



JAIDEV EDUCATION SOCIETY'S
JD COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR

Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.in

(An Autonomous Institute, with NAAC "A" Grade)

Affiliated to DBATU, RTMNU & MSBTE Mumbai

Department of Electronics and Telecommunication Engineering

“Rectifying Ideas, Amplifying Knowledge”



॥ ज्ञानम् सर्वार्थं साधनम् ॥

VISION	MISSION
“To be a Department providing high quality & globally competent knowledge of concurrent technologies in the field of Electronics and Telecommunication.”	<ol style="list-style-type: none">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.

Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	ET3T001	Multivariate Calculus	2	1	0	3

Prerequisites for the course	
1	Basic Knowledge of Mathematics, Algebra, Trigonometry

Prior Reading Material/useful links	
1	http://www.pearsonhighered.com/educator/product/Vector-Calculus/9780321780652.page
2	https://archive.nptel.ac.in/courses/111/107/111107108/
3	http://www.infocobuild.com/education/audio-video-courses/mathematics/MultivariableCalculus-IIT-Roorkee/lecture-32.html

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Describe properties of Laplace transform, Convolution Theorem, Fourier integral theorem, Parseval's identity, Cauchy's integral theorem, Cauchy's residue theorem.
2	CO2	Illustrate the examples using Laplace transform, Fourier Transform, Partial differential equation, Function of Complex Variables, Matrices.
3	CO3	Apply the knowledge of Laplace transform, Z-transform, function of complex variable, Advance partial differentialequation.
4	CO4	Analyze the question on Laplace transform, Fourier Transform, Partial differential equation, Function of Complex Variables
5	CO5	Create a modal using Laplace transform, Fourier Transform, Theory of probability, Function of Complex Variables, Matrices.

Syllabus:

CourseContents	
Unit I	Matrices Characteristics equation, Eigen values and Eigen vectors, Statement and Verification of Cayley Hamilton Theorem [without proof], Reduction to Diagonal form, Sylvester's theorem [without proof] (6 Hours)
Unit II	Laplace Transform Definition – conditions for existence; Properties of Laplace transforms; Transforms of some special functions- periodic function, Heaviside-unitstep function. (5 Hours)
Unit III	Inverse Laplace Transform Introductory remarks; Inverse transforms of some elementary functions; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of differential equations. (5 Hours)
Unit IV	Z-Transform Definition, Convergence of Z-transform and Properties, Inverse Z-transform by Partial Fraction Method, Residue Method (Inversion Integral Method), Solutions of Difference Equations with Constant Coefficients by Z- transform. (5 Hours)
Unit V	Theory of Probability Axioms of Probability, Conditional Probability, Baye's Rule, Random variables: Discrete and Continuous random variables, Probability function and Distribution function, Joint distributions, Independent Random Variables, Conditional Distributions. (6 Hours)
Unit VI	Functions of Complex Variables Analytic functions; Conjugate functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form, Cauchy's integral theorem; Bilinear transform Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorem without proofs). (5 Hours)
Text Books	
1	Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi
2	Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3	A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
4	A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
5	Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.
Reference Books	
1	Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2	A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.
3	Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4	.Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy. Knowledgeware, Mumbai.
5	Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.
6	Advanced Mathematics for Engineers by Chandrika Prasad

Useful links

1	http://math.clarku.edu/~djoyce/ma131/
2	https://courses.maths.ox.ac.uk/course/view.php?id=57
3	https://www.whitman.edu/mathematics/multivariable/multivariable.pdf



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Semester	Course Code	Name of the course	L	T	P	Credits
III	ET3T002	Electronics Devices and Circuits	2	1	0	3

Prerequisites for the course	
1	Basic knowledge of Semiconductor Physics (FYT106 and FYT110)

Prior Reading Material/ useful links	
1	https://onlinecourses.nptel.ac.in/noc21_ee80/preview
2	https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_ECE_EDC%20NOTE S.pdf

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Explain the working principle, operation and characteristics of basic solid state devices such as PN junction diode, BJT and JFET.
2	CO2	Apply the concept of biasing techniques and feedback to improve stability of circuits.
3	CO3	Categorize amplifiers and oscillators based on feedback topology.
4	CO4	Analyse different amplifier configurations and DC bias circuitry of BJT.
5	CO5	Interpret BJT circuits for small signal at low and high frequencies.
6	CO6	Design Electronic circuits using diodes and transistors.

Syllabus:

Course Contents	
Unit I	Semiconductor Theory and PN Junction Devices Energy bands in silicon, intrinsic and extrinsic silicon, Carrier transport in silicon diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. P-N junction diode theory, Zener diode, Zener as a Voltage regulator, Tunnel diode, LED, Schottky diode, Varactor Diode operation, characteristics and applications such as Rectifiers, Filters [6Hours]
Unit II	Bipolar Junction Transistors BJT Structure, Operation, Input and Output Characteristics in CE, CB and CC configuration, Comparison of transistor configurations, Ebers-Moll model, BJT biasing techniques, Load line concept, Thermal Runaway, Stability factor, Stabilization Techniques, Ratings and specifications of BJT from data sheet. [6 Hours]
Unit III	Single Stage Amplifiers BJT small signal model – Analysis of CE, CB, CC amplifiers, Concept of frequency response, Miller's theorem, Effect of coupling, bypass, junction and stray capacitance on frequency response of BJT amplifiers. [5Hours]
Unit IV	Power Amplifiers Classes of Power amplifiers – Class A, Class B, Class AB, Class C and Class D amplifiers, Analysis of Class A, Class B, Class AB amplifiers, Distortions in amplifiers, concept of Total Harmonic Distortion, Comparison of power amplifiers. [5 Hours]
Unit V	Feedback Amplifiers and Oscillators Feedback Concept, Classification of amplifiers based on feedback topology, (Voltage, Current, Transconductance and Transresistance amplifiers), Effect of negative feedback on various performance parameters of an amplifier, Analysis of one circuit for each feedback topology. Oscillators: Condition for oscillations, Phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators. [5Hours]
Unit VI	Junction Field Effect Transistors JFET:-Structure, Symbol, Basic Operation, Drain and Transfer Characteristics, Biasing arrangements for JFET, Biasing against device variation, biasing for zero current drift. Universal JFET bias curve, Ratings and specifications of JFET from data sheet. [5Hours]
Text Books	
1	Millman & Halkies, "Electronic Devices and Circuits", Second Edition, Tata McGraw Hill.
2	Boylestead & Nashelsky, "Electronic devices and Circuits Theory" Eighth edition, PHI
3	S. Salivahanan, N. Suresh Kumar, "Electronic devices and Circuits", Fourth Edition, McGraw Hill Education (India) Private Ltd
4	Donald Neaman, "Electronic Circuit Analysis and Design", Third Edition, Tata McGraw Hill.
Reference Books	
1	Millman & Halkies, "Integrated Electronics", Seventh Edition, Tata McGraw Hill.
2	David A. Bell, "Electronics Device and Circuits", Fourth Edition, PHI.
3	Gupta, J.B, "Electron Devices and Circuits", Second Edition, S.K. Kataria & Sons.
4	Floyd, "Electronic Devices", Seventh Edition, Pearson.
5	Sedra and Smith, "Microelectronic Circuits", Oxford University Press, 2004.

6	Ben G. Streetman “Solid State Electronic Devices”, Sixth Edition ,Pearson
Useful links	
1	https://nptel.ac.in/courses/122/106/122106025/
2	https://onionesquereality.wordpress.com/.../more-video-lectures-iit-open
3	http://www.nesoacademy.org/electronics-engineering/analog-electronics/analog
4	http://www.electronics-tutorials.ws/transistor/trans_1.html
5	http://www.allaboutcircuits.com/textbook/semiconductors/chpt-1/active-versus-passivedevices/



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Semester	Course Code	Name of the course	L	T	P	Credits
III	ET3T003	Analog Communication System	2	1	0	3

Prerequisites for the course	
1	Basic knowledge of communication concepts.
2	A basic understanding of Signal and Systems, Electronics and Communication would be an advantage

Prior Reading Material/ useful links	
1	https://archive.nptel.ac.in/courses/117/105/117105143/
2	https://onlinecourses.nptel.ac.in/noc21_ee74/preview
3	https://archive.nptel.ac.in/noc/courses/noc19/SEM2/noc19-ee46/

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
2	CO2	Distinguish between different types of analog modulation techniques based on bandwidth Occupied and power transmitted.
3	CO3	Analyze the performance of analog communications in the presence of noise by evaluating the figure of merit for different schemes of modulation

4	CO4	Evaluate different components of analog communication systems such as modulator, demodulator, mixer, receiver in time and frequency domain.
5	CO5	Design the modulators, demodulators for amplitude and frequency modulated systems.
6	CO6	Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

Syllabus:

Course Contents	
Unit I	AM Transmission Introduction Overview: Signals and their classifications, Fourier analysis of Signals and Systems. Elements of a Communication System, Need for modulation, Channel, Noise, and Band pass transmission: Complex low pass representation of narrowband signals and systems, Equivalent low pass transmission model. [5Hours]
Unit II	AM Reception Amplitude modulation DSB-FC, DSB-SC, SSB, VSB and ISB transmissions: mathematical Analysis-time and frequency domain analysis, modulation index, generation and detection methods, power requirement of these systems, Comparison of AM modulation schemes, Quadrature Carrier Multiplexing(QAM), frequency division multiplexing. [6Hours]
Unit III	FM Transmission Angle Modulation Frequency Modulation (FM),: Single Tone Frequency Modulation, Spectrum Analysis, Narrowband FM, Wideband FM, Transmission Bandwidth of FM Waves, Generation of FM waves: Direct and Indirect Methods, Demodulation of FM, Phase Locked Loops, Limiting of FM waves, comparison between AM & FM, Phase Modulation, Relation between FM and PM. [6 Hours]
Unit IV	FM Reception Radio Receivers and performance in the noise Basic receiver (TRF), Super heterodyne receiver for AM and FM, performance parameters for receiver such as sensitivity, selectivity, fidelity, image frequency rejection etc., AGC technique, Sources of noise, Signal to Noise Ratios, Figure of Merit Calculations, Noise in AM, Pre emphasis and De-emphasis in FM, Comparison of Noise Performance of different modulation schemes. [5Hours]
Unit V	Applications of AM and FM Applications of AM and FM AM Radio, Television: Video Bandwidth, Choice of Modulation, Colour Television, HDTV, FM Radio, FM Stereo Multiplexing. [4 Hours]
Unit VI	Acoustics Acoustics: Introduction to acoustic transducers, microphone and loud speakers, construction, types, characteristics and applications, Block schematic of Public address system, High quality audio such as stereophonic, Dolby, surround, 3-D etc. [5 Hours]
Text Books	
1	J. G. Proakis and M. Salehi, "Communication system engineering", 2/e, Pearson Education Asia, 2002.
2	R. E. Ziemer, W. H. Tranter, "Principles of Communications: Systems, Modulation, and Noise", 5/e, John Wiley & Sons, 2001.
3	Simon Haykins and Michael Moher, "Communication Systems", 5th Edition, John Wiley and sons, 201
4	Communication Systems-Analog and digital, Singh and Sapre, 2nd edition, 2007, TMH.
Reference Books	
1	Wayne Tomasi, "Electronic Communications Systems – Fundamentals Through

	advanced”, 5th Edition Pearson Education, 2012
2	H. Taub and D. L. Schilling, Principles of Communication Systems, 3 rd Reprint, McGraw Hill, 2006.
3	George Kennedy and Bernard Davis,” Electronic Communication systems”, 4 th Edition, TMH, 2008
4	Modern digital and analog Communication systems, B. P. Lathi, 3rd edition, 2015, Oxford University Press.
5	Roddy and Coolen, “Electronic Communication Systems”, Pearson Education.
6	Frank R. Dungan, “Electronic Communication Systems”, Delmar Publishers.
Useful links	
1	https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SECA1303.pdf
2	https://www.javatpoint.com/analog-communication
3	https://www.mgcub.ac.in/pdf/material/202004290051377727b35713.pdf
4	https://www.jntua.ac.in/gate-online-classes/registration/downloads/material/a159050820125.pdf



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Semester	Course Code	Name of the course	L	T	P	Credits
III	ET3T004	Digital Circuits and Microprocessor	2	1	0	3

Prerequisites for the course	
1	Basic knowledge of Number systems and core compute concepts

Prior Reading Material/ useful links	
1	https://onlinecourses.nptel.ac.in/noc19_ee51/preview
2	https://nptel.ac.in/courses/117106086
3	https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-ee75/

Course Outcomes:

Sr.No	Course Outcome number	CO statement
1	CO1	Define Logic Families and Programmable Devices and understand the architecture of logic families and combinational digital circuits and describe the basic concept and interrupts in microprocessors.
2	CO2	Classify SOP and POS forms, combinational and sequential circuits, synchronous and asynchronous circuits.
3	CO3	Apply the principles of Boolean algebra to manipulate, minimize design logic circuits using logic gates and K-map and Use HDL & appropriate EDA tool for digital logic design and simulation.
4	CO4	Analyze combinational logic circuits and sequential circuits.
5	CO5	Recommend various combinational logic circuits like code converters, multiplexers, adders in the design of complex hierarchical combinational blocks like multipliers, fast adders etc and Validate sequential logic circuit elements like latches, flip-flops for counters, registers, simple finite state machine and similar circuits.
6	CO6	Design modular combinational circuits, synchronous sequential logic circuits and interface various devices with microprocessor.

Syllabus:

Course Contents	
Unit I	Logic Simplification Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Logic Gates, combinational Logic Optimization Techniques, Canonical forms of Boolean expression. Implementations of Boolean expressions using logic gate, Introduction to logic families & their characteristics such as Fan-In, Fan-out, Propagation delay, Power dissipation, Noise Margin. [6Hours]
Unit II	Combinational Logic Design Comparators, Multiplexers, Demultiplexer, Encoder, Decoder, K-Map, half and full adders, Subtractors, serial parallel adders, Barrel Shifter, ALU. VHDL constructs and codes for combinational circuits [5Hours]
Unit III	Sequential Circuits Latches and flip-flops: SR-FF, D-FF, JK-FF, Master-Slave JK-FF & T-FF's, Excitation & Truth Table, Flip-flop conversions, Shift registers. Introduction to Synchronous Counters: Ring counter, Johnson counter. [5Hours]
Unit IV	Synchronous Machines Classification of synchronous machines, Design of synchronous sequential machines using Moore & Mealy circuits: Sequence detector, State diagram and implementation. [5Hours]
Unit V	Fundamentals of Microprocessor Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor IC pin outs and signals. [5Hours]
Unit VI	Programming With 8085 Assembly Language Programming Basics, Addressing Modes, Instruction set of microprocessor, Instruction timing diagram. Writing, Assembling & Executing Assembly Language Programs, Memory Interfacing. [6Hours]
Text Books	
1	An approach to digital Design: Morris Mano, Pearson Publications.
2	Microprocessor Architecture, Programming and Applications with the 8085: Ramesh Gaonkar, Penram International Publications.
3	Engineering Approach to Digital Design: W. Fletcher, PHI Publications.
Reference Books	
1	Fundamentals of digital circuits: A. Anand Kumar, Prentice-Hall of India, 4 Edition.
2	Modern digital Electronics: R.P. Jain, Tata McGraw Hill, 4 Edition.
3	Digital Electronic Principles: Malvino, PHI, 3 Edition.
Useful links	
1	https://ict.iitk.ac.in/wp-content/uploads/EE370A-Digital-Electronics-Microprocessor-Technology-Digital-Integrated-Circuits-2nd-Edition.pdf.pdf
2	https://pages.uoregon.edu/rayfrey/DigitalNotes.pdf
3	https://www.cet.edu.in/noticefiles/264_DIGITAL%20ELECTRONICS%20CIRCUIT%20BY%20K%20C%20BHUYAN.pdf



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Semester	Course Code	Name of the course	L	T	P	Credits
III	ET3T005	Integrated Circuit and Applications	2	1	0	3

Prerequisites for the course	
1	Concepts of Basic Electrical Engineering.
2	Fundamentals of Engineering Mathematics

Prior Reading Material/ useful links	
1	https://onlinecourses.nptel.ac.in/noc23_ee47/preview
2	https://onlinecourses.swayam2.ac.in/cec21_cs16/preview
3	https://www.iare.ac.in/sites/default/files/PPT/IC%20APPLICATIONS%20PPTS.pdf

Course Outcomes:

Sr. No	Course outcome number	CO statement
1	CO1	Understand and explain the basic concepts of OPAMP.
2	CO2	Demonstrate the working principle of various analog circuits.
3	CO3	Conduct experiments using analog electronic components, electronic instruments and modern tool.
4	CO4	Analyze analog circuits to evaluate various performance parameters.
5	CO5	Compare multivibrator circuits, Data converters.
6	CO6	Design and realize filters, Oscillators, linear and non-linear applications of Op-Amp

Syllabus:

