ability to target the resume to the presenting purpose andDemonstrate professional behaviour(s) including preparedness, professional attire, and respectful presentation during interviews

Syllabus:

Course Contents	
Unit I	**Part I: - Quantitative Ability**
	Module 1
	Speed Math's Calculation, Number Systems, Ratio & Proportion, Percentage **[03 Hours]**
	Module 2
	Profit – Loss & Discount, Simple Interest & Compound Interest, Simple EquationandAge's **[03Hours]**
	Module 3
	Averages Mixture & Allegation, Time and work, Time Speed & Distance, Permutation–Combination&Probability. **[03Hours]**
Unit II	**Part II: - Reasoning Ability**
	Module 1
	Coding Decoding, Blood Relation, Direction sense, Number Series, Analogy **[03 Hours]**
	Module2
	SittingArrangementPuzzles. **[03 Hours]**
	Module 3
	Syllogism,Statementcourseofaction,Statementarguments,Statement Assumptions, Miscellaneous TypeofReasoning **[03Hours]**
Unit III	**Part III: - Employability Skills**
	Module 1 PresentationSkills What is a presentation? Essential characteristics of Goodpresentation.
	Preparation of presentation: Identify the purpose, Analyze the audience, Design and organize the information, Medium of presentation and Visual aids
	Delivering Presentation: rehearsal, body Language, Handling questions, Tips tofight. **[2Hours]**
	Module 2 Job Interview Skills
	Types of interviews Focus of interview, dress code, importance of body language. Probable interview questions, Telephonic and video interview, Strategies for successatinterview. **[2 Hours]**
	Module 3ResumeBuilding
	Meaning, Difference among Bio-data, Curriculum vitae and Resume.
	CV writing tips, the content of Resume, Structure of Resume **[2 Hours]**
Text Books	
1	Prashant Sharma, Soft Skills Personality Development For Life Success. BPB Publication.
2	P. D. Chaturvedi & Mukesh Chaturvedi, Business Communication:Concepts, Cases, and Applications 2nd Edition. Pearson Education.
3	Barun Mitra, Personality Development and Soft Skills. OxfordUniversity Press.
4	Dr.K.Alex, *Soft Skills Know yourself and Know the World*.S.Chand Publishing, 2014
5	R.S Agrawal, Quantitative Aptitude.
6	Arun Sharma, How to Prepare for Quantitative Aptitude.
7	R. S Agrawal, Verbal and Non Verbal Reasoning.
8	R.V.Praveen,Quantitative Aptitude and Reasoning, 2nd Revised Edition2013, Prentice-Hall of India Pvt.Ltd
9	G.K.Ranganath,C.S.SampangiramandY.Rajaram,AtextBookof business Mathematics, 2008, Himalaya Publishing House
Useful links	
1	https://www.time4education.com/CRT/Online-Courses
2	https://globaledu.net.in/campus-recruitment-training

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Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6P003	Mini Project	0	0	2	1

Prerequisites for the course	
1	Basic knowledge of solving the problem in group and to inculcate the process of self-learning and research.

Prior Reading Material/useful links	
1	https://www.aft.org/education/igniting-fire/project-ideas-reading

Course Outcomes:

Sr.No	Course outcome umber	CO statement
1	CO1	Identify problems based on societal /research needs.
2	CO2	Demonstrate capabilities of self-learning in a group, which leadsto lifelong learning.
3	CO3	Demonstrate project management principles during project work.
4	CO4	Apply Knowledge and skill to solve societal problems in a group.
5	CO5	Analyzetheimpactofsolutionsinsocietalandenvironmentalcontext for sustainable development.
6	CO6	Excel in written and oral communication.
7	CO7	Draw the proper inferences from available results through theoretical/ experimental/simulations.

