VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE
(VJTI)
MATUNGA, MUMBAI 400 019

(Autonomous Institute affiliated to University of Mumbai)

Curriculum
(Scheme of Instruction & Evaluation and Course contents)

For
Second Year Undergraduate Programme Leading to
Bachelor of Technology (B. Tech.) Degree
in
Electronics Engineering

Implemented from Academic Year 2014-15

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

(Autonomous Institute affiliated to University of Mumbai)

Curriculum

(Scheme of Instruction & Evaluation and Course contents)

For

Second Year Undergraduate Programme Leading to
Bachelor of Technology (B. Tech.)
In

106 Electronics Engineering

PROGRAM OUTCOMES (POs)

Engineering Graduate will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Electronics Engineering Graduate will be able to:

1. Design, develop and test electronic systems in the areas related to analog and digital electronics, electronic instrumentation, signal processing and VLSI design.
2. Analyze, design and implement electronic systems to strive balance between increasing complexity, robustness and performance of systems.
3. Design electronic software and hardware systems, components or process to meet desired needs within realistic constraints.

S Y B. Tech (Electronics Engineering), SEMESTER III								
Scheme of Instruction				Scheme of Evaluation				
S. No.	**Course Code**	**Course Title**	**L-T-P (Hours/week)**	**Credits**	**TA**	**IST**	**ESE**	**ESE hours**
1.	MA2003S	Mathematics for Electrical Engineers - I	3-1-0=4	4	10	30	60	3
2.	CE2012S	Environmental Studies	3-0-0=3	3	10	30	60	3
3.	EC2001S	Electrical Networks	3-1-0=4	4	10	30	60	3
4.	EC2002T	Electronics Circuit Analysis and Design - I	3-0-0=3	3	10	30	60	3
	EC2002P	Electronics Circuit Analysis and Design - I Lab	0-0-2=2	1	100% CIE			
5.	EC2003T	Digital Combinational Circuits	3-0-0=3	3	10	30	60	3
	EC2003P	Digital Combinational Circuits Lab	0-0-2=2	1	100% CIE			
6.	EC2004T	Numerical Techniques	3-0-0=3	3	10	30	60	3
	EC2004P	Numerical Techniques Lab	0-0-2=2	1	100% CIE			
7.	EC2005A	Economics for Engineers	3	3 units	100% CIE			
		Total	**29**	**23**				

S Y B. Tech (Electronics Engineering), SEMESTER IV								
Scheme of Instruction				Scheme of Evaluation				
S. No.	**Course Code**	**Course Title**	**L-T-P (Hours/week)**	**Credits**	**TA**	**IST**	**ESE**	**ESE hours**
1.	MA2013S	Mathematics for Electrical Engineers - II	3-1-0=4	4	10	30	60	3
2.	EC2011S	Signals and Systems	3-1-0=4	4	10	30	60	3
3.	EC2013T	Digital Sequential Circuits	3-0-0=3	3	10	30	60	3
	EC2013P	Digital Sequential Circuits Lab	0-0-2=2	1	100% CIE			
4.	EC2012T	Electronics Circuits Analysis and Design - II	3-0-0=3	3	10	30	60	3
	EC2012P	Electronics Circuits Analysis and Design - II Lab	0-0-2=2	1	100% CIE			
5.	EC2014T	Measurements and Instrumentation	3-0-0=3	3	10	30	60	3
	EC2014P	Measurements and Instrumentation Lab	0-0-2=2	1	100% CIE			
6.	EC2015T	Microprocessor and Microcontroller	3-0-0=3	3	10	30	60	3
	EC2015P	Microprocessor and Microcontroller Lab	0-0-2=2	1	100% CIE			
7.	HM2001L	Presentation and Communication Skills	1-0-2=3	2	100% CIE			
		Total	**31**	**26**				

*Abbreviations: **L**: Lecture, **T**: Tutorial, **P**: Practical, **TA**: Teacher Assessment / Term work Assessment, **IST**: In Semester Tests (comprise of average of two In semester tests), **ESE**: End Semester Written Examination, **CIE**: Continuous In-semester Evaluation*

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER - III**
Course Code	**MA2003S**
Course Title	**MATHEMATICS FOR ELECTRICAL ENGINEERS – I**

COURSE OUTCOMES

After completion of this course, students should be able to

- Evaluate the Fourier components of various functions.
- Compute the Laplace transform of various functions
- Analyse and solve differential equation using Laplace transforms.
- Compute and characterise various behaviours of complex variables.