Course Contents	
Unit I	<p>Module-1: Introduction to Operational Amplifier Op-Amp Fundamentals: Block diagram of operational amplifier, Op-Amp parameters, virtual ground concept, Differential amplifiers, Interpreting datasheet. Inverting & non inverting configurations Circuits with resistive feedback: Concept of feedback & their types. [6 Hours]</p>
Unit II	<p>Module-2: OP-Amp Linear Applications Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators (Practical considerations and design), current to voltage converters, voltage to current converters, Peak detector, using Op-Amp & Transistor and analog multipliers. [6 Hours]</p>
Unit III	<p>Module-3: OP-Amp Non Linear Applications Comparators, Log and anti-log amplifiers, Schmitt trigger, Clipper and Clamper, Precision Rectifier. Multivibrators: Bistable, Monostable, Astable multivibrator circuits using Op-Amp, Sample/Hold circuits. [6Hours]</p>
Unit IV	<p>Module-4: Signal Generator Principle of Oscillators, Barkhausen's criterion, Oscillator types: RC, LC oscillators, Triangular wave generator, Saw tooth wave generators. Monolithic timer IC 555, applications of IC 555, V to F and F to V converters. [6Hours]</p>
Unit V	<p>Module-5: Design of Converters and filters D-A conversion techniques, A-D Conversion techniques, First and second order Low Pass filter, High Pass filter, Band Pass filter, Band Select and All passive filters. [6Hours]</p>
Unit VI	<p>Module-6: Phase Locked Loops & multipliers Block diagram of PLL free running frequency, lock range, capture range and Sample circuits for each block. Applications of PLL - Frequency synthesizer FM demodulator, AM demodulator, FSK demodulator, Analog multiplier, Multiplier IC. [6Hours]</p>
Text Books	
1	David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2	D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.
3	Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.
4	N. C. Goyal and Khetan 'A Monograph on Electronics Design Principals', Khanna Publications
5	Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", McGraw Hill.
Reference Books	
1	Fiore, "Opamps & Linear Integrated Circuits Concepts & Applications", Cengage, 2010.
2	Floyd, Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.
3	Jacob Millman, Christos C. Halkias, "Integrated Electronics - Analog and Digital circuits system", Tata McGraw Hill, 2003.
4	Robert F. Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', PHI Learning, 6 th edition, 2012.
5	Tobey, Graham, Huelsman "Operational Amplifier Design and Applications"

	McGraw Hill.
Useful links	
1	https://www.iare.ac.in/sites/default/files/IARE_ICA_LECTURE_NOTES%20EE_E.pdf
2	https://www.google.com/search?client=firefox-b-d&q=integrated+circuits+and+applications+pdf



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Semester	Course Code	Name of the course	L	T	P	Credits
III	ET3T006	Network Synthesis and Analog Filter	2	1	0	3

<u>Prerequisites for the course</u>	
1	Basic knowledge of network analysis, Ohms law, Kirchoff’s Current and Voltage law.

<u>Prior Reading Material/ useful links</u>	
1	https://archive.nptel.ac.in/courses/117/108/117108107/
2	https://archive.nptel.ac.in/courses/117/101/117101106/
3	https://srmuniv.digimat.in/nptel/courses/video/117108107/L26.html

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Define various terminologies and network theorems.
2	CO2	Understand the basics of Network synthesis and analog filters.
3	CO3	Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same.
4	CO4	Analyze steady state and transient response of electrical circuits
5	CO5	Characterize the transfer function for two – port networks.
6	CO6	Design various electrical circuits using network theorems.

Syllabus:

Course Contents	
Unit I	<p>Module-1: Basics of electric circuits Basics of electric circuits, circuit elements and their voltage – current relationship, classification of circuit elements, sources – their types and characteristics, concept of equivalent sources, source transformation, nodal analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy. Series Circuit, Parallel Circuit, Source shifting, Principle of duality, concept of V-shift and I-shift. [5 Hours]</p>
Unit II	<p>Module-2: Basics of Network Analysis Mutual inductance, coefficient of coupling, dot convention, dot marking in coupled coils, mesh analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy. [5Hours]</p>
Unit III	<p>Module-3: Network Theorems Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem. [5Hours]</p>
Unit IV	<p>Module-4: Laplace Transform Review of Laplace Transform, concept of complex frequency, transform impedance and admittance, s – domain impedance and admittance models for resistor, inductor and capacitor, series and parallel combinations of elements. Transformed network on loop and mesh basis, mesh and node equations for transformed networks, time response of electrical network with and without initial conditions by Laplace transform, Transient analysis. [5Hours]</p>
Unit V	<p>Module-5: Introduction to Active Filters Aspects of filter design problem, approximation problem in network theory, maximally flat low pass filter approximation (Butterworth), Chebyshev approximations. [6Hours]</p>
Unit VI	<p>Module-6: Synthesis of Active filters Synthesis of Active filters: Low Pass, Band Pass, RC-CR Transformation, Sensitivity, Biquad Circuits. [5Hours]</p>
Text Books	
1	Franklin Kuo, "Network Analysis & Synthesis", Wiley International.
2	Govind Daryanani, "Analysis and Synthesis of Filters".
Reference Books	
1	Kendall Su, "Analog Filters", Kluwer Academic Publisher, 2nd Edition, 2002.
2	2. John O' Malley, "Basic Circuit Analysis", Schaum's series.
3	3. Van Valkenberg, "Network Analysis", Pearson Education.
Useful links	
1	https://www.vssut.ac.in/lecture_notes/lecture1423722706.pdf
2	https://www.coep.org.in/previousyearquestionpapers/2.%20Second%20Year%20B.Tech/2014-15/Electronics%20And%20Telecommunication/Network%20Synthesis%20And%20Analog%20Filters.pdf
3	https://www.ee.iitb.ac.in/~belur/ee225/books/AndersonAndVongpanitlerd-Network-Analysis-and-Synthesis1973.pdf
4	https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SEEA1301.pdf



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JD COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR**

Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.in

(An Autonomous Institute, with NAAC "A" Grade)

Affiliated to DBATU, RTMNU & MSBTE Mumbai

Department of Electronics and Telecommunication Engineering

“Rectifying Ideas, Amplifying Knowledge”



VISION	MISSION
<p>“To be a Department providing high quality & globally competent knowledge of concurrent technologies in the field of Electronics and Telecommunication.”</p>	<p>1.To provide quality teaching learning process through well-developed educational environment and dedicatedfaculties. 2.To produce competent technocrats of high standards satisfying the needs ofall stakeholders.</p>

Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	ET3L002	Electronics Devices and Circuits Lab	0	0	2	1

Prerequisites for the course	
1	Basic knowledge of Semiconductor Physics and theoretical knowledge about the practical.

Prior Reading Material/ useful links	
1	https://www.nrtec.in/wp-content/uploads/2022/01/Course-material_Electronic-Devices-and-Circuits-1.pdf
2	https://archive.nptel.ac.in/content/storage2/courses/122106026/LECTURE1.pdf
3	https://stage.inrhythm.com/project?id=7E192K8&hl=us&source=Introduction-Basic-Electronics-Lab-Nptel.pdf

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Acquire the basic concepts of different semiconductor components and understand the use of semiconductor devices in different electronic circuits.
2	CO2	Identify basic devices such as diodes, BJT and JFET from their package information by referring to manufacturer’s data sheets.
3	CO3	Plot and study the characteristics of semiconductor devices.
4	CO4	Simulate Electronic circuits using SPICE.
5	CO5	Calculate different performance parameters of transistor.
6	CO6	Design, build and test the performance of various circuits.

Syllabus:

Course Contents	
Expt.1	To Plot the V- I characteristics of PN junction diode (Silicon), Zener diode, LED under forward and reverse bias conditions.
Expt.2	To find the i) Voltage regulation ii) Load Regulation of a Zener shunt regulator
Expt.3	To design Half wave rectifier (with and without Filter) and find ripple factor and efficiency of Half wave Rectifier
Expt.4	To plot input and output wave forms of the Full Wave Rectifier (with and without Filter) and find ripple factor and efficiency of Full wave Rectifier
Expt.5	To observe the action of a Transistor as an Electronic switch
Expt.6	To plot input and Output Characteristics of Common Base Transistor configuration
Expt.7	To plot input and Output Characteristics of Common Emitter Transistor configuration
Expt.8	To obtain Frequency Response of single stage CE Amplifier and Find performance parameters
Expt.9	To plot Drain and Transfer characteristics of Field Effect Transistor (JFET) and Find g_m , r_d and μ from characteristics
Expt.10	Design and simulate LC Oscillators (Compare practical and theoretical oscillation frequency)
Expt.11	Build and test RC oscillator
Expt.12	Design and simulate Power Amplifiers - Class A, Class B, Class AB
Expt.13	Design and simulate Voltage Shunt Feedback Amplifiers
Expt.14	Design and simulate Current Series Feedback Amplifiers
Expt.15	Applications of Diodes: To verify the truth table for Logic Gates (AND & OR) using Diodes
Text Books	
1	Millman & Halkies, "Electronic Devices and Circuits", Second Edition, Tata McGraw Hill.
2	Boylestead & Nashelsky, "Electronic devices and Circuits Theory" Eighth edition, PHI
3	S. Salivahanan, N.SureshKumar, "Electronic devices and Circuits", Fourth Edition, McGraw Hill Education (India) Private Ltd

4	Donald Neuman, "Electronic Circuit Analysis and Design", Third Edition, Tata McGraw Hill.
Reference Books	
1	Millman Halkies, "Integrated Electronics", Seventh edition, Tata McGraw Hill.
2	David A. Bell, "Electronic Device and Circuits", Fourth Edition, PHI.
3	Gupta. J.B, "Electron Devices and Circuits", Second Edition, S.K. Kataria & Sons.
4	Floyd, "Electronic Devices", Seventh Edition, Pearson.
5	Sedra and Smith, "Microelectronic Circuits", Oxford University Press, 2004.
6	Ben G. Streetman "Solid State Electronic Devices", Sixth Edition, Pearson
Useful links	
1	https://onlinecourses.nptel.ac.in/noc21_ee80/preview
2	https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_ECE_EDC%20NOTES.pdf
3	https://nptel.ac.in/courses/122/106/122106025/
4	https://onionesquereality.wordpress.com/.../more-video-lectures-iit-open
5	http://www.nesoacademy.org/electronics-engineering/analog-electronics/analog
6	http://www.electronics-tutorials.ws/transistor/trans_1.html
7	http://www.allaboutcircuits.com/textbook/semiconductors/chpt-1/active-versus-passivedevices/



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
III	ET3L003	Analog Communication System Lab	0	0	2	1

Prerequisites for the course	
1	Basic knowledge of communication concepts.

Prior Reading Material/ useful links	
1	https://nptel.ac.in/courses/117102059
2	https://kanchiuniv.ac.in/academics/department-of-electronics-and-communication-engineering/nptel-videos/
3	https://www.studocu.com/in/document/apj-abdul-kalam-technological-university/analog-communication-engineering/lec60-analog-communication/26979180

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Observe SSB detection techniques.
2	CO2	Realize various modulation technique..
3	CO3	Generate signals using Scilab.
4	CO4	Identify and design different analog modulation techniques.
5	CO5	Analyze multiplexing systems such as FDM, TDM and QAM.
6	CO6	Compare different communication systems by analyzing in time and frequency domain

Syllabus:

Course Contents	
Expt.1	To generate amplitude modulated wave and determine the percentage modulation.
Expt.2	To generate frequency modulated signal and determine the modulation index and bandwidth for various values of amplitude and frequency of modulating signal.
Expt.3	To generate SSB using phase method and detection of SSB signal using Synchronous detector.
Expt.4	To generate DSB using phase method and detection of DSB signal using Synchronous detector
Expt.5	To generate the pulse amplitude modulated and demodulated signals
Expt.6	To implement the pulse width modulated and demodulated signals
Expt.7	To Design & generate the pulse position modulated and demodulated signals
Expt.8	To Study Differential PULSE Code Modulation & Demodulation
Expt.9	Implement and Study the AM Superhetrodyne radio receiver
Expt.10	To construct the frequency division multiplexing and demultiplexing circuit and to verify its operation
Expt.11	To perform the AM DSB-SC signal Generation and Detection using Scilab Simulink.
Expt.12	To perform the FM signal Generation and Detection using Scilab Simulink.
Expt.13	Quadrature Amplitude Modulation and Demodulation.
Expt.14	Time Division Multiplexing and Demultiplexing.
Expt.15	Study of phase modulator.
Text Books	
1	J. G. Proakis and M. Salehi, "Communication system engineering", 2/e, Pearson Education Asia, 2002.
2	R. E. Ziemer, W. H. Tranter, "Principles of Communications: Systems, Modulation, and Noise", 5/e, John Wiley & Sons, 2001.
3	Simon Haykins and Michael Moher,"Communication Systems", 5th Edition, John Wiley and sons, 201
4	Communication Systems - Analog and digital, Singh and Sapre, 2nd edition, 2007, TMH.
Reference Books	
1	Wayne Tomasi, "Electronic Communications Systems – Fundamentals Through advanced", 5th Edition Pearson Education,2012
2	H. Taub and D. L. Schilling, Principles of Communication Systems, 3 rd Reprint,McGraw Hill, 2006.
3	George Kennedy and Bernard Davis," Electronic Communication systems", 4 th Edition, TMH, 2008
4	Modern digital and analog Communication systems, B. P. Lathi, 3rd edition, 2015, Oxford University Press.
5	Roddy and Coolen, "Electronic Communication Systems", Pearson Education.
6	Frank R. Dungan, "Electronic Communication Systems", Delmar Publishers.

Useful links

1	https://mrcet.com/downloads/digital_notes/ECE/III%20Year/ANALOG%20COMMUNICATIONS-18.pdf
2	https://www.jntua.ac.in/gate-online-classes/registration/downloads/material/a159050820125.pdf



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Semester	Course Code	Name of the course	L	T	P	Credits
III	ET3L004	Digital Circuits and Microprocessor Lab	0	0	2	1

Prerequisites for the course	
1	Basic knowledge of digital electronics components and microprocessor

Prior Reading Material/ useful links	
1	https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/2018/15MH211J-digital-sys-micro-Lab-ktr.pdf
2	https://rmkcet.ac.in/cse-dpsd-lab.php
3	https://msrcasc.edu.in/uploads/2021-01/Electronics_Lab.pdf

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Find and prevent various hazards and timing problems in a digital design.
2	CO2	Understand the fundamental of basic gates and their use in combinational and sequential circuits Outline the use of digital components as a switching elements.
3	CO3	Develop ability to handle arithmetic operations using assembly language programming.
4	CO4	Analyze basic arithmetic and logical circuits required in microcomputer systems.
5	CO5	Examine the structure of various number systems and its application in digital design.
6	CO6	Design various combinational and sequential circuits and develop

	skill to build, and troubleshoot cost effective digital circuits
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Syllabus:

Course Contents	
Expt.1	Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates.
Expt.2	Construction of half / full adder using XOR and NAND gates and verification of its operation.
Expt.3	To Study & Verify Half and Full Subtractor.
Expt.4	Verify the truth table of RS, JK, T and D flip-flops using NAND & NOR gates.
Expt.5	Implementation and verification of decoder/de-multiplexer and encoder using logic gates.
Expt.6	Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates.
Expt.7	Design and verify the 4- Bit Synchronous/ Asynchronous Counter using JK flip flop.
Expt.8	Verify Binary to Gray and Gray to Binary conversion using NAND gates only.
Expt.9	Verify the truth table of one bit and two-bit comparator using logic gates.
Expt.10	Write a Program Using 8085 & verify for: a. Addition of Two 8-Bit Numbers. b. Addition of Two 16-Bit Numbers. (With Carry)
Expt.11	Write a Program Using 8085 & verify for: a. Subtraction of Two 8-Bit Numbers. (Display of Borrow) b. Subtraction of Two 16-Bit Numbers. (Display of Borrow)
Expt.12	Write a Program Using 8085 & Test for Typical Data: a. Multiplication of Two 8-Bit Numbers by Bit Rotation Method b. Division of Two 8-Bit Numbers by Repeated Subtraction Method
Expt.13	Write a Program to Move a Block of Data Using 8085 & verify.
Expt.14	Write a Program to Arrange Number in Ascending Order Using 8085 & verify.
Expt.15	Write a Program to Check Number of 1's and 0's in Given Number Using 8085 & verify.
Text Books	
1	An approach to digital Design: Morris Mano, Pearson Publications.
2	Microprocessor Architecture, Programming and Applications with the 8085: Ramesh Gaonkar, Penram International Publications.
3	Engineering Approach to Digital Design: W. Fletcher, PHI Publications.
Reference Books	
1	Fundamentals of digital circuits: A. Anand Kumar, Prentice-Hall of India, 4 Edition.
2	Modern digital Electronics: R.P. Jain, Tata McGraw Hill, 4 Edition.
3	Digital Electronic Principles: Malvino, PHI, 3 Edition.