Guidelines for Mini Project:

	Course Contents
1	Students should form groups with minimum 2(two) and not more than4 (four), as it is a group activity.
2	Students should do survey and identify needs, which shall be converted into problem statement for major project in consultation with faculty supervisor/head of department/internal committee of faculties.
3	Student shall submit implementation plan which will cover weekly activity of major project.
4	Alogbooktobepreparedbyeachgroup,whereingroupcanrecordweekly work progress, guide/supervisor can verify and record notes/comments.
5	Faculty supervisor may give inputs to students during major project activity; however, focus shall be on self-learning.
6	Students in a group shall understand problem effectively, propose multiple solution and select best possible solution in consultation with guide/ supervisor.
7	Studentsshallconvertthebestsolutionintoworkingmodelusingvarious components of their domain areas and demonstrate.
8	The solution to be validated with proper justification and report to be compiled in standardformat
	Text Books
1	MiniandMajorElectronicsProjectsforEngineeringStudents(English, Paperback, Khan S.A.)
	Useful links
1	https://www.aft.org/education/igniting-fire/project-ideas-reading
2	https://www.stumagz.com/in/5-websites-that-can-help-you-through-your-mini-projects/

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Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6T006	Research Methodology	2	0	0	Audit

Prerequisites for the course	
1	Basic knowledge of conceptual and methodological issues that go into successful conduction of research.

Prior Reading Material/usefullinks	
1	https://nptel.ac.in/courses/121/106/121106007/

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Student will learn the meaning, objective, motivation and type of research
2	CO2	Student will be able to formulate their research work with the help of literature review
3	CO3	Student will be able to develop an understanding of various research design and techniques
4	CO4	Student will have overview knowledge of modeling and simulation of research work
5	CO5	Student will be able to collect the statistical data with different methods related to research work
6	CO6	Student will be able to write their own research work with ethics and non-plagiarized way

Syllabus:

	Course Contents
Unit I	**Objectives and Types of Research**
	Motivation and objectives, research methods vs methodology. Types of research – descriptive vs analytical, applied vs fundamental, quantitative vs qualitative, conceptual vs empirical. Introduction to drug discovery & development research, objectives, flowchart from discovery to post-marketing research, overview of research methodology in various areas of drug discovery and developmentresearch. **[5Hours]**
Unit II	**Research Formulation**
	Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, Literature review - primary and secondary sources, reviews, monographs, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature review and research databases, development ofworkinghypothesis. **[5Hours]**
Unit III	**Research Design and Methods**
	Research design – basic principles, need of research design, features of good design, important concepts relating to research design, observation and facts, laws and theories, Prediction and explanation, research databases, development of models, developing a research plan – exploration, description, diagnosis, and experimentation. **[5Hours]**
Unit IV	**Execution of the Research, Data Collection and Analysis**
	Aspects of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statistical packages (Sigma STAT, SPSS for Student t-test, ANOVA, etc), hypothesis testing, generalization andinterpretation. **[5 Hours]**
Unit V	**Reporting and Thesis Writing**
	Structure and components of scientific reports, types of report, technical reports and thesis. Thesis writing – different steps and software tools (Word processing, etc) in the design and preparation of thesis, layout, structure (chapter plan) and language of typical reports, Illustrations and tables, bibliography, referencing and footnotes. Oral presentation – planning, software tools, creating and making effective presentation, use of visual aids, importance of effective communication. **[5Hours]**
Unit VI	**Research Ethics, IPR and Scholarly Publishing**
	Ethics – ethical issues, ethical committees (human & animal); IPR - intellectual property rights and patent law, commercialization, copy right, royalty, trade relatedaspectsofintellectualpropertyrights(TRIPS);Scholarlypublishing– IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibilityand accountability. **[5Hours]**
	Text Books
1	Kothari, C.R. Research Methodology (Methods and Techniques), NewAge Publisher.
2	Best and Kahn, Research Methodology, PHI Limited.
3	Fundamentals of modern statistical methods by Rand R.wilcox.
	Reference Books
1	Kerlinger, Foundation of Research.
2	Power Analysis for Experimental research A Practical Guide for the Biological, Medical and social Sciences by R. Barker Bausell, Yi-Fang LiCambridge University Press.
3	Design of Experience: Statistical Principles of Research Design and Analysis,by Robert O. Kuehl Brooks/cole.
4	Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, EssEss

	Publications. 2 volumes.
5	Garg,B.L.,Karadia,R.,Agarwal,F.andAgarwal,U.K.,2002.Anintroduction to Research Methodology, RBSA Publishers
Useful links	
1	https://nptel.ac.in/courses/121/106/121106007/
2	https://onlinecourses.swayam2.ac.in/cec20_hs17/preview
3	https://www.youtube.com/watch?v=QddNp6nYEqU

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Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6O002	**OPEN ElectiveCourse-II** Introduction toMicroprocessor, Microcontroller &Robotics	4	0	0	4

	Prerequisites for the course
1	Basic knowledge of digital circuits and digital System design ,computer& other electronic devices.