Useful links

1	https://onlinecourses.nptel.ac.in/noc19_ee51/preview
2	https://nptel.ac.in/courses/117106086
3	https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-ee75/



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Semester	Course Code	Name of the course	L	T	P	Credits
III	ET3T007	Universal Human Values	3	0	0	3

Prerequisites for the course	
1	Broadmindedness; wisdom; social justice; equality; a world at peace; a world of beauty; unity with nature; protecting the environment; inner harmony

Prior Reading Material/ useful links	
1	https://www.skit.ac.in/techno-incubation-centre/universal-human-values-uhv.html
2	https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf
3	https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SAIC4003.pdf

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Distinguish between self and body, and formulate the role of self in the day-today activities of a human being
2	CO2	Examine the role of a human being in ensuring harmony in society and nature.
3	CO3	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.
4	CO4	Analyze the value of harmonious relationship based on trust and respect in their life and profession
5	CO5	Evaluate the significance of value inputs in formal education and start applying them in their life and profession
6	CO6	Develop more confidence and commitment for value-based living in family, society and nature

Syllabus:

Course Contents	
Unit I	<p>Introduction - Need, Basic Guidelines, Content and Process for Value Education</p> <p>1. Purpose and motivation for the course, recapitulation from Universal Human Values-I</p> <p>2. Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration</p> <p>3. Continuous Happiness and Prosperity- A look at basic Human Aspirations</p> <p>4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority</p> <p>5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario</p> <p>6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.</p> <p>Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking</p> <p style="text-align: right;">[6 Hours]</p>
Unit II	<p>Understanding Harmony in the Human Being - Harmony in Myself!</p> <p>7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’</p> <p>8. Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility</p> <p>9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)</p> <p>10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’</p> <p>11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail</p> <p>12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease</p> <p style="text-align: right;">[6 Hours]</p>
Unit III	<p>Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship</p> <p>13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship</p> <p>14. Understanding the meaning of Trust; Difference between intention and competence</p> <p>15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship</p> <p>16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals</p> <p>17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.</p> <p>Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students’ lives</p> <p style="text-align: right;">[6 Hours]</p>
Unit IV	<p>Understanding Harmony in the Nature and Existence - Whole existence as Coexistence</p>

	<p>18. Understanding the harmony in the Nature</p> <p>19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature</p> <p>20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space</p> <p>21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.</p> <p style="text-align: right;">[5 Hours]</p>
Unit V	<p>Implications of the above Holistic Understanding of Harmony on Professional Ethics</p> <p>22. Natural acceptance of human values</p> <p>23. Definitiveness of Ethical Human Conduct</p> <p>24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order</p> <p>25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.</p> <p>26. Case studies of typical holistic technologies, management models and production systems</p> <p>27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations</p> <p>28. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc. [7Hours]</p>
Text Books	
1	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
Reference Books	
1	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3	The Story of Stuff (Book).
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher.
6	Slow is Beautiful - Cecile Andrews
7	Economy of Permanence - J C Kumarappa
8	Bharat Mein Angreji Raj – Pandit Sunderlal
9	Rediscovering India - by Dharampal
10	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11	India Wins Freedom - Maulana Abdul Kalam Azad
12	Vivekananda - Romain Rolland (English)

13	Gandhi - Romain Rolland (English)
Useful links	
1	https://gyansanchay.csjmu.ac.in/wp-content/uploads/2022/09/UHVE-2.0-Class-Notes-Part-1-of-4-1.pdf
2	https://www.scribd.com/document/489293136/human-values-unit-3



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Semester	Course Code	Name of the course	L	T	P	Credits
IV	ET4T001	Partial Differential Equation and Numerical Methods	2	1	0	3

Prerequisites for the course	
1	Complex Analysis, study of the complex numbers and functions of a complex variable, including aspects of limits, continuity, infinite series, differentiation and integration.
2	Numerical Analysis, part of applied math, and has to do with algorithms and procedures for solving mathematical problems computationally.

Prior Reading Material / useful links	
1	https://www.digimat.in/nptel/courses/video/111105093/L01.html
2	https://www.youtube.com/watch?v=NL-nGACP3Ws
3	https://www.digimat.in/nptel/courses/video/111108152/L01.html

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Understand calculation and interpretation of various errors in numerical methods and partial differential equations.
2	CO2	Familiar with finite precision computation.
3	CO3	Solve nonlinear equations in a single variable and find numerical solutions.
4	CO4	Apply Numerical analysis which has enormous application in the field of science and some fields of Engineering.
5	CO5	Analyze the numerical integration and differentiation, numerical solution of ordinary differential equation.

Syllabus:

Course Contents	
Unit I	Error Analysis Significant figures, round-off, precision and accuracy, approximate and true error, truncation error and Taylor series, machine epsilon, data uncertainties, error propagation, importance of errors in computer programming. [6Hours]
Unit II	Solution of Transcendental / Polynomial Equations and System of Linear Equation Solution of Transcendental / Polynomial Equations: Finding root of polynomial equations deploying computational methods such as Bisection, Regula-falsi, Newton-Raphson, Secant, Successive approximation. System of linear equation: Solving linear equations deploying computational methods such as Gauss elimination, Gauss Jordan, Partial pivoting, Matrix triangularisation (LU decomposition), Cholesky, Gauss Seidel and Jacobi methods. [6 Hours]
Unit III	Interpolation and Polynomial Approximation Least square approximation, Orthogonal polynomials Chebyshev polynomials, Finite difference operator and their relations, Forward, backward, central and divided difference, Newton's forward divided difference, Backward difference interpolation, Sterling interpolation, Lagrange's interpolation polynomials, Spline interpolation, Least square approximation. [6Hours]
Unit IV	Numerical Integration and Differentiation Numerical Integration: Methods based on interpolation such as Trapezoidal rule, Simsons 1/3 and 3/8 rules. Numerical differentiation: Euler's method, Modified Euler's method, Taylor's series, Runge Kutta 2 nd and 4 th order, Stability analysis of above methods. [5Hours]
Unit V	Advance Partial Differential equations Introduction Partial differential equation, method of separation of variables, Application of partial differential equations. (Heat equation, wave equation, Laplace Equation) [6 Hours]
Unit VI	Object Oriented Programming Software Evaluation, Object oriented programming paradigm, Basic concepts of object oriented programming, Benefits of OOP, Object oriented languages, Applications of OOP Beginning with C++: Structure of C++ program, creating the source file, Compiling & linking, Basic data types, User defined data types, Symbolic constants, Declaration of variables, Dynamic initialization of variables, Reference variables, Operators in C++, Scope resolution operator, Type cast operator. Functions in C++: Function prototyping, Inline functions Function overloading, Friend and virtual functions. Classes and Objects Specifying a class, Defining member functions, C++ program with class, Arrays within a class, Memory allocation for objects, Constructors, Multiple constructor in class, Dynamic initialization of

	objects, Dynamic constructor, Destructors.	[6Hours]
Text Books		
1	Steven C Chapra, Reymond P. Canale, “Numerical Methods for Engineers”, Tata McGrawHill Publications, 2010.	
2	E. Balaguruswamy, “Numerical Methods”, Tata McGraw Hill Publications, 1999.	
Reference Books		
1	V. Rajaraman, “Fundamental of Computers”, Prentice Hall of India, New Delhi, 2003.	
2	S. S. Sastri, “Introductory Methods of Numerical Methods”, Prentice Hall of India, New Delhi 3 rd edition, 2003.	
3	K. E. Atkinson, “An Introduction to Numerical Analysis”, Wiley, 1978.	
4	M.J. Maron, “Numerical Analysis: A Practical Approach”, Macmillan, New York, 1982 D. Ravichandran, "Programming with C++", TMH	
5	E. Balagurusamy, "Object-Oriented Programming with C++", TMH, New Delhi, 2001, 2 nd Edition	
6	Yeshwant Kanetkar, "Let us C++", BPB Pub.", Delhi, 2002, 4th Edition	
Useful links		
1	http://www.digimat.in/nptel/courses/video/111105038/L23.html	
2	https://www.digimat.in/nptel/courses/video/111105038/L39.html	
3	https://www.digimat.in/nptel/courses/video/111105038/L01.html	
4	https://www.digimat.in/nptel/courses/video/111105038/L10.html	



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Program: B. Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	ET4T002	Basics of Python Programming	3	0	0	3

Prerequisites for the course	
1	Basic Computer Skills.
2	Understand the Difference Between Front-end and Back-end.
3	Probability & Statistics

Prior Reading Material/ useful links	
1	https://www.youtube.com/watch?v=c235EsGFcZs
2	https://nptel.ac.in/courses/106106145
3	https://onlinecourses.nptel.ac.in/noc21_cs45/preview

Course Outcomes:

Sr. No	Course outcome number	CO statement
1	CO1	Remember variables, types, operators, data structures, arguments, object oriented programming and libraries.
2	CO2	Understand assignment, keyword, expressions, lists, modules, exceptions and standard libraries.
3	CO3	Apply variables, types, operators, data structures, arguments, object oriented programming and Libraries.
4	CO4	Analyze modern updates in python for keyword, expressions, lists, modules, exceptions, standard libraries.
5	CO5	Evaluate storage space required to program python scripts, variables, types, operators and data structures.
6	CO6	Create python code to make functional Electronics hardware.

Syllabus:

Course Contents	
Unit I	Introduction History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords,Input-Output,Indentation. [6Hours]
Unit II	Types, Operators and Expressions Types – Integers, Strings, Booleans; Operators - Arithmetic Operators, Comparison(Relational) Operators, Assignment Operators, Logical Operators, Bit-wise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while break,continue,pass. [6Hours]
Unit III	Data Structures Lists, Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions. [6Hours]
Unit IV	Default Arguments Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function- Global and Local Variables. Modules: Creating modules, import statement, from. Import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages. [6 Hours]
Unit V	Object-Oriented Programming OOP in Python Classes, self-variable Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, Error, and Exceptions: Difference between an error and Exception, Handling Exception, try except for block, Raising Exceptions, User DefinedExceptions. [6 Hours]
Unit VI	Brief Tour of the Standard Library Operating System Interface – String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics Testing: Why testing is required ?, Basic concepts of testing, Unit testing in Python, Writing Test cases, RunningTests. [6 Hours]
Text Books	
1	Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2	Learning Python, Mark Lutz, Orielly

Reference Books	
1	Think Python, Allen Downey, Green Tea Press
2	Core Python Programming, W.Chun, Pearson
3	Introduction to Python, Kenneth A. Lambert, Cengage
Useful links	
1	https://www.python.org/
2	https://swayam.gov.in/nd1_noc19_cs41/preview
3	https://www.codecademy.com/learn/learn-python
4	https://www.learnpython.org/
5	https://developers.google.com/edu/python/
6	https://www.datacamp.com/tracks/python-programming
7	https://www.udemy.com/courses/search/?q=python+programming
8	https://docs.python.org/3/tutorial/index.html
9	http://www.pythonchallenge.com/
10	https://www.tutorialspoint.com/python/index.htm



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	ET4T003	Electrical Machines and Instruments	2	1	0	3

Prerequisites for the course

1	Basic Electrical Engineering
2	Circuit theory

Prior Reading Material /useful links

1	https://nptel.ac.in/courses/108105155
2	https://onlinecourses.nptel.ac.in/noc21_ee24/preview
3	https://archive.nptel.ac.in/courses/108/102/108102146/
4	https://nptel.ac.in/courses/108105131
5	https://nptel.ac.in/courses/108105017

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Remember basic principles & construction, of electrical instruments and ac & dc machines.
2	CO2	Understand the operation, performance and characteristics of electrical instruments and ac & dc machines.
3	CO3	To identify the different issues related to the electrical instruments, speed control and torque improvement in ac & dc machines.
4	CO4	Analyze the performance indices of electrical instruments and ac & dc machines. DC machines during various conditions..
5	CO5	Evaluate the operation of ac and dc machines along with the testing of electrical instruments.
6	CO6	Solve the different problems related to operation, & performance indices of electrical instruments ac and dc machines.

Syllabus:

Course Contents	
Unit I	<p>DC Machines</p> <p>Construction, working principle (motor & generator), EMF equation of DC Machine (motor and generator), Types and its characteristics of DC machines (motor and generator), back emf, starters of dc machine, Speed control of DC motor ,Breakingof DC motor, applications ofDC machines (motorandgenerator). [5Hours]</p>
Unit II	<p>Synchronous Machines</p> <p>Construction, types, armature reaction, circuit model of synchronous machine, determination of synchronous reactance, phasor diagram, power angle characteristics, parallel operation of synchronous generators, synchronous motor operation, synchronous condenser. [5Hours]</p>
Unit III	<p>Three phase Induction (Asynchronous) Motor</p> <p>Types of induction motor, flux and mmf waves, development of circuit model, power across airgap, torque and power output, starting methods, cogging and crawling, speed control, deep bar/ double cage rotor, induction generator, efficiency .of inductionmotors [6 Hours]</p>
Unit IV	<p>Special Machines</p> <p>Construction, working and application of stepper motor, variable reluctance motor, servo motor, FHP motor, hysteresis, repulsion, linear IM. [6 Hours]</p>
Unit V	<p>Electrical Instruments</p> <p>Classification selection of transducers strain gauges, LVDT, Temperature transducers, piezoelectric, photosensitive transducers, Hall Effect transducers, proximity devices Digital transducers need of signal conditioning and types, interfacing techniques of transducers with microprocessor and controller. [6 Hours]</p>
Unit VI	<p>Applications of Electrical Instruments</p> <p>Measurement of electrical telemetry thickness vibration,,humidity, thermal conductivity and gas analysis emission computerized tomography, smoke and fire detection, burglar alarm, objectcounterlevelmeasurement,on/offtimers,RTC,soundlevelmeter,tachometer,VAW meter. [6Hours]</p>
Text Books	
1	Electrical Machines by Ashfaqu Husain, Dhanpatrai and publication
2	Instrumentation Devices System edition C. S. Rajan, G. R. sharma.

Reference Books	
1	A course in Electrical and Electronic Measurement and Instrumentation" by A. K. Sawhney (Publisher name: Dhanpat Rai& Co.)
2	Electronics Instrumentation by H.S. Kalsi (Publisher McGraw Hill)
3	Abhijit Chakrabarti & Sudipta Debnath, "Electrical Machines", Tata McGraw-hillPublication.
4	William H Hayt, Jack E Kimmerly and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill.
5	A.E. Fitzgerald, Charles Kingsley & Jr. Stephen D. Umans, "Electrical Machinery", Tata McGraw-hill Publication 6th Edition.
6	I.J Nagarath& D.P Kothari, "Electrical Machines", Tata McGraw-hill Publication 4 th Edition.
7	T. J. E. Miller, "Brushless permanent-magnet and reluctance motor drives", OxfordUniversity Press (1989).
8	B. L. Theraja, "Electrical technology" volume 2, S. Chand.
Useful links	
1	https://www.digimat.in/nptel/courses/video/108105131/L01.html
2	https://www.youtube.com/watch?v=qmcriUdYBW0
3	https://www.digimat.in/nptel/courses/video/108105017/L10.html
4	https://www.digimat.in/nptel/courses/video/108105017/L26.html
5	https://archive.nptel.ac.in/courses/108/102/108102146/
6	https://nptel.ac.in/courses/108102146
7	https://nptel.ac.in/courses/108101167
8	https://www.digimat.in/nptel/courses/video/108105131/L01.html
9	https://www.youtube.com/watch?v=qmcriUdYBW0
10	https://www.digimat.in/nptel/courses/video/108105153/L01.html



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	ET4T004	Electronic Devices and Circuits-II	2	1	0	3

Prerequisites for the course

1	A basic course in electrical engineering
2	KCL, KVL, network theorems, AC analysis

Prior Reading Material/ useful links

1	https://onlinecourses.nptel.ac.in/noc21_ee80/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee55/preview
3	https://archive.nptel.ac.in/courses/117/106/117106089/

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Explain the working principle, operation and characteristics of Semiconductor devices such as MOSFET
2	CO2	Apply Knowledge of semiconductor devices and concepts to implement various electronic circuits.
3	CO3	Analyze different amplifier configurations.
4	CO4	Evaluate the small signal model and performance parameters of the device.
5	CO5	Design different oscillator circuits for various frequencies
6	CO6	Build and test the performance of electronic circuits

Syllabus:

Course Contents	
Unit I	<p>MOSFET Structure, Symbol, Construction of n-channel E-MOSFET, MOS Transistor operation, EMOSFET</p> <p>Characteristics & parameters, non-ideal voltage current characteristics viz. Finite output resistance, body effect, sub-threshold conduction, breakdown effects and temperature effects, N-MOS, P-MOS and CMOS devices</p> <p style="text-align: right;">[6 Hours]</p>
Unit II	<p>MOSFET Biasing and its DC Analysis</p> <p>Common source circuit, Load Line & Modes of operation, Common MOSFET configurations: DC Analysis, constant current source biasing, MOSFET as switch, diode/active resistor, Current sink and source, Current mirror.</p> <p style="text-align: right;">[6Hours]</p>
Unit III	<p>CMOS Inverter</p> <p>Principle of operation, dc characteristics, transient characteristics, noise margin, static load MOS inverter, transmission gate</p> <p style="text-align: right;">[5 Hours]</p>
Unit IV	<p>Study of CMOS Logic</p> <p>Study of Combinational logic, gates, compound gates, multiplexers, and memory elements using CMOS technology</p> <p style="text-align: right;">[6 Hours]</p>
Unit V	<p>Oscillators</p> <p>Barkhausen criterion, stability with feedback. Classification of oscillators, RC Oscillators: FET RC Phase Shift oscillator, Wein bridge oscillator, LC Oscillators: Hartley and Colpitts oscillators, Crystal oscillators, UJT Relaxation oscillator.</p> <p style="text-align: right;">[5Hours]</p>
Unit VI	<p>Voltage Regulators</p> <p>Block diagram of an adjustable three terminal positive and negative regulators (317, 337) typical connection diagram, current boosting, Low drop out voltage regulators, Introduction to Switch Mode Power supply (SMPS), Block diagram of SMPS, Types of SMPS. Comparison of Linear Power supply and SMPS.</p> <p style="text-align: right;">[5Hours]</p>
Text Books	
1	Neil Weste and David Harris, Addison-Wesley "CMOS VLSI Design – A Circuits and Systems Perspective", Fourth edition, Pearson
2	2. R.L. Boylestad & Nashlesky, "Electronic devices and Circuits Theory" Ninth Edition, Prentice Hall of India
3	3. Donald Neaman, "Electronic Circuit Analysis and Design", Third Edition, Tata McGraw Hill
4	4. Millman, Halkias, "Integrated Electronics- Analog and Digital Circuits and Systems", Second Edition, Tata McGraw Hill

Reference Books

1	Brijesh Iyer, S. L. Nalbalwar, R. Dudhe, "Electronics Devices & Circuits", Synergy Knowledge ware Mumbai, 2017. ISBN:9789383352616
2	David A. Bell, "Electronic Devices and Circuits", Fourth Edition, PHI
3	Floyd, "Electronic Devices", Seventh Edition, Pearson
4	Sedra and Smith, "Microelectronic Circuits", Oxford University Press, 2004

Useful links

1	https://nptel.ac.in/content/storage2/courses/117101058/downloads/
2	http://www.nesoacademy.org/electronics-engineering/analog-electronics/analog
3	https://onionesquereality.wordpress.com/.../more-video-lectures-iit-open
4	http://www.electronics-tutorials.ws/transistor/tran_1.html
5	http://www.allaboutcircuits.com/textbook/semiconductors/chpt-1/active-versus-passivedevices/



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	ET4T005	Signal and System	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of Integration
2	Differentiation
3	Complex Numbers

Prior Reading Material/ useful links	
1	https://onlinecourses.nptel.ac.in/noc20_ee15/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee28/preview
3	https://nptel.ac.in/courses/117106116

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Understand different types of signals & systems.
2	CO2	Familiar with the properties of LTI (Linear Time Invariant System) system and process involved in analysis of signals before transmission.
3	CO3	Solve various complex mathematical problems for signal analysis and conversion of signals from one domain to another.
4	CO4	Apply knowledge of sampling and interpolation to sample and reconstruct signals during real time signal transmission and reception.
5	CO5	Analyze continuous and discrete systems in time and frequency domain.
6	CO6	Design Various Mathematical models to Investigate stability of the system.

Syllabus:

Course Contents	
Unit I	<p>: Basics of signals and system</p> <p>Introduction and Classification of signals, Definition of signal, Continuous time and discrete time signal, Classification of signals as even, odd, periodic and non-periodic, Deterministic and non-deterministic, energy and power, elementary signals used for testing, Exponential, sine, impulse, step and its properties, ramp, rectangular, triangular, signum, sinc, Operations on signals, Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shifting and time folding, Systems Definition, Classification, linear and non-linear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable invertible.</p> <p style="text-align: right;">[6 Hours]</p>
Unit II	<p>Time Response Analysis</p> <p>Continuous-Time and Discrete-Time Signals, Transformations of the Independent Variable, Continuous-Time and Discrete-Time Systems, Basic System Properties, Discrete-Time LTI(Linear Time Invariant System) Systems, the Convolution Sum, Continuous-Time LTI Systems, the Convolution Integral, Properties of Linear Time-Invariant Systems, Causal LTI Systems Described by Differential and Difference Equations.</p> <p style="text-align: right;">[6 Hours]</p>
Unit III	<p>Fourier Series Analysis</p> <p>The Response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-Time Periodic Signals, Convergence of the Fourier Series, Properties of Continuous-Time Fourier Series, Fourier Series Representation of Discrete-Time Periodic Signals, Properties of Discrete-Time Fourier Series, Fourier Series and LTI Systems, Examples of Continuous-Time Filters Described by Differential Equations, Examples of Discrete-Time Filters Described by Difference Equations.</p> <p style="text-align: right;">[6 Hours]</p>
Unit IV	<p>Fourier Transform Analysis</p> <p>The Continuous-Time Fourier Transform, Representation of A periodic Signals, The Fourier Transform for Periodic Signals, Properties of the Continuous-Time Fourier Transform, Systems Characterized by Linear Constant-Coefficient Differential Equation, The Discrete-Time Fourier Transform, Representation of A periodic Signals, The Fourier Transform for Periodic Signals, Properties of the Discrete-Time Fourier Transform, Systems Characterized by Linear Constant-Coefficient Difference Equations.</p> <p style="text-align: right;">[6 Hours]</p>
Unit V	<p>Frequency Response Analysis</p> <p>The Magnitude-Phase Representation of the Frequency Response of LTI Systems, Concept of Frequency Response, Group Delay, Phase Delay, Time-Domain Properties of Ideal Frequency-Selective Filters, Time- Domain and Frequency-Domain Aspects of Non ideal Filters, First-</p>

	Order and Second-Order Continuous-Time Systems, Discrete-Time System, Representation of a Continuous-Time Signal by its Samples, the Sampling theorem, Reconstruction of a Signal from Its Samples Using Interpolation, Aliasing effect, Discrete-Time Processing of Continuous-Time Signals. [6 Hours]
Unit VI	Laplace and Z-Domain Analysis The Laplace Transform, Region of Convergence for Laplace Transforms, Inverse Laplace Transform, Properties of the Laplace Transform, Analysis and Characterization of LTI Systems Using Laplace Transform, System Function Algebra and Block Diagram Representations, The Unilateral Laplace Transform, The z-Transform, Region of Convergence for the z-Transform, Inverse z-Transform, Properties of z-Transform, Analysis and Characterization of LTI Systems Using z-Transforms, System Function Algebra and Block Diagram Representations, The Unilateralz-Transform. [6Hours]
Text Books	
1	Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia), Private Limited,
2	B. P. Lathi, "Linear Systems and Signals", OXFORD University Press.
3	A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
4	"Signals and Systems", A. Nagoor Kanni, 2nd Edition, McGraw Hill.
Reference Books	
1	J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.
2	2. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
3	3. Signals Systems and Transforms, 3rd Edition, 2004, C. L. Philips, J.M.Parr and EveA.Riskin, Pearson education.
4	4. S.S. Soliman & M.D. Srinath, "Continuous and Discrete Signals and Systems", Prentice-Hall, 1990.
5	5. Shaila Dinkar Apte "Signals and Systems" Principles and Applications", Cambridge University Press.
6	3. Signals Systems and Transforms, 3rd Edition, 2004, C. L. Philips, J.M.Parr and EveA.Riskin, Pearson education.
Useful links	
1	NPTEL link principal of signals and system. https://www.youtube.com/watch?v=xrVWB9VYZ64&list=PLq-Gm0yRYwTjwxaqapPsSAHzs4_nkQLVr
2	E-BOOK Signal and Systems Simon Haykin Wiley https://www.academia.edu/38588821/Signal_and_Systems_Simon_Haykin_Wiley
3	E-BOOK B. P. Lathi, "Linear Systems and Signals", https://india.oup.com/productPage/5591038/7421214/9780198062271



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	ET4T006	Electromagnetic Fields	3	1	0	4

Prerequisites for the course	
1	A basic course in electrical engineering
2	KCL, KVL, network theorems, AC analysis
3	Electromagnetic Field theory

Prior Reading Material /useful links	
1	Engineering Electromagnetics, W. H. Hayt and J. A. Buck, 7th edition, Tata McGraw Hill
2	Electromagnetics with applications, J. D. Kraus and Fleisch, Tata McGraw-Hill
3	Principles of Electromagnetics, M. O. Sadiku, Oxford University Press

Course Outcomes:

Sr. No	Course outcome number	CO statement
1	CO1	Understand characteristics and wave propagation on high frequency transmission lines
2	CO2	Carry out impedance transformation on TL
3	CO3	Use sections of transmission line sections for realizing circuit elements
4	CO4	Characterize uniform plane wave
5	CO5	Calculate reflection and transmission of waves at media interface
6	CO6	Analyze wave propagation on metallic waveguides in modal form

Syllabus:

Course Contents	
Unit I	<p>Maxwell's Equations</p> <p>Maxwell's Equations Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface [6Hours]</p>
Unit II	<p>Uniform Plane Wave</p> <p>Uniform Plane Wave Uniform plane wave, Propagation of wave, Wave polarization, Poincare's Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor. [6 Hours]</p>
Unit III	<p>Transmission Lines</p> <p>Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission lines sections as circuitelements. [6Hours]</p>
Unit IV	<p>Plane Waves at a Media Interface</p> <p>Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary. [6Hours]</p>
Unit V	<p>Wave propagation</p> <p>Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide [6Hours]</p>
Unit VI	<p>Radiation</p> <p style="text-align: center;">Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna. [6Hours]</p>
Text Books	
1	R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
2	E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India

Reference Books	
1	Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.
2	4. David Cheng, "Electromagnetics", Prentice Hall.
3	5. Sadiku, "Elements of Electromagnetics", Oxford.
4	6. Krauss, "Electromagnetics", McGraw Hill, New York, 4th edition.
5	7. W. H. Hayt, "Engineering Electromagnetics", McGraw Hill, New Delhi, 1999.
6	8. Edminister, Schaum series, "Electromagnetics", McGraw Hill, New York, 1993, 2 nd edition.
7	Sarvate, "Electromagnetism", Wiley Eastern.
Useful links	
1	https://nptel.ac.in/courses/108105155
2	https://archive.nptel.ac.in/courses/108/106/108106170/
3	https://onlinecourses.nptel.ac.in/noc21_ee83/preview
4	https://onlinecourses.nptel.ac.in/noc21_ee83/preview



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	ET4L003	Electrical Machines and Instruments Lab	0	0	2	1

Prerequisites for the course

1	Basic Electrical Engineering
2	Circuit theory

Prior Reading Material/ useful links

1	https://nptel.ac.in/courses/108105155
2	https://onlinecourses.nptel.ac.in/noc21_ee24/preview
3	https://archive.nptel.ac.in/courses/108/102/108102146/
4	https://nptel.ac.in/courses/108105131

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Remember basic principles & construction, of electrical instruments and ac & dc machines.
2	CO2	Understand the operation, performance and characteristics of electrical instruments and ac & dc machines.
3	CO3	To identify the different issues related to the electrical instruments, speed control and torque improvement in ac & dc machines.
4	CO4	Analyze the performance indices of electrical instruments and ac & dc machines.
5	CO5	Evaluate the operation of ac and dc machines along with the testing of electrical instruments.
6	CO6	Solve the different problems related to operation, & performance indices of electrical instruments ac and dc machines.

Syllabus:

List of Experiment	
Expt.1	To study the construction of field and armature of DC Machine.
Expt.2	To determine external characteristics of DC Generator
Expt.3	To perform Load test on DC shunt motor.
Expt.4	To perform speed control of DC shunt motor using armature and field control method.
Expt.5	To perform Load test on DC shunt generator.
Expt.6	To study and perform the voltage build up in the DC shunt Generator
Expt.7	To study the internal construction of three phase induction motor.
Expt.8	To perform no Load and block rotor tests on squirrel cage induction motor
Expt.9	To study various starting methods of three phase induction motor
Expt.10	To control speed of induction motor by V/F control
Expt.11	To control speed of slip ring induction motor by rotor resistance control
Expt.12	To study the internal construction of three phase synchronous machine.
Expt.13	Determination of sequence impedance of salient pole synchronous machine
Expt.14	To perform speed control of Stepper motor
Expt.15	To study various electrical instruments with their industrial applications.
Text Books	
1	Electrical Machines by Ashfaq Husain, Dhanpatrai and publication
2	Instrumentation Devices System edition C. S. Rajan, G. R. sharma.
Reference Books	
1	A course in Electrical and Electronic Measurement and Instrumentation" by A. K. Sawhney (Publisher name: Dhanpat Rai & Co.)
2	2. Electronics Instrumentation by H.S. Kalsi (Publisher McGraw Hill)
3	3. Abhijit Chakrabarti & Sudipta Debnath, "Electrical Machines", Tata McGraw-hill Publication.
4	4. William H Hayt, Jack E Kimmerly and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill.
5	5. A.E. Fitzgerald, Charles Kingsley & Jr. Stephen D. Umans, "Electrical Machinery", Tata McGraw-hill Publication 6th Edition.
6	6. I.J Nagarath & D.P Kothari, "Electrical Machines", Tata McGraw-hill Publication 4 th Edition.
7	7. T. J. E. Miller, "Brushless permanent-magnet and reluctance motor drives", Oxford

	University Press (1989).
Useful links	
1	https://www.digimat.in/nptel/courses/video/108105017/L26.html
2	https://archive.nptel.ac.in/courses/108/102/108102146/
3	https://nptel.ac.in/courses/108102146
4	https://nptel.ac.in/courses/108101167



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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.

Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	ET4L004	Electronic Devices and Circuits-II Lab	0	0	2	1

Prerequisites for the course

1	A basic course in electrical engineering
2	KCL, KVL, network theorems, AC analysis

Prior Reading Material/useful links

1	https://onlinecourses.nptel.ac.in/noc21_ee80/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee55/preview
3	https://archive.nptel.ac.in/courses/117/106/117106089/

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Acquire the basic concepts of different semiconductor components and understand the use of semiconductor devices in different electronic circuits.
2	CO2	Plot and study the characteristics of semiconductor devices like MOSFET, UJT
3	CO3	Simulate Electronic circuits using SPICE.
4	CO4	Calculate different performance parameters of transistor.
5	CO5	Design, build, and test the performance of various circuits.

Syllabus:

List of Experiment	
Expt.1	To Plot Drain and Transfer characteristics of N- Channel E- MOSFET
Expt.2	To design NMOS Common source amplifier
Expt.3	To obtain the frequency response of MOSFET amplifier in common source configuration with given specifications
Expt.4	To Study MOSFET as a Switch
Expt.5	To assemble and characterize MOSFET current mirrors
Expt.6	To design and plot the static (VTC) and dynamic characteristics of a digital CMOS inverter using Virtual lab
Expt.7	To design and plot the dynamic characteristics of 2-input NAND and NOR logic gates using CMOS technology using Virtual lab
Expt.8	Implement 2:1 Multiplexer using transmission gate
Expt.9	Implementation of NAND and NOR gate
Expt.10	To Design and Simulate Wein Bridge oscillator using FET
Expt.11	To Design and Simulate RC Phase shift oscillator using FET
Expt.12	To Design and Simulate Hartley Oscillator using FET
Expt.13	To Design and Simulate Colpitts Oscillator using FET
Expt.14	To Study the operation of UJT as a Relaxation Oscillator
Expt.15	To Design adjustable Voltage Regulated Power Supply using LM317
Text Books	
1	Neil Weste and David Harris, Addison-Wesley “CMOS VLSI Design – A Circuits and Systems Perspective”, Fourth edition, Pearson
2	R.L. Boylestad & Nashlesky, “Electronic devices and Circuits Theory” Ninth Edition, Prentice Hall of India
3	Donald Neaman, “Electronic Circuit Analysis and Design”, Third Edition, Tata McGraw Hill
Reference Books	
1	David A. Bell, “Electronic Devices and Circuits”, Fourth Edition, PHI
2	Floyd, “Electronic Devices”, Seventh Edition, Pearson
3	Sedra and Smith, “Microelectronic Circuits”, Oxford University Press, 2004

Useful links

1	http://www.electronics-tutorials.ws/transistor/tran_1.html
2	http://www.allaboutcircuits.com/textbook/semiconductors/chpt-1/active-versus-passivedevices/
3	David A. Bell, "Electronic Devices and Circuits", Fourth Edition, PHI
4	https://nptel.ac.in/content/storage2/courses/117101058/downloads/
5	http://www.nesoacademy.org/electronics-engineering/analog-electronics/analog



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	ET4L005	Signal and System Lab	0	0	2	1

Prerequisites for the course

1	Basic knowledge of Integration
2	Differentiation
3	Complex Numbers

Prior Reading Material/ useful links

1	https://onlinecourses.nptel.ac.in/noc20_ee15/preview
2	https://onlinecourses.nptel.ac.in/noc21_ee28/preview
3	https://nptel.ac.in/courses/117106116

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Understand basics of SCILAB syntax, functions and programming.
2	CO2	Familiar With characterization of various continuous and discrete time signals.
3	CO3	Solve the Problems on basic operations on the signals.
4	CO4	Apply Knowledge of linear time-invariant (LTI) systems for computing its response.
5	CO5	Analyze the spectral characteristics of signals using various transforms.
6	CO6	Design the Mathematical model of systems using various transforms.

Syllabus:

List of Experiment	
Expt.1	Introduction to SCILAB.
Expt.2	To create user defined functions for generating Continuous and Discontinues time sinusoidal signal.
Expt.3	To create user defined functions for generating Continuous and Discontinues time delta signal and unit step signal.
Expt.4	To create user defined functions for generating Continuous and Discontinues time Exponential and RAMP Signal.
Expt.5	To create user defined functions for signal operation: signal addition, subtraction, and multiplication.
Expt.6	To create user defined functions for signal operation: time shifting, time scaling and time inversion.
Expt.7	To compute convolution of two signals and verify its properties.
Expt.8	To compute auto-correlation of two signals and verify its properties.
Expt.9	To compute cross-correlation of two signals and verify its properties.
Expt.10	To obtain the response of LTI system defined by linear constant coefficient difference equations.
Expt.11	To synthesize the periodic signal using Fourier series.
Expt.12	To analyze the spectrum of the signal using Fourier transform and verify its properties
Expt.13	To compute and plot the impulse response and pole-zero diagram of transfer function using Laplace transform
Expt.14	To compute and plot the impulse response and pole-zero diagram of transfer function using Z-transform.
Expt.15	Program for calculating Inverse z-transform of Given function.
Expt.16	Program for calculating Inverse Laplace-transform of Given function
Expt.17	To Analyze discrete-time signals with the (discrete) Fast Fourier transform
Expt.18	To find whether the system is linear or nonlinear for the given signal.

Text Books

1	Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia), Private Limited,
2	B. P. Lathi, "Linear Systems and Signals", OXFORD University Press.
3	A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.

Reference Books

- | | |
|---|--|
| 1 | J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001. |
| 2 | M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003. |

Useful links

- | | |
|---|--|
| 1 | NPTEL link principal of signals and system.
https://www.youtube.com/watch?v=xrVWB9VYZ64&list=PLq-Gm0yRYwTjwxaqapPsSAHzs4_nkQLVr |
| 2 | E-BOOK Signal and Systems Simon Haykin Wiley
https://www.academia.edu/38588821/Signal_and_Systems_Simon_Haykin_Wiley |
| 3 | E-BOOK B. P. Lathi, "Linear Systems and Signals",
https://india.oup.com/productPage/5591038/7421214/9780198062271 |



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
IV	ET4T007	Innovation and Entrepreneurship Development	2	0	0	Audit

Prerequisites for the course

1	Inquiry and experiment with creative thinking
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Prior Reading Material/ useful links

1	Entrepreneurship Development, S. S. Khanka, S. Chand Publishers.
2	https://onlinecourses.nptel.ac.in/noc22_de08/preview

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Identify and validate of ideas.
2	CO2	Remember Patent registration of Innovation.
3	CO3	Understand roles and responsibilities of Entrepreneurship.

Syllabus:

Course Contents	
Unit I	Innovation Concept of creativity, innovation, invention, discovery. Methods for development of creativity, convergent & divergent thinking etc. Introduction to Intellectual Property Rights (IPR), Patent and laws related to patents. [06Hours]
Unit II	Entrepreneurship Concept of entrepreneurship, its relations in economic developments, Eventuation of concept of entrepreneur, characteristics of an Entrepreneur, Types of entrepreneurs, Qualities of entrepreneur, Factors affecting growth of entrepreneurship. [06Hours]
Unit III	Role of Entrepreneurial Bodies Theory of achievement, motivation, Medalland's. Experiment, Women entrepreneurship, Role of SSI, its advantages & limitations, policies governing small scale industries, Procedure to set up small scale industrial unit, Advantages and limitations of SSI. [06 Hours]
Unit IV	Role of Entrepreneurial Support Factors governing project selection, Market survey, Preparation of project report. Financial, technical & market analysis of project. Entrepreneurial support systems, Role of consultancy organization like, District Industrial Centre, State Industrial Development Corporation, Financial institution, Latest SSI schemes of DIC (to be confirmed from DIC from time to time. [06 Hours]
Text Books	
1	Entrepreneurship Development, S. S. Khanka, S. Chand Publishers.
Reference Books	
1	Creativity Innovation & Entrepreneurship, Zechariah James Blanchard, Needle Rat Business Publishers.
Useful links	
1	https://nptel.ac.in/courses/110107094
2	https://onlinecourses.nptel.ac.in/noc21_mg70/preview
3	https://nptel.ac.in/courses/110106141



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Program: B.Tech in 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:

Sr. No	Course outcome number	Co statement
1	CO1	Represent discrete-time signals analytically and visualizethem in the time domain.
2	CO2	Understand and meet the requirement of theoreticaland 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 thewavelet transform.
6	CO6	Discuss the use of multi rate signal processing to estimate the wavelet transform.

Syllabus:

Course Contents	
Unit I	<p>DSP Preliminaries</p> <p>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.</p> <p style="text-align: right;">[5 Hours]</p>
Unit II	<p>Discrete Fourier Transform</p> <p>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</p> <p style="text-align: right;">[5 Hours]</p>
Unit III	<p>Z transforms</p> <p>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 for LTI systems, Inverse Z transform, Power series method, partial fraction expansion method, Solution of difference equations.</p> <p style="text-align: right;">[5 Hours]</p>
Unit IV	<p>IIR Filter Design</p> <p>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, Lowpass, High pass, Bandpass and Bandstop filters design using spectral transformation (Design of all filters using Lowpass filter)</p> <p style="text-align: right;">[5 Hours]</p>
Unit V	<p>FIR Filter Design</p> <p>Ideal filter requirements, Gibbs phenomenon, windowing techniques, characteristics and comparison of different window functions, Design of linear phase FIR filter using window and frequency sampling method. FIR filters realization using direct form, cascade form and lattice form.</p> <p style="text-align: right;">[5 Hours]</p>
Unit VI	<p>Introduction to Multirate signal processing</p> <p>Concept of Multirate DSP, Introduction to Up sampler, Down sampler and two channel filterbank, Sampling rate conversion by rational factor I/D, Application of Multirate signal processing in communication, Music processing, Image processing and Radar signal processing.</p> <p style="text-align: right;">[5 Hours]</p>
Text 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
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 and W.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 in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5T002	Microcontroller and Application	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of microcontroller architecture, register details, peripherals, memories knowledge of c programming etc. knowledge of Cprogramming.

Prior Reading Material/useful links	
1	https://www.youtube.com/watch?v=ot-ufo2AJ_c
2	https://www.taylorfrancis.com/books/mono/10.4324/9781315367118/computer-architecture-joseph-dumas
3	https://www.accessscience.com/content/article/a154030

Course Outcomes:

Sr.No	Course outcome number	Co statement
1	CO1	Know importance of microcontroller in designing embedded application and use of hardware and software tools.
2	CO2	Understand modern tools like Programmers, Debuggers, cross compilers and current IDE i.e. integrated development environment tools
3	CO3	Apply knowledge of microcontroller to interface mechanical system to function in multidisciplinary system like robotics, Automobiles
4	CO4	Analyze and formulate control and monitoring systems using microcontrollers.
5	CO5	Evaluate experiments based on interfacing of devices to real world applications.
6	CO6	Design real time cost effective controllers using microcontroller based system and develop interfacing to real world devices to serve engineering solution for Global, social and economic context.

Syllabus:

Course Contents	
Unit I	Fundamentals of Microcontrollers Introduction to the general structure of 8 and 16 bit Microcontrollers Harvard & Von Neumann architecture, RISC & CISC processors, Role of microcontroller in embedded system, Selection criteria of microcontroller Block diagram and explanation of 8051, Port structure, memory organization, Interrupt structure, timers and its modes, serial communication modes. Overview of Instruction set, Sample programs (assembly): Delay using Timer and interrupt, Programming Timer 0&1, Data transmission and reception using Serial port. <p style="text-align: right;">[6 Hrs]</p>
Unit II	Interfacing with 8051 PART I Software and Hardware tools for development of microcontroller-based systems such as assemblers, compilers, IDE, Emulators, debuggers, programmers, development board, DSO, Logic Analyzer, Interfacing LED with and without interrupt, Keypads, Seven Segment multiplexed Display, LCD, ADC Interfacing. All Programs in assembly language and C. <p style="text-align: right;">[6 Hrs]</p>
Unit III	Interfacing with 8051 PART II 8051 timer programming, serial port and its programming, interrupt programming, LCD and keyboard interfacing, ADC and DAC interfacing, interfacing to external memory Interfacing of DAC, Temperature sensors, Stepper motor, Motion detectors, Relay, Buzzer, Opto isolators. All programs in assembly and C <p style="text-align: right;">[6 Hrs]</p>
Unit IV	PIC Microcontroller Architecture PIC 10, PIC12, PIC16, PIC18 series comparison, features and selection as per application PIC18FXX architecture, registers, memory Organization and types, stack, oscillator options, BOD, power down modes and configuration bit settings, timer and its programming, Brief summary of Peripheral support, Overview of instruction set, MPLAB IDE & C18 Compiler. <p style="text-align: right;">[6 Hrs]</p>
Unit V	Real World Interfacing Part I Port structure with programming, Interrupt Structure (Legacy and priority mode) of PIC18F with SFRS, Interfacing of switch, LED, LCD (4&8 bits), and Key board, Use of timers with interrupts, CCP modes: Capture, Compare and PWM generation, DC Motor speed control with CCP: All programs in embedded C. <p style="text-align: right;">[6 Hrs]</p>
Unit VI	Real World Interfacing Part II Basics of Serial Communication Protocol: Study of RS232, RS 485, I2C, SPI, MSSP structure (SPI & I2C), UART, Sensor interfacing using ADC, RTC (DS1306) with I2C and EEPROM with SPI. Design of PIC test Board, Home protection System: All programs in embedded C. <p style="text-align: right;">[6 Hrs]</p>
Text Books	
1	Mazidi&Mazidi, The 8085 microcontroller & embedded system, using assembly and C,2nd edi, pearsonedu.
2	Calcut, 8051 microcontrollers: Applications based introduction, Elsevier.
3	Udyashankara V., Mallik arjuna swamy, 8051 microcontroller, TMH.
4.	Han-way Huang, using The MCS-51 microcontroller, Oxford university press.
Reference Books	
1	. M.Bates, "PIC Microcontrollers", Newnes, 2011
2	M.A. Mazidi, S. Naimi, S. Naimi, "The AVR Microcontroller and Embedded

	Systems: Using Assembly and C”, Prentice Hall, 2011.
3	M.A.Mazidi,R.D.McKinlay,J.G.Mazidi,“The8051Microcontroller:A Systems Approach”, Pearson, 2013.
Useful links	
1	https://onlinecourses.nptel.ac.in/noc21_ee18/preview
2	https://onlinecourses.swayam2.ac.in/aic20_sp04/course
3	https://www.electronicshub.org/?s=microcontroller
4	https://www.exploreembedded.com/



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Program: B.Tech in 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, types of 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:

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	<p>Introduction to Control Problem</p> <p>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.</p> <p style="text-align: right;">[7 Hours]</p>
Unit II	<p>Time Response Analysis</p> <p>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</p> <p style="text-align: right;">[7 Hours]</p>
Unit III	<p>Stability Analysis</p> <p>Concept of Stability, Routh-Hurwitz Criteria, Relative Stability analysis, Root-Locus technique. Construction of Root-loci, Dominant Poles, Application of Root Locus Diagram,</p> <p style="text-align: right;">[7 Hours]</p>
Unit IV	<p>Frequency-Response Analysis</p> <p>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.</p> <p style="text-align: right;">[7 Hours]</p>
Unit V	<p>Introduction to Controller Design</p> <p>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.</p> <p style="text-align: right;">[6 Hours]</p>
Unit VI	<p>State Variable Analysis</p> <p>Concepts of state variables, State space model. Diagonalization of State Matrix, Solution of state equations, Eigenvalues 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.</p> <p style="text-align: right;">[8 Hours]</p>
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.
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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“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.

Program: B.Tech in 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:

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	<p>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.</p> <p style="text-align: right;">[6 Hours]</p>
Unit II	<p>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.</p> <p style="text-align: right;">[6 Hours]</p>
Unit III	<p>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.</p> <p style="text-align: right;">[6 Hours]</p>
Unit IV	<p>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.</p> <p style="text-align: right;">[6 Hours]</p>
Unit V	<p>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.</p> <p style="text-align: right;">[6 Hours]</p>
Unit VI	<p>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-Roboteconomics.</p> <p style="text-align: right;">[7 Hours]</p>
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.

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/CI23xQrvFhk
2	https://youtu.be/tbAMXgAVPn8
3	https://nptel.ac.in/courses/108106098



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Program: B.Tech in Electronics and Telecommunication Engineering

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:

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	<p>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 analogenvironment. [7Hrs]</p>
Unit II	<p>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]</p>
Unit III	<p>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, AvailabilityandSecurity. [6Hrs]</p>
Unit IV	<p>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]</p>
Unit V	<p>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]</p>
Unit VI	<p>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: Digitalcellulartelephone. [5Hrs]</p>
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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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5L001	Digital signal processing lab	0	0	2	3

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:

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 Schaffer, 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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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5L002	Microcontroller and application lab	0	0	2	3

Prerequisites for the course	
1	Basic knowledge of Microprocessor and microcontroller programming.

Prior Reading Material/useful links	
1	https://www.youtube.com/watch?v=a56Cfmcitf4
2	https://www.youtube.com/watch?v=liRPtvj7bFU

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	1. Design assembly languages structure and programming.
2	CO2	2. Interface various peripherals with 8051 microcontroller.
3	CO3	3. Simulate the programs on different software platforms.

Syllabus:

Course Contents	
EXPT.1	Write and execute an assembly language program to perform addition & subtraction on 8 bit / 16 bit number for 8051 using Keil uvision 4.
EXPT.2	Write and execute an assembly language program to perform Multiplication & Division on 8 bit / 16 bit number for 8051 using Keil uvision 4.
EXPT.3	Write and execute 8051 assembly language program to find smallest byte in a string of bytes.
EXPT.4	Write and execute 8051 assembly language program to exchange two data strings.
EXPT.5	Write and execute 8051 assembly language program to generate square wave of 1 KHz (and any other frequency) on one of the pin of output port
EXPT.6	Design & implementation of LED & Switch interfacing with 8051.
EXPT.7	Design & implementation of 7 segment display interfacing with 8051.
EXPT.8	Design & implementation of 16 x 2 LCD interfacing with 8051.
EXPT.9	Design & implementation of DC Motor interfacing with 8051.
EXPT.10	Design & implementation of Stepper Motor interfacing with 8051.
EXPT.11	Design & implementation of 4 x 4 matrix keyboard interfacing with PIC Microcontroller.
EXPT.12	Interfacing of 8051 Microcontroller with various display devices.
EXPT.13	Interfacing of 8051 Microcontroller with ADC and DAC.
EXPT.14	Interfacing of 8051 Microcontroller with DC motor.
EXPT.15	To study the serial port communication with 8051 microcontroller.
Text Books	
1	. M.Bates, "PIC Microcontrollers", Newnes, 2011
2	M.A. Mazidi, S. Naimi, S. Naimi, "The AVR Microcontroller and Embedded Systems: Using Assembly and C", Prentice Hall, 2011.
3	
Reference Books	
1	M.A. Mazidi, S. Naimi, S. Naimi, "The AVR Microcontroller and Embedded Systems: Using Assembly and C", Prentice Hall, 2011.
2	M.A. Mazidi, R.D. McKinlay, J.G. Mazidi, "The 8051 Microcontroller: A Systems Approach", Pearson, 2013.
Useful links	
1	https://www.youtube.com/watch?v=m_5gKvaAjNc
2	https://elearn.daffodilvarsity.edu.bd/course/view.php?id=7763
3	https://www.youtube.com/watch?v=vhoouVHjdU



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5L005	Software workshop lab	0	0	2	3

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:

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 Technolgoy”, 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 in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
V	ET5T006	Consumer Affairs	2	0	0	1

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:

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	<p>Conceptual Framework</p> <p>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</p> <p>Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite</p> <p style="text-align: right;">[6Hours]</p>
Unit II	<p>The Consumer Protection Law in India</p> <p>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.</p> <p style="text-align: right;">[6 Hours]</p>
Unit III	<p>Grievance Redressal Mechanism under the Indian Consumer Protection Law</p> <p>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.</p> <p style="text-align: right;">[6 Hours]</p>
Unit IV	<p>Role of Industry Regulators in Consumer Protection</p> <p>Banking: RBI and Banking Ombudsman Insurance: IRDA and Insurance Ombudsman Telecommunication: TRAI Food Products: FSSAI Electricity Supply: Electricity Regulatory Commission Real Estate Regulatory Authority</p> <p style="text-align: right;">[6 Hours]</p>
Text Books	
1	Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H. K. Awasthi. (2007) Consumer Affairs, Universities Press.
2	Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.
3	Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi
4	Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
5	Empowering Consumer e-book, www.consumeraffairs.nic.in
Reference Books	
1	Misra Suresh, (Aug 2017) "Is the Indian Consumer Protected? One India One People.
2	Raman Mittal, Sonkar Sumit and Parineet Kaur (2016) Regulating Unfair Trade 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 at www.cuts-international.org/doc01.doc .
Useful links	
1	www.ncdr.nic.in
2	www.consumeraffairs.nic.in
3	www.iso.org
4	www.bis.org.in



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Semester	Course Code	Name of the course	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 and its advantages. reference model etc.
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Prior Reading Material/useful links

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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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	<p>Uniform Plane Waves 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 theorem and vector. [6Hours]</p>
Unit II	<p>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, Stub matching. [6Hours]</p>
Unit III	<p>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 Coherence Time. 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]</p>
Unit IV	<p>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 all these elements. [4Hours]</p>
Unit V	<p>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 Dolph-Tchebyshev array, Planar Array, Circular Array, Log Periodic Antenna, Yagi Uda Antenna Array. [6Hours]</p>
Unit VI	<p>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, Aperture antenna. [6Hours]</p>
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	Mathew N O Sadiku, "Elements of Electromagnetics" 3rd edition, 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 Reading Material/useful links	
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 of a switch. [5Hours]
Unit II	Data Link Layer Introduction to Data Link Layer, DLC Services, DLL protocols, HDLC, PPP, Media Access Control: Random Access, Controlled Access, Channelization. Wired LAN: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10Gigabit Ethernet. [5Hours]
Unit III	Wireless LANS & Virtual Circuit Networks Introduction, Wireless LANS: IEEE 802.11 project, Bluetooth, Zigbee, Connecting devices and Virtual LANS: Connecting devices, Virtual LANS. [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, Internet Protocols. [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 of India.
3	TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.
4	Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, 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	Define and Classify Embedded System and understand role of each element of embedded system. State special requirements and constraints (such as sustainability, reliability) that are imposed on embedded systems.
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 for embedded 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 Overview With Applications. [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 Serial Bus Protocols. [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 Case Study: RT-Linux And Win-CE, Device Driver Programming. [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, Cortex Architecture Overview. [6Hours]
Unit V	ARM Processor Architecture and Programming ARM 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 And Stack) Handling. [6 Hours]
Text Books	
1	Kenneth J. Ayala and Dhananjay V. Gadre, "The 8051 Microcontroller & Embedded System Using Assembly And C", Cengage Learning, India Edition, 2nd impression, 2010.
2	Mazidi A. M., Mazidi J. G. and McKinley R. D., "The 8051 Microcontroller And Embedded Systems-Using Assembly And C", Pearson Education, 2nd Ed., 2008.
3	Raj Kemal, "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Publications, 2nd Ed., 2008
4	Sloss A. N., Symes D. and Wright C., "ARM System Developer's Guide", Morgan Kaufmann Publishers, 1st Ed., 3rd Reprint, 2006.
Reference Books	
1	Jonathan W. Valvano, "Embedded Microcomputer Systems: Real Time Interfacing"; Thomson Learning, INDIA Edition, 2nd Reprint, 2007
2	Alex Doboll and Edward H. Currie, "Introduction To Mixed-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 to formal 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	Represent given problem using state space representation and apply informed and uninformed search techniques on it.
3	CO3	Analyze the issues in the design of search programs and apply 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, The Level Of The Model, Criteria For Success, Some General References, One Final Word. [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-Ends Analysis. [3Hours]
Unit III	Expanding 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 Versus Backward Reasoning. [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 AI Programming Languages. [5Hours]
Text Books	
1	Artificial Intelligence – A Modern Approach (3rd Edition) By – Stuart Russell and Peter Norvig
2	Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of 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 (2nd Edition) 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 Ivan Bratko (Addison-Wesley)
5	“Programming with PROLOG” –By Klocksinn 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 and Apply network tools.
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, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Firewalls using open source available software and tools.

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, <i>James F Kurose and Keith W Ross</i>
2	Andrew Tanenbaum, “Computer Networks” 4th /5th Edition ,Prentice Hall Publications
Reference Books	
1	JamesF.Kurose,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://ycetnlnl.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 is expected).
Expt.4	Interfacing of displays (LCD, LED, 7 Segment) with PCs
Expt.5	Hardware Mini Project <ul style="list-style-type: none">• Hardware Mini project should consist of Circuit design, PCB fabrication, assembling & testing of small digital or analog application circuit.• Mini Project work should be carried out by group of maximum three students.• Student should use standard software available for drawing circuit schematic, simulating the design and 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	Printed Circuit Boards: Design and Technology; Bosshart; Tata McGraw-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 of knowledge of recruitment pattern of companies through on campus placement processes, off campus placement processes, national level recruitment 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	Solve the problem easily by using Short-cut method with time 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	Learn a series of techniques through practical activities to develop presenting skills and enhance confidence to expand the potential of the individual.
5	CO5	Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity.
6	CO6	Ability to target the resume to the presenting purpose and Demonstrate professional behaviour(s) including preparedness, professional attire, and respectful presentation during interviews

Syllabus:

Course Contents	
Unit I	<p><u>Part I: - Quantitative Ability</u></p> <p>Module 1 Speed Math's Calculation, Number Systems, Ratio & Proportion, Percentage [03 Hours]</p> <p>Module 2 Profit – Loss & Discount, Simple Interest & Compound Interest, Simple Equation and Age's [03Hours]</p> <p>Module 3 Averages Mixture & Allegation, Time and work, Time Speed & Distance, Permutation–Combination&Probability. [03Hours]</p>
Unit II	<p><u>Part II: - Reasoning Ability</u></p> <p>Module 1 Coding Decoding, Blood Relation, Direction sense, Number Series, Analogy [03 Hours]</p> <p>Module2 SittingArrangementPuzzles. [03 Hours]</p> <p>Module 3 Syllogism, Statementcourseofaction, Statementarguments, Statement Assumptions, Miscellaneous TypeofReasoning [03Hours]</p>
Unit III	<p><u>Part III: - Employability Skills</u></p> <p>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]</p> <p>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]</p> <p>Module 3ResumeBuilding Meaning, Difference among Bio-data, Curriculum vitae and Resume. CV writing tips, the content of Resume, Structure of Resume [2 Hours]</p>
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, <i>Soft Skills Know yourself and Know the World</i> .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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Program: B.Tech in Electronics and Telecommunication Engineering

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 number	CO statement
1	CO1	Identify problems based on societal /research needs.
2	CO2	Demonstrate capabilities of self-learning in a group, which lead to 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	Analyze the impact of solutions in societal and environmental context 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 than 4 (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	A logbook to be prepared by each group, where in group can record weekly 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	Students shall convert the best solution into working model using various components of their domain areas and demonstrate.
8	The solution to be validated with proper justification and report to be compiled in standard format
Text Books	
1	Mini and Major Electronics Projects for Engineering Students (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	<p>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 development research. [5Hours]</p>
Unit II	<p>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 of working hypothesis. [5Hours]</p>
Unit III	<p>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]</p>
Unit IV	<p>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 and interpretation. [5 Hours]</p>
Unit V	<p>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]</p>
Unit VI	<p>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 related aspects of intellectual property rights (TRIPS); Scholarly publishing – IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability. [5Hours]</p>
Text Books	
1	Kothari, C.R. Research Methodology (Methods and Techniques), New Age 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 Li Cambridge 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. and Agarwal, U.K., 2002. An introduction 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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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VI	ET6O002	OPEN Elective Course-II Introduction to Microprocessor, 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 number	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 microprocessor or 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 device drivers.
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. <div style="text-align: right;">[8 Hours]</div>
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 <div style="text-align: right;">[8 Hours]</div>
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. <div style="text-align: right;">[8Hours]</div>
Unit IV	Introduction to Basic Microcontroller Introduction to basic microcontroller,8051architecture-functional block diagram,I/O pins,ports and circuits,Addressing modes and Interrupts <div style="text-align: right;">[7 Hours]</div>
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. <div style="text-align: right;">[8Hours]</div>
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. <div style="text-align: right;">[8Hours]</div>
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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Program: B.Tech in Electronics and Telecommunication Engineering

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 Systems and 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 characteristics of LEDs and LASERS. Photodetectors: Basic Concepts, 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, multimedia applications, media types, communication modes, network types, multipoint conferencing, network QoS Application QoS. [8Hours]
Unit IV	Communication Interface Infrared, Bluetooth, Wi-Fi, Zigbee, GPRS, USB (UNIVERSAL SERIAL BUS), Bus Topology: Star, Ring, Mesh and Applications. [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 and space qualification. [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 rural development, 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



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7T001	Digital Communication	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of communicating transmitter and receiver.

Prior Reading Material / useful links	
1	https://www.researchgate.net/publication/268508509_Types_of_E-Resources_and_its_utilities_in_Library
2	https://www.ojcmr.net/article/digital-communication-in-educational-process-development-trends-and-new-opportunities-7928
3	https://journals.ala.org/index.php/lrts/article/view/5158/6260

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Understand knowledge about various techniques of digital communication Systems.
2	CO2	Explain the knowledge of waveform coding and practice related to Digital communication.
3	CO3	Identify and solve engineering problems related to Mobile communication system
4	CO4	Analyze the spectral characteristics of band pass signaling schemes and their noise performance
5	CO5	Design error control coding schemes.

Syllabus:

Course Contents	
Unit I	Information Theory Discrete Memoryless source, Information, Entropy, Mutual Information-Discrete Memory less channels – Binary Symmetric Channel, Channel Capacity -Hartley-Shannon law - Source coding theorem - Shannon – Fano & Huffman codes. [5Hours]
Unit II	Waveform Coding & Representation Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles- Linear Predictive Coding- Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ– Manchester [6Hours]
Unit III	Baseband Transmission & Reception ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding-Eyepattern–Receiving Filters-Matched Filter, Correlation receiver, Adaptive Equalization [6Hours]
Unit IV	Digital Modulation Scheme Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK-QAM-Carrier Synchronization-Structure of Non-coherent Receivers - Principle of DPSK. [7Hours]
Unit V	Error Control Coding Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder. [7Hours]
Unit VI	Mobile Communication Cellular Telephone systems: Digital cellular telephone, Mobile communication system, Role of mobile communication, mobile hotspot and mobile applications related to rural development, GPS. [5Hours]
Text Books	
1	S. Haykin, —Digital Communications, John Wiley, 2015
2	B.P. Lathi and Z. Ding, “Modern Digital and Analog Communication Systems,” 4th Ed., Oxford University Press, 2009
Reference Books	
1	T. M. Cover and J. A. Thomas, “Elements of Information Theory,” Wiley Student Edition, 1999, Reprint 2009
2	J.G Proakis, —Digital Communication, 4th Edition, Tata McGraw Hill Company, 2001.
Useful links	
1	https://www.researchgate.net/publication/268508509_Types_of_E-Resources_and_its_utilities_in_Library
2	https://www.ojcmnt.net/article/digital-communication-in-educational-process-development-trends-and-new-opportunities-7928
3	https://journals.ala.org/index.php/lrts/article/view/5158/6260



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Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7E002A	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:

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 structureforIoT. [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 ModelofIoT. [7Hours]
Unit IV	IoT Reference Architecture Getting Familiar with IoT Architecture, Various architectural views of IoT suchas Functional, Information, Operational and Deployment. Constraints affecting design in IoT world- Introduction, TechnicaldesignConstraints. [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 forthe IoT in Smart Cities, Privacy and Security Issues inIoT. [7Hours]
Text Books	
1	Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Aves and, Stamatias 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 Madiseti and ArshdeepBahga, “Internet of Things (A Hands-on Approach)”, 1st Edition, VPT, 2014.
Reference Books	
1	Francis daCosta, “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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Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7E002BC	Optical Communication Networks	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of communication engineering

Prior Reading Material / useful links	
1	https://nptel.ac.in/courses/108/106/108106167/
2	https://nptel.ac.in/courses/117101054

Course Outcomes:

Sr. No	Course outcome number	CO statement
1	CO1	Explain the principles of operation of various optical fiber communication systems.
2	CO2	Analyze the performance of various digital and analogue optical fiber systems.
3	CO3	Calculate various key parameters of optical fiber systems. These include the system optical power budget and system rise time budget, receiver noise power, Q factor, bit error rate and maximum usable bit rate of a digital optical fiber system.
4	CO4	Explain/compare the factors affecting the performance of different optical fibre communication systems.
5	CO5	Communicate laboratory findings through written reports

Syllabus:

Course Contents	
Unit I	Overview of Optical Fiber Wave Guides General system, transmission link, advantage of optical fiber communication, basic structure of optical fiber waveguide, ray theory transmission, optical fiber modes and configuration, step index & graded index fiber, single mode fiber, fiber materials, fiber fabrication. [6Hours]
Unit II	Signal Degradation in Optical Fiber Introduction, attenuation, intrinsic & extrinsic absorption losses, linear & nonlinear scattering losses, bending losses, distortion in optical wave guide, intramodal and intermodal dispersion. Power launching and coupling Source to fiber power launching, power calculation, lensing schemes, fiber to fiber joints, fiber splicing technique, fiber connectors. [7Hours]
Unit III	Optical Sources LASER: Basic concepts of laser, Optical emission from semiconductors, Semiconductor injection laser (ILD), Injection laser characteristics. LED: power and efficiency, LED structures, LED characteristics. Optical detectors: p-n photodiodes, P-I-N photodiodes, Avalanche photodiodes, Quantum efficiency, speed of response, Phototransistor. [6Hours]
Unit IV	Optical Receiver Receiver operation, digital receiver noise, shot noise, pre-amplifier types, Digital receiver performance, introduction to analog receivers. [5Hours]
Unit V	Digital Transmission Systems Point to point links, system considerations, link power budget, rise time budget, modulation formats for analog communication system, introduction to WDM concepts, Introduction to advanced multiplexing strategies. [7Hours]
Unit VI	Optical Networks [6 Hours] Basic networks-SONET/ SDH-wavelength routed networks, nonlinear effects on network performance, performance of various systems (WDM, DWDM +SOA).
Text Books	
1	G.Keiser: Optical Fiber Communication – MGH
2	Jenkins & White: Fundamentals of Optics – MGH.
Reference Books	
1	Bhattacharya, Pallab / “Semiconductor Optoelectronics Devices” /Pearson Education.
2	Singh, Jasprit / “Optoelectronics An Introduction to Materials and Devices”/ McGraw-Hill
3	Khare, R.P. / “Fiber Optics & Optoelectronics” / Oxford University Press
Useful links	
1	https://nptel.ac.in/courses/108/106/108106167/
2	https://nptel.ac.in/courses/117101054



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Department of Electronics and Telecommunication Engineering

“Rectifying Ideas, Amplifying Knowledge”



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<u>VISION</u>	<u>MISSION</u>
“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.

Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7E002C	Advanced Cellular Communication	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of Digital and wireless Communication System.