	Prior Reading Material/useful links
1	https://www.udemy.com/course/microprocessors-and-microcontrollers/
2	https://onlinecourses.nptel.ac.in/noc23_ee47/preview

Course Outcomes:

Sr.No	Course outcome umber	CO statement
1	CO1	Select a microprocessor or microcontroller suitable to the application.
2	CO2	Architect a microprocessor or microcontroller system and estimate the required hardware and software resources.
3	CO3	Perform the detailed hardware design of a microprocessoror microcontroller system.
4	CO4	Program the microprocessor or microcontroller using suitable techniques including use of allocation schemes and device drivers.
5	CO5	Program the microprocessor or microcontroller using suitable techniques including use of allocation schemes and devicedrivers.
6	CO6	Explain the fundamentals of robotics and its components

Syllabus:

	Course Contents
Unit I	**Introduction to Basic Microprocessor** General definition of mini computers, microprocessor and microcontroller, Introduction to 8085 microprocessor, architecture-functional block diagram, introduction to 8086 microprocessor architecture-functional diagram. Introduction to addressing modes and Interrupts of 8085 microprocessor. **[8 Hours]**
Unit II	**Introduction to Basic Instructions and Assembly Language Programming of 8085:** Instructionformats,instructionset,datatransferinstructions,arithmetic and logical instructions, Timing and control instructions. Basic assembly languageprograms **[8 Hours]**
Unit III	**Applications of Microprocessor** 8255 PPI various modes of operation and interfacing to 8086. Interfacing keyboard, display, stepper motor interfacing, D/A and A/D converter, Memory interfacingto8086,Interruptstructureof8086,Vectorinterrupttable,Interrupt service routine, Interfacing Interrupt Controller 8259, DMA Controller 8257 to 8086,Serial datatransferschemes. **[8Hours]**
Unit IV	**Introduction to Basic Microcontroller** Introduction to basic microcontroller,8051architecture-functional block diagram,I/O pins,ports and circuits,Addressing modes and Interrupts **[7 Hours]**
Unit V	**Microcontroller Programming and Applications** 8051 instruction set, Assembly language programming, I/O port programming, Timer andcounter programming, 8051 interfacing: 7 segment LED, LCD, Stepper Motors,andKeyboard. **[8Hours]**
Unit VI	**Introduction to Robotics** Introduction to robotics, classification of robots, workspace analysis, Manipulator Kinematics: Convention for affixing frames to links – DH Representation, Derivation of Direct kinematic equations for various types of robots. Inverse Manipulator Kinematics: Solvability, algebraic vs. geometric, Pipers solution when three axes intersect, Examples of inverse manipulator kinematics, repeatabilityandaccuracy. **[8Hours]**
	Text Books
1	Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 4th Edition, Penram International Publishing, New Delhi, 2000. (Module I, II).
2	John Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Pearson Education, 2002.
3	Mohammed Ali Mazidi and Janice GillispieMazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi, 2003. (ModuleIV, V)
4	Introduction to Robotics Mechanics and Control, John J. Craig, Third Edition, Pearson EducationInternational
	Reference Books
1	A. K. Ray and K. M. Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition,2000.
2	Kenneth J Ayala, The 8051 Microcontroller Architecture Programmingand Application, 2nd edition, Penram International Publishers (India), New Delhi, 1996.
3	M. Rafi Quazzaman, Microprocessors Theory and Applications: Inteland Motorola prentice Hall of India, Pvt. Ltd., New Delhi, 2003.
4	Introduction to Robotics: Analysis, Control, Applications, 2nd Edition, SaeedB.