Prior Reading Material / useful links	
1	https://crln.acrl.org/index.php/crlnews/article/view/8545/8878
2	https://eudl.eu/journal/mca
3	https://www.researchgate.net/publication/286455750_mobile_technology_in_libraries_for_discovering_e-resources_and_services

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Know the concept of cellular wireless communication system
2	CO2	Understand emerging technologies required for fourth and fifth generation mobile systems such as SDR, MIMO etc
3	CO3	Knowledge of GSM mobile communication standard, its architecture, logical channels, advantages and limitations
4	CO4	Apply frequency-reuse concept in mobile communications, and to analyze its effect on interference, system capacity, handoff techniques
5	CO5	Analyze various methodologies to improve the cellular capacity
6	CO6	Compare and explain various radio access technologies for 5G networks

Syllabus:

Course Contents	
Unit I	Introduction to Wireless communication Wireless communication systems, Applications of wireless communication systems, Types of wireless communication systems, trends in mobile communication systems. [4 Hours]
Unit II	Cellular Mobile Systems Basic cellular systems, Performance criteria, Uniqueness of mobile radio environment, Operation of cellular systems, analog & digital cellular systems. [6 Hours]
Unit III	Elements of Cellular Radio System Design Concept of frequency reuse channels, Co-channel interference reduction factor, Desired C/I from a normal case in an omnidirectional antenna system, Handoff mechanism, Cellsplitting. [6Hours]
Unit IV	Interference in Cellular Mobile System Co-channel interference, Design of an omnidirectional antenna system in the worst case, Design of a directional antenna system, Lowering the antenna height, Power control, Reduction in CI by tilting antenna, umbrella pattern effect Adjacent-channel interference, Near-end – far-end interference, Effecton near-endmobileunits. [7Hours]
Unit V	Frequency Management, Channel Assignment and Handoffs [7 Hours] Frequency management, Frequency-spectrum utilization, Set-up channels, Fixed channel assignment schemes, Non-fixed channel assignment schemes, Concept of handoff, Initiation of a hard handoff, Delaying a handoff, Forced handoffs, Queuingofhandoffs,Powerdifferencehandoffs,Mobileassistedhandoff,Soft handoffs, Cell-site handoff, Intersystem handoff, dropout calls.
Unit VI	GSM System Overview Over Wireless Networks And 5G Technology GSM system architecture, GSM radio subsystem, GSM channel types, Frame structure for GSM, Signal processing in GSM, GPRS and EDGE. Overview of Wi-Fi, Wi-MAX and Bluetooth technology (Basic features and physical specifications).5G architecture, D2D: from 4G to 5G – Radio Resource Management for Mobile Broadband D2D –5G radio access technologies. [8 Hours]
Text Books	
1	Mobile Cellular Telecommunications: Analog and Digital Systems by WilliamC. Y. Lee; Tata McGraw Hill Publication.
2	H. Labiod, H. Afifi, C. De Santis: WI-FI, BLUETOOTH , ZIGBEE and WIMAX- Springer2007
Reference Books	
1	Asif Oseiran, Jose F.Monserrat and Patrick Marsch, “5G Mobile andWireless Communications Technology”, Cambridge University Press, 2016.
2	Jonathan Rodriquez, “Fundamentals of 5G Mobile Networks”, Wiley, 2015
3	Patrick Marsch, Omer Bulakci, Olav Queseth and Mauro Boldi, “5G System Design – Architectural and Functional Considerations and Long Term Research”, Wiley, 2018arson
Useful links	
1	https://crln.acrl.org/index.php/crlnews/article/view/8545/8878
2	https://eudl.eu/journal/mc
3	https://www.researchgate.net/publication/286455750_mobile_technology_in_libraries_for_discovering_e-resources_and_services



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7E003A	Verilog HDL	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of Digital Circuits, Microprocessor and Microcontroller.

Prior Reading Material / useful links	
1	https://onlinecourses.nptel.ac.in/noc19_cs73
2	https://www.classcentral.com/course/swayam-synthesis-of-digital-systems-10067

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Relate VHDL and Verilog
2	CO2	Understand the Digital Design with Verilog HDL
3	CO3	Identify the various modules and ports in Digital Design with Verilog HDL.
4	CO4	Compare the task and functions and make use of useful modeling techniques
5	CO5	Analyze the gate level, data flow and behavioral modeling of Digital Design with Verilog HDL.
6	CO6	Design digital systems with various constraints.

Syllabus:

Course Contents	
Unit I	<p>Overview of Digital Design with Verilog HDL Evolution of CAD, emergence of HDLs, typical HDL-based design flow, why Verilog HDL?, trends in HDLs.</p> <p>Hierarchical Modeling Concepts Top-down and bottom-up design methodology, differences between modules and module instances, parts of a simulation, design block, stimulus block. [6Hours]</p>
Unit II	<p>Modules and Ports Lexical conventions, data types, system tasks, compiler directives, Module definition, port declaration, connecting ports, hierarchical name referencing. [5 Hours]</p>
Unit III	<p>Gate-Level Modeling Modeling using basic Verilog gate primitives, description of and/or and buf/not type gates, rise, fall and turn-off delays, min, max, and typical delays. [7Hours]</p>
Unit IV	<p>Dataflow Modeling Continuous assignments, delay specification, expressions, operators, operands, operator types. [6Hours]</p>
Unit V	<p>Behavioral Modeling Structured procedures, initial and always, blocking and nonblocking statements, delay control, generate statement, event control, conditional statements, multiway branching, loops, sequential and parallel blocks. [6Hours]</p>
Unit VI	<p>Tasks, Functions & Useful Modeling Techniques Differences between tasks and functions, declaration, invocation, automatic tasks and functions. Procedural continuous assignments, overriding parameters, conditional compilation and execution, useful system tasks. [7Hours]</p>
Text Books	
1	Verilog HDL: A Guide to Digital Design and Synthesis, Second Edition, Samir Palnitkar, Prentice Hall PTR, February 21, 2003
Reference Books	
1	Steve Kilts, "Advanced FPGA Design: Architecture, Implementation and Optimization", J. Wiley and Sons, 2007.
2	Seetharaman Ramachandran, "Digital VLSI Systems Design", Springer Verlag, 2012.
3	Peter J. Ashenden, "The designer's guide to VHDL", Morgan Kaufmann, 2008.
4	Charles H. Roth Jr., "Digital Systems Design using VHDL", Cengage Learning, 2014.
5	Digital System Design—John Wakerley, McGraw Hill Publications.
Useful links	
1	https://onlinecourses.nptel.ac.in/noc19_cs73
2	https://www.classcentral.com/course/swayam-synthesis-of-digital-systems-10067



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7E003B	UHF & Microwave Engineering	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of Electromagnetic field and Antenna & Wave Propagation.

Prior Reading Material / useful links	
1	https://archive.nptel.ac.in/courses/108/101/108101112/#watch
2	https://youtu.be/NW1NXoM4q5c
3	https://onlinecourses.nptel.ac.in/noc20_ee91/preview

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Describe the use of active and passive microwave devices.
2	CO2	Demonstrate the use of different Klystrons, magnetron devices.
3	CO3	Analyze different UHF components with the help of scattering parameter.
4	CO4	Describe micro strip lines.
5	CO5	Analyze the different power distribution Tees.
6	CO6	Describe the transmission and waveguide structures and how they are used as elements in impedance matching and filter circuits.

Syllabus:

Course Contents	
Unit I	Microwave Active Devices (O-type) Interaction of electron beam with electromagnetic field, power transfer condition. Principles of working of two cavity and Reflex Klystrons, arrival time curve and oscillation conditions in Reflex klystrons, mode-frequency characteristics, Effect of repeller voltage variation on power and frequency of output. Slow wave structures, Principle and working of TWT amplifier & BWO Oscillator. [6Hours]
Unit II	Microwave Active Devices (M-type) Principle of working of M-type TWT, Magnetrons, Electron dynamics in planar and cylindrical Magnetrons, Cutoff magnetic field, phase focusing effect, mode operation, Mode separation techniques, Tuning of magnetron. [7Hours]
Unit III	Transmission Line Input impedance, Standing wave distribution, Quarter Wave and Stub Matching using Smith chart, losses in Transmission lines, Planar Transmission line types, Introduction - Types of MICs and their technology, Fabrication process of MMIC, Hybrid MICs. [6Hours]
Unit IV	Microwave Networks and Passive Components Transmission line ports of microwave network, Scattering matrix, Properties of scattering matrix of reciprocal, nonreciprocal, loss-less, Passive networks, Examples of two, three and four port networks, wave guide components like attenuator. Principle of operation and properties of E-plane, H-plane Tee junctions of wave guides, Hybrid T, Directional couplers, Microwave resonators-rectangular, Excitation of wave guide and resonators. Principles of operation of non-reciprocal devices, properties of ferrites, Gyrotors, Isolators, Circulator and phase shifters. [8Hours]
Unit V	Microwave Measurements Function of Tuning Probes, Detector mounts and Detector diode, Slotted line section and VSWR meter, Measurement of wave-guide impedance at load port by slotted line, Measurement of scattering matrix parameters, High, Medium and low-level power measurement techniques, Characteristics of bolometer, bolometer mounts, Power measurement bridges, Calorimetric method, Microwave frequency measurement techniques, calibrated resonators (transmission and absorption type), Network Analyzer and its use in measurements. [6Hours]
Unit VI	Microwave Solid State Devices and Application PIN diodes-Properties and applications, Microwave detector diodes-detection characteristics, Varactor diodes, Parametric amplifier fundamentals-Manley-Rowe Power relation, MASERS, Transferred electron devices, Gunn effect, Various modes of operation of Gunn oscillator, IMPATT, TRAPATT and BARITT. [6Hours]
Text Books	
1	Samuel Y. Liao, 'Microwave Devices and Circuits', Pearson Education, 5th Edition.
Reference Books	
1	Manojit Mitra, 'Microwave engineering', 3rd edition, Dhanpat Rai & Company.
2	Peter A. Rizzi, 'Microwave Engineering Passive Circuits', PHI, 1999.
3	Annapurna Das, Sisir Das, 'Microwave Engineering', April 1987, Tata McGraw Hill Publication.
4	Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, 'Microwave Principles', 4th edition, 1998.
5	G. S. Raghuvanshi, 'Microwave Engineering', CENGAGE Learning
Useful links	

1	https://archive.nptel.ac.in/courses/108/101/108101112/#watch
2	https://onlinecourses.nptel.ac.in/noc20_ee91/preview



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7E004A	Machine Learning	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of programming
2	Basic knowledge of probability theory and linear algebra

Prior Reading Material / useful links	
1	https://onlinecourses.nptel.ac.in/noc22_cs29/preview
2	https://nptel.ac.in/courses/106106139

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Understand a very broad collection of machine learning algorithms and problems.
2	CO2	Appreciate the importance of visualization in the dataanalytics solution.
3	CO3	Apply structured thinking to unstructured problems.
4	CO4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory.
5	CO5	Develop an appreciation for what is involved in learning from data.

Syllabus:

Course Contents	
Unit I	Introduction Learning Problems, Perspectives and Issues, Concept Learning, Version Spaces and Candidate Eliminations, Inductive bias, Decision Tree learning, Representation, Algorithm, HeuristicSpaceSearch. [5Hours]
Unit II	Neural Networks and Genetic Algorithms Neural Network Representation, Problems, Perceptrons, Multilayer Networks and Back Propagation Algorithms, Advanced Topics, Genetic Algorithms, Hypothesis Space Search, Genetic Programming, Models of Evaluation and Learning. [7Hours]
Unit III	Bayesian and Computational Learning Bayes Theorem, Concept Learning, Maximum Likelihood, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier, Bayesian Belief Network, EM Algorithm, Probability Learning, Sample Complexity, Finite and Infinite Hypothesis Spaces, MistakeBoundModel. [7Hours]
Unit IV	Instant Based Learning K- NearestNeighbour Learning, Locally weighted Regression, Radial Bases Functions, and CaseBasedLearning. [6Hours]
Unit V	Advanced Learning Learning Sets of Rules, Sequential Covering Algorithm, Learning Rule Set, First Order Rules, Sets of First Order Rules, Induction on Inverted Deduction, Inverting Resolution, Analytical Learning, Perfect Domain Theories, Explanation Base Learning, FOCL Algorithm, Reinforcement Learning, Task, Q-Learning, Temporal Difference Learning. “Current StreamsofThought”. [7Hours]
Unit VI	Introduction to Cluster Analysis & Clustering Methods The Clustering Task and the Requirements for Cluster Analysis, Overview of Some Basic Clustering Methods, Hierarchical Methods: Agglomerate versus Divisive Hierarchical Clustering, Distance Measures, ProbabilisticHierarchical Clustering, Multiphase Hierarchical ClusteringUsingClustering [6Hours]
Text Books	
1	Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2	EthemAlpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
Reference Books	
1	Machine Learning Engineering, AndriyBurkov, ISBN-10 : 1999579577, True Positive Inc. (8 September 2020)
2	Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
3	Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verilog.
Useful links	
1	https://onlinecourses.nptel.ac.in/noc22_cs29/preview
2	https://nptel.ac.in/courses/106106139



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7E004B	Digital Image Processing	3	0	0	3

Prerequisites for the course	
1	Signals and systems. Since DIP is a subfield of signals and systems, some knowledge about signals and systems, Calculus and probability.
2	Types of images and its coding techniques,
3	Basic programming skills.

Prior Reading Material / useful links	
1	https://nptel.ac.in/courses/117105079
2	https://onlinecourses.nptel.ac.in/noc19_ee55/preview
3	https://nptel.ac.in/courses/117105135

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Recall the fundamental concepts of a digital image processing system.
2	CO2	Understand images in the frequency domain using various transforms.
3	CO3	Apply various techniques for image enhancement and image restoration.
4	CO4	Analyze various compression techniques
5	CO5	Interpret Image compression standards.

Syllabus:

Course Contents	
Unit I	Introduction and Digital Image Fundamentals Digital Image Fundamentals, Need for DIP, Fundamental steps in DIP, Human visual system, Image representation – Gray scale and Color images, Types of neighborhoods, Basic relationships between pixels, Distance Measures, [6 Hours]
Unit II	Basic operations on Images and Color Fundamentals. Image addition, subtraction, logical operations, scaling, translation, rotation, Image Histogram, Color fundamentals & models – RGB, HSI YIQ, image sampling and quantization. [6Hours]
Unit III	Image Enhancement and Restoration Spatial domain enhancement: Point operations-Log transformation, Power-law transformation, Piecewise linear transformations, Histogram equalization. Filtering operations- Image smoothing, Image sharpening. Basic gray level Transformations, Low pass filtering, High pass filtering, Noise Models, Noise Reduction, Inverse Filtering, MMSE(Wiener)Filtering, [8Hours]
Unit IV	Image Compression Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, LZW coding, JPEG Compression standard. [4Hours]
Unit V	Image Segmentation and Morphological Operations Image Segmentation: Point Detections, Line detection, Edge Detection-First order derivative –Prewitt and Sobel, Second order derivative – LoG, DoG, Canny, Edge linking, Hough Transform, Region Growing, Region Splitting and Merging, Dilation, Erosion, Opening, Closing, Hit-or-Miss transform, Boundary Detection, Thinning, Thickening, Skeleton. [8Hours]
Unit VI	Representation and Description Representation – Chain codes, Polygonal approximation, Signatures. Boundary Descriptors – Shape numbers, Fourier Descriptors. [6Hours]
Text Books	
1	Gonzalez & Woods, —Digital Image Processing, 3rd ed., Pearson education, 2008
Reference Books	
1	Milan Sonka, Vaclav Hlavav, Roger Boyle, —Image Processing, Analysis and Machine Vision, 2nd ed., Thomson Learning, 2001
2	Rangaraj M. Rangayyan, —Biomedical Image Analysis, CRC Press, 2005
3	Pratt W.K, —Digital Image Processing, 3rd ed., John Wiley & Sons, 2007
	Jain Anil K., —Fundamentals Digital Image Processing, Prentice Hall India, 2010
Useful links	
1	https://nptel.ac.in/courses/117105079
2	https://onlinecourses.nptel.ac.in/noc19_ee55/preview
3	https://nptel.ac.in/courses/117105135



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Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7E004C	Advanced Digital Signal Processing	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of Signals and Systems, Digital Signal Processing.

Prior Reading Material / useful links	
1	https://nptel.ac.in/courses/117101001
2	https://onlinecourses.nptel.ac.in/noc21_ee20/preview

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Represent discrete-time signals analytically and visualize them in the time domain.
2	CO2	Summarize the requirement of theoretical and practical aspects of DSP with regard to sampling and reconstruction.
3	CO3	Apply various techniques of filter designs for various applications.
4	CO4	Analyze Multi Rate Signal Processing and describe how to apply it for the wavelet transform.
5	CO5	Comprehend the Finite word length effects in Fixedpoint DSP Systems
6	CO6	Estimate the power spectral estimation methods.

Syllabus:

Course Contents	
Unit I	Multirate Digital Signal Processing Introduction, Review of Decimation and Interpolation, Sampling Rate Conversion by a Rational Factor I/D, Filter Design and Implementation for sampling rate Conversion Multirate Digital Signal Processing Multistage, Implementation of Sampling Rate Conversion. [6Hours]
Unit II	Applications of Multirate Digital Signal Processing Applications of Multirate Signal Processing, Sampling Rate Conversion of Bandpass Signals Linear Prediction and Optimum Linear [4Hours]
Unit III	Filters Innovations Representation of a Stationary Random Process, Forward and Backward Linear Prediction, Solution of the Normal Equations, Properties of linear prediction - Error Filter, AR Lattice and ARMA Lattice-Ladder Filters. [7 Hours]
Unit IV	Power Spectral Estimation Estimation of Spectra from Finite Duration Observations of a signal, the Periodogram, Use DFT in power Spectral Estimation, Bartlett, Welch and Blackman, Tukey Methods, Comparison of performance of Non-Parametric Power Spectrum Estimation Methods [6Hours]
Unit V	Parametric Method of Power Spectrum Estimation Parametric Methods for power spectrum estimation, Relationship between Auto-Correlation and Model Parameters, AR (Auto-Regressive) Process and Linear Prediction, Moving Average (MA) and ARMA Models Minimum Variance Method. [7Hours]
Unit VI	Wavelet Transform Window Selection, Wavelet Transform, STFT to Wavelet conversion, Basic Wavelet, Discrete time orthogonal Wavelet, Continuous Time Orthogonal Wavelets. [6Hours]
Text Books	
1	J. G. Proakis & D. G. Manolakis, "Digital Signal Processing – Principles, Algorithms Applications", PHI.
Reference Books	
1	S. M. Kay, "Modern spectral Estimation techniques", PHI, 1997. Emmanuel C. Ifeacheer Barrie. W. Jervis, "DSP – A Practical Approach", Pearson Education.
2	Oppenheim, Alan V. Discrete-time signal processing. Pearson Education India, 1999.
3	Mitra, Sanjit Kumar, and Yonghong Kuo. Digital signal processing: a computer-based approach. Vol. 2. New York: McGraw-Hill Higher Education, 2006.
Useful links	
1	https://nptel.ac.in/courses/117101001
2	https://onlinecourses.nptel.ac.in/noc21_ee20/preview



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Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7L005	Basic Electronic Simulation Lab	0	0	2	1

Prerequisites for the course	
1	Knowledge of Electronic Components and instruments for practice.