	Niku.
Useful links
1	https://www.vssut.ac.in/lecture_notes/lecture1423813120.pdf
2	https://www.techtarget.com/iotagenda/definition/microcontroller
3	https://www.guru99.com/difference-between-microprocessor-and-microcontroller.html

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Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6O002B	OPEN Elective Course-II Broadband Communication	4	0	0	4

Prerequisites for the course	
1	Basic knowledge of wired and wireless communication, Types of networks, multimedia communication, satellite stations, mobile communication for electronic devices.

Prior Reading Material/useful links	
1	https://www.igi-global.com/book/resource-allocation-next-generation-broadband/171019
2	https://www.routledge.com/Introduction-to-Broadband-Communication-Systems/Akujuobi-Sadiku/p/book/9781420061499
3	https://link.springer.com/book/10.1007/978-3-030-02613-4

Course Outcomes:

Sr.No	Course Outcome number	CO statement
1	CO1	**Recall** Knowledge of theory and practice related to Broadband communication.
2	CO2	**Understand** knowledge about Elements of Optical Fiber Systemsand knowledge about Computer networks
3	CO3	**Analyze** the various aspects of Computer networks and multimedia networks
4	CO4	**Solve** problems related to satellite and Ability to identify engineering problems related to satellite communication
5	CO5	**Identify** and solve engineering problems related to Mobile communication system

Syllabus:

	Course Contents
Unit I	**Optical Fiber Communication** Key Elements of Optical Fiber Systems, Optical Fibers as a Communication Channel: Optical Fiber Modes and Configurations, Mode Theory for Circular Waveguides, Single-mode Fibers, Graded-index Fiber Structure, Signal Degradation in Optical Fibers. Optical Sources: Basic Concepts and characteristicsof LEDs and LASERs.Photodetectors:BasicConcepts,Common Photodetectors. **[9Hours]**
Unit II	**Computer communication network** Introduction to LAN, MAN, WAN, Intranet & Internet system, Role of Computer networks, broadband,ISDN,VSAT. **[7Hours]**
Unit III	**Multimedia Communication** Introduction, multimedia information representation, multimedia networks, multimediaapplications,mediatypes,communicationmodes,networktypes, multipoint conferencing, network QoSapplicationQoS. **[8Hours]**
Unit IV	**Communication Interface** Infrared, Bluetooth, Wi-Fi, Zigbee, GPRS, USB (UNIVERSAL SERIAL BUS), Bus Topology: Star, Ring. MeshandApplications. **[7Hours]**
Unit V	**Satellite (Space Segments)** Satellite Subsystems, Attitude and control systems (AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystems, Satellite antennas, Equipment Reliability andspacequalification. **[9Hours]**
Unit VI	**Mobile Communication** Cellular Telephone systems: Digital cellular telephone, Mobile communication system, Role of mobile communication, mobile hotspot and mobile applications related to ruraldevelopment,GPS. **[8Hours]**
	Text Books
1	Introduction to Embedded Systems – Shibu K.V Mc Graw Hill
2	Mobile Communications – Design fundamentals: William C. Y. Lee, John Willey, 2 Edition, 2010
3	Computer Networks: Andrew Tanenbaum, 4th Edition, PHI.
4	Video Processing and Communications, by Yao Wang, Joern Ostermann, and Ya Qin Zhang. Prentice Hall, 2001
5	Wireless Communication – Principles and practice: T S. Rappaport, Prentice Hall PTR, 2 Edition, 2007
	Reference Books
1	Multimedia Systems, J.F.K, Buford, ACM Press, 1994
2	Understanding Networked Multimedia, Fluckiger, Prentice Hall
3	Compressed Video over Networks, edited by Ming-Ting Sun and Amy R. Reibman,
4	Marcel Dekker Inc., Switzerland, 2000
5	J. E. Flood, "Telecommunications Switching, Traffic and Networks", Pearson Education
6	Computer Communication Networks: Frouzan, 4th Edition, Tata Mc-Graw Hill
	Useful links
1	https://www.igi-global.com/book/resource-allocation-next-generation-broadband/171019
2	https://www.routledge.com/Introduction-to-Broadband-Communication-Systems/Akujuobi-Sadiku/p/book/9781420061499
3	https://link.springer.com/book/10.1007/978-3-030-02613-4