Prior Reading Material / useful links	
1	https://youtu.be/NFXyltNODpQ
2	https://be-iitkgp.vlabs.ac.in/

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Develop the Verilog/VHDL programs to simulate Combinational circuits in Dataflow, Behavioral and Gate level Abstractions.
2	CO2	Describe sequential circuits like flip flops and counters in Behavioral description and obtain simulation waveforms.
3	CO3	Synthesize Combinational and Sequential circuits on programmable ICs and test the hardware
4	CO4	Interface the hardware to the programmable chips and obtain the required output

Syllabus:

List of Experiments	
PART A	
1	Develop a Verilog program for 2 to 4 decoder.
2	Develop a Verilog program for 8 to 3 encoder (without priority & with priority).
3	Develop a Verilog program for 8 to 1 multiplexer
4	Design 4 bit binary to gray converter in Verilog
5	Model in Verilog for a full adder and add functionality to perform logical operations of XOR, XNOR, AND and OR gates.
6	Write a Verilog code to model 32 bit ALU.
7	Write Verilog code for SR, D and JK and verify the flip flop.
8	Write Verilog code for 4-bit BCD synchronous counter.
9	Write Verilog code for counter with given input clock and check whether it works as clock divider performing division of clock by 2, 4, 8 and 16. Verify the functionality of the code.
PART-B	
1	Develop a Verilog code to design a clock divider circuit that generates 1/2, 1/3rd and 1/4th clock from a given input clock. Port the design to FPGA and validate the functionality through oscilloscope.
2	Interface a DC motor to FPGA and write Verilog code to change its speed and direction.
3	Interface a Stepper motor to FPGA and write Verilog code to control the Stepper motor rotation which in turn may control a Robotic Arm. External switches to be used for different controls like rotate the Stepper motor (i) +N steps if Switch no.1 of a Dip switch is closed (ii) +N/2 steps if Switch no. 2 of a Dip switch is closed (iii) -N steps if Switch no. 3 of a Dip switch is closed etc.
4	Interface a DAC to FPGA and write Verilog code to generate Sine wave of frequency F KHz (eg. 200 KHz) frequency. Modify the code to down sample the frequency to F/2 KHz. Display the Original and Down sampled signals by connecting them to an oscilloscope.
5	Write Verilog code using FSM to simulate elevator operation.
6	Write Verilog code to convert an analog input of a sensor to digital form and to display the same on a suitable display like set of simple LEDs, 7-segment display digits or LCD display.



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Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.in

(An Autonomous Institute, with NAAC "A" Grade)

Affiliated to DBATU, RTMNU & MSBTE Mumbai

Department of Electronics and Telecommunication Engineering

“Rectifying Ideas, Amplifying Knowledge”



॥ ज्ञानम् सर्वार्थं स्वर्णम् ॥

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.

Program: B.Tech in Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VII	ET7L001	Digital Communication Lab	0	0	2	1

Prerequisites for the course	
1	Basic knowledge of Communication System Engineering, error control coding, Digital Communications, Signals and Systems.

Prior Reading Material / useful links	
1	https://onlinecourses.nptel.ac.in/noc21_ee11/preview
2	https://nptel.ac.in/courses/117101051

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Evaluate the performance of PCM, DPCM and Delta modulation schemes.
2	CO2	Implement different digital modulation schemes like FSK, PSK, and DPSK.
3	CO3	Analyze source/channel encoding & decoding methods.
4	CO4	Simulate Pulse Digital Modulation & demodulation using MATLAB.
5	CO5	Simulate digital communication techniques like ASK, FSK & PSK.

Syllabus:

List of Experiments:	
Trainer Kit Based Experiments	
1	Generation and Detection of Pulse Code Modulation for both A.C and D.C signals
2	Generation and Detection of Differential Pulse Code Modulation
3	Generation and Detection of Delta Modulation
4	Generation and Detection of PSK.
5	Generation and Detection of FSK.
6	Generation and Detection of DPSK.
7	Generation and Detection of QPSK.
8	Linear Block code-Encoder and Decoder
9	Convolution code-Encoder and Decoder
10	To study the Spectrum Analyzer
Simulation Based Experiments (Open Source/Matlab/Multisim)	
1	Amplitude Shift Keying
2	Phase Shift keying
3	Time Division Multiplexing
4	Pulse Code Modulation



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Program: B.Tech Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VIII	ET8E001A	5G Wireless Networks	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of Digital and Wireless communication

Prior Reading Material/useful links	
1	https://www.qualcomm.com/5g/what-is-5g#:~:text=A%3A%205G%20is%20based%20on,sub%2D6%20GHz%20and%20mmWave.
2	https://www.techtarget.com/searchnetworking/feature/Understand-the-basics-of-5G-wireless-networks

Course Outcomes:

Sr. No	Course outcome number	CO statement
1	CO1	Understand the objectives of 5G
2	CO2	Compare 5G Architecture with 4G Architecture.
3	CO3	Analyze the principles of Softwarization in 5G.
4	CO4	Explain the concept of MEC and Fog computing.
5	CO5	Evaluate physical layer design in 5G.
6	CO6	Characterize and analyze network security aspect in 5G.

Syllabus:

Course Contents	
Unit I	Introduction 5GPP&NGMN,5GDesignObjectivePart1,5GDesignObjectivePart2,ITU- R IMT-2020 vision for 5G, 5G Spectrum Requirements, Globally Harmonised 5G Spectrum, 5G Industry Progress, 5G NetworkPerspectives [6 Hours]
Unit II	Architecture 5G Scenarios, 5G RAN, 5G Mobile Core and Operating System, 5G Architecture View, 5G Network Slicing, 5G Architecture Plane Part 1, 5G Architecture Plane Part 2, Logical and Functional 5G Architecture, Dynamic CRAN, 5G NR Logical Architecture [7Hours]
Unit III	Programmability and Softwarization Network Programmability and Softwarization, Network Programmability. [5 Hours]
Unit IV	Mobile Edge Computing and FOG Computing[6 Hours] MEC Introduction, MEC Concept, MEC Architecture, MEC Benefits, Fog Computing. [5Hours]
Unit V	Radio Access Technologies Millimeter Wave Propagation, Flexible Physical Layer Design Part 1, Flexible Physical Layer Design Part 2, Distributed Massive MIMO Principles, Energy Transfer forMassive MIMO [7Hours]
Unit VI	Network Security 5G Security, 5G Security Goals, 5G New Trust Model, Diversified Identity Management, UserPrivacyProtectionRequirement,5GCoreSecurity,5GRadio NetworkSecurity. [7Hours]
Text Books	
1	R. Vannithamby and S. Talwar, Towards 5G: Applications, Requirements and Candidate Technologies. John Willey & Sons, West Sussex, 2017.
2	Manish, M., Devendra, G., Pattanayak, P., Ha, N., 5G and Beyond Wireless Systems PHY Layer Perspective, Springer Series in Wireless Technology.
Reference Books	
1	T. S. Rappaport, R. W. Heath Jr., R. C. Daniels, and J. M. Murdock,, Millimeter Wave Wireless Communication., Pearson Education, 2015.
2	M. Vaezi, Z. Ding, and H. V. Poor,, Multiple Access techniques for 5G Wireless Networks and Beyond., Springer Nature, Switzerland, 2019
Useful linkss	
1	https://onlinecourses.nptel.ac.in/noc21_ee12/preview
2	https://5g.systemsapproach.org/intro.html



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Program: B.Tech Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VIII	ET8E001B	Modern Digital Communication System	3	0	0	3

Prerequisites for the course	
1	Basic knowledge of Digital communication.
2	Basic knowledge about different communication techniques.

Prior Reading Material/useful links	
1	https://www.youtube.com/watch?v=hTA1crqjNps
2	https://www.egr.msu.edu/~tongli/teaching/ece865/Introduction

Course Outcomes:

Sr. No	Course outcome number	CO statement
1	CO1	Understand the principles and theories required to design reliable communication link
2	CO2	Compare different digital communication techniques and judge their applicability and performance in different application scenarios.
3	CO3	Evaluate mathematical modeling to solve problems in wireline and wireless digital communications, and explain how this is used to analyze and synthesize methods and algorithms within the relevant communication standards
4	CO4	Develop skill set to choose and optimize design parameters [e.g.,

		power distribution, modulation, redundancy, speed] in advanced communication technologies used in the telecommunication industry.
5	CO5	Improve fundamental grounding and sophistication needed to explore topics in Advanced and Emerging wireless communication standards like 4G, 5G and different WLAN that include MIMO, mmWave communication

Syllabus:

Course Contents	
Unit I	Introduction Introduction to Digital Communication, Elements of Digital Communication, Mathematical Models for Communication Channels and their characteristics, Review system designing and performance aspects, Networks aspects of digital interface, Historical background and developments in modern digital communication. [5Hours]
Unit II	Mathematical Preliminaries Signals, LTI system, The Nyquist Sampling theorem, Complex envelope representation, the spectrum of bandpass signal, low pass equivalent of bandpass signal, Energy considerations, low pass equivalent of a bandpass system. Signal space representation of waveforms: Vector space concepts, Signal space concepts, Orthogonal expansions of signals, Gram-Schmidt procedure. [6Hours]
Unit III	Digital Modulation Schemes and Optimum Receivers for AWGN Channels Representation of digitally modulated signals, Multidimensional Signaling, Signaling Schemes with Memory: CPFSK, CPM. Spectral properties of various modulation schemes and their comparison, The Nyquist criterion for ISI avoidance, Optimum Receivers for AWGN Channels: Waveform and Vector Channel models, Optimum reception in AWGN, error probability of band-limited and power limited signaling, detection non-coherent detection. [8Hours]
Unit IV	Carrier and symbol Synchronization Receiver design requirements, Signal Parameter estimation: Carrier recovery and symbol synchronization in signal demodulation, Carrier Phase estimation, Symbol timing estimation, Joint estimation of Carrier Phase and Symbol timing, Performance characteristics of ML estimators. [7Hours]
Unit V	Information-Theoretic Limits and Channel Coding The capacity of AWGN Channel: modeling and geometry, Shannon theory basics: entropy, mutual information, and divergence, channel coding theorem, the capacity of standard constellations, parallel Gaussian channels and water filling Channel codes: Binary convolution codes, Turbo codes and iterative coding, LDPC codes, bandwidth-efficient coded modulation. [7Hours]
Unit VI	Digital Modulation for Wireless Communication Physical modeling for wireless channels, Fading and diversity, OFDM, CDMA, MIMO-linear array, Beam-steering, MIMO-OFDM, Spatial Multiplexing, Space-time coding. [6 Hours]

Text Books	
1	John. G. Proakis, Digital Communications, McGraw Hill
2	Upamanyu Madhow, Fundamentals of Digital Communication, Cambridge University Press, 2012
Reference Books	
1	B. P. Lathi, Modern Digital and Analog Communication Systems, Oxford University Press, 4th Ed., 2009
2	J. R. Barry, E. A. Lee, and D. G. Messerschmitt, Digital Communication, Kluwer Academic Publishers, 2004
3	Simon Haykin, "Communication Systems," John Wiley & Sons, 5th Ed., 2009.
Useful links	
1	https://eng.uok.ac.ir/mohammadkhani/courses/AdvDigitalComm_94_2.html
2	https://www.psa.gov.in/technology-frontiers/advanced-communication-technologies/758



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Program: B.Tech Electronics and Telecommunication Engineering

Semester	Course Code	Name of the course	L	T	P	Credits
VIII	ET8O004	Advanced Processors & Controllers	4	0	0	4

Prerequisites for the course	
1	Basic knowledge of digital circuits.
2	Basic Idea about microprocessors & Microcontrollers and their interfacing.

Prior Reading Material/useful links	
1	https://www.elprocus.com/what-is-digital-circuit-design-and-its-applications/
2	https://www.agner.org/digital/digital_electronics_agner_fog.pdf

Course Outcomes:

Sr.No	Course outcome number	CO statement
1	CO1	Understand basic concepts of microprocessor 8085.
2	CO2	Explain the hardware architecture of 8051.
3	CO3	Discuss the ARM microprocessor architectures and its features.
4	CO4	Analyse Arduino Boards and Components.
5	CO5	Develop simple assembly language programs.
6	CO6	Elaborate practical applications of different processors.

Syllabus:

Course Contents	
Unit I	<p>Introduction to 8085 Microprocessor systems with bus organization, Microprocessor Architecture & Operations, Memory, I/O Device, Memory and I/O Operations, Introduction to 8085 assembly language programming, 8085 Microprocessor Architecture and its operation, Address, Data and Control Buses, Pin Functions, De-multiplexing of Buses, Generation Of Control Signals. Assembly Language Programming Basics, Introduction to 8085 instructions, Addressing Modes, Writing, Assembling & Executing a Program. [10Hours]</p>
Unit II	<p>Introduction to 8051 Microcontrollers: Microprocessors and Micro-controllers, 8051 controller, Block Diagram & Architecture. 8051 Instruction Set, Addressing modes & introduction to programming. 8051 Timers, Serial I/O, Interrupts. [8Hours]</p>
Unit III	<p>ARM Processors ARM Micro-controllers – overview; features, ARM 7 – architecture, Thumb, Register Model, Addressing modes. The RISC design philosophy, ARM design philosophy, embedded system hardware- AMBA bus protocol, Registers, CPSR- Processor modes, Banked registers. Pipeline- Characteristics. Fundamentals of ARM instructions, Barrel shifter. Advantages & Disadvantages of ARM processors. [8Hours]</p>
Unit IV	<p>ARDUINO Introduction to Arduino, Architecture, Advantages, Versions of Arduino, Characteristics and layout of UNO, Introduction to Arduino IDE software, Introduction to sensors and actuators. Case study example. [7 Hours]</p>
Unit V	<p>Introduction to Raspberry Pi Introduction to Raspberry Pi, OS for Raspberry Pi, Raspberry Pi processor, Versions of Raspberry pi models, Hardware components of Raspberry Pi3, Case study of IoT Applications based on Raspberry Pi. [8Hours]</p>
Unit VI	<p>Applications of 8085 & 8051 Case study: Traffic Controller using 8085 Microprocessor, Temperature Control Using 8051 Microcontroller, ARM Cortex [STM32] based Solar Street Light, Arduino Based Home Automation System, Quadcopter using Raspberry Pi. [7 Hours]</p>
Text Books	
1	Steve Heath, “Embedded System Design” Butterworth Helnemann.
2	Kenneth J. Ayala “The 8051 Micro-controller
3	Architecture, Programming & Applications”, Second Edition, Penram International & Thomson Asia.
4	John B. Peatman, “Design with PIC Micro- controllers”, Low Price Edition, Pearson Education
5	Microprocessor Architecture, Programming & Applications, by Goankar, 6th Edition 2013
6	Fundamentals of Microprocessor and Microcontrollers, by B.Ram, Dhanpat Rai Publications, 9th edition 2019.

7	Simon Monk, "Programming the Raspberry Pi: Getting Started with Python", January 2012, McGraw Hill Professional
Reference Books	
1	ARM System Developer's guide –Andrew N. SLOSS, ELSEVIER Publications, ISBN 978-81-8147- 646-3, 2016
2	ARM Assembly Language – William Hohl, CRC Press, ISBN:978-81-89643-04-1
3	ARM System-on-chip Architecture by Steve Furber, Pearson Education, ISBN978-81- 317-0840-8, 2E,2012
4	LPC 2148 USER MANUAL
5	In Side R's Guide To Philips Arm7 Based Microcontrollershitex.Co.Uk
6	ARM Programming Techniques – from ARM website
7	Embedded Systems: A Contemporary Design Tool- James K. Peckol ISBN: 978-0-471- 72180-2 October 2007, ©2008
8	Eben Upton and Gareth Halfacree, "Raspberry Pi User Guide", August 2016, 4th edition, John Wiley & Sons
9	Alex Bradbury and Ben Everard, "Learning Python with Raspberry Pi", Feb 2014, JohnWiley& Sons
10	Michael Margolis, "Arduino Cookbook", First Edition, March 2011, O'Reilly Media, Inc
Useful links	
1	https://www.raspberrypi.org/magpiissues/Projects_Book_v1.pdf
2	https://www.sim8085.com/
3	http://www.edsim51.com/
4	https://nptel.ac.in/courses/117104072
5	https://archive.nptel.ac.in/content/storage2/courses/106108100/pdf/Lecture_Notes/LNm1.pdf
6	https://ict.iitk.ac.in/courses/learn-iot-through-arduino-and-raspberry-pi/