COURSE CONTENTS

Module I	**Complex Variables I**
	1.1 Function of Complex variable. Analytic function, Necessary and sufficient conditions for f(Z) to be analytic. Cauchy-Riemann equations in polar coordinates. 1.2 Milne-Thomson method to determine analytic function f(Z) when its real or imaginary part or its combination is given. 1.3 Harmonic function, orthogonal trajectories. Transformations 1.4 Conformal mapping and standard transformations such as Rotation, Magnification and inversion. 1.5 Bilinear Transformation and Mapping under bilinear Transformation with geometrical interpretation. Cross ratio and fixed points.
Module II	**Complex Variables II**
	2.1 Line integral of a function of Complex variable, Properties of line integral Cauchy's theorem for analytic function. Cauchy's Goursat theorem (without proof), Cauchy's integral formula and deductions. 2.2 Series of Complex Term: Taylor's and Laurent's Series (without proof), Singularities and poles, Residues, Residue Theorem and its evaluation. 2.3 Application of Residue to evaluate real Function.
Module III	**Laplace Transforms I**
	3.1 Functions of bounded variation 3.2 Linear property of Laplace transforms. 3.3 Laplace transforms of standard functions such as; $1, t^n, e^{at}$, *sinat, cosat, sinhat, erf(t)* 3.4 Change of scale property ,First shifting theorem, Second shifting theorem

	$L\{t^n f(t)\}, L\{f'(t)\}, L\left\{\frac{f(t)}{t}\right\}, L\left\{\int_0^t f(u)du\right\}, L\left\{\frac{d^n}{dt^n} f(t)\right\}$
Module IV	**Laplace Transform II**
	4.1 Inverse Laplace transform using linear property, theorems, partial fractions and convolution theorem. 4.2 Unit step functions, Heaviside, Dirac delta functions, Periodic functions and their Laplace transforms. 4.3 Application to solve ordinary differential equations with one dependent variable.
Module V	**Fourier Series**
	Orthogonal, Orthonormal sets, Expressions of a Function in Series of Orthogonal Functions. 1.2. Dirchlet's conditions. 1.3. Fourier series of periodic function with period 2π, $2l$. 1.4. Dirchlet's theorem, even and odd functions. 1.5. Half range expansions, Parseval's relations. 1.6. Complex form of Fourier series. 1.7. Fourier integral and Fourier transform.
Text Books:	
1.	Advanced Engineering Mathematics, H K Dass, S Chand & Co. Ltd, 3rd Edition, 2006
2.	Higher Engineering Mathematics, Dr B S Grewal, Khanna Publications, 39th Edition,2005
3.	A Text Book of Engineering Mathematics, N.P. Bali & Dr. Manish Goyal, Eight Edition, Laxmi Publication.
4.	Complex Variables & Applications: Churchil, Mc Graw Hill, 2003, 7th Edition
Reference Books:	
1.	Theory of functions of complex variables, Shanti Narayan, S Chand & Co, 2006.
2.	Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Ltd
3.	Engineering Mathematics for semester III, T Veerrajan, Tata McGraw Hill.
4.	Matrices , A R Vasishtha , 2005
5.	Advanced Engineering Mathematics, Jain & Iyengar, II Edition, Narosa Publication

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – III**
Course Code	**CE2012S**
Course Title	**ENVIRONMENTAL STUDIES**

COURSE OUTCOMES

After completion of this course, students should be able to

- Identify and analyse impact of human development on natural resources.
- Compute the impact of environmental problems on socio economic growth and human health.
- Evaluate strategies, technologies, and methods for sustainable management of environmental systems and for the remediation of degraded environment.
- Identify impact of human population on the environment and human health.

COURSE CONTENTS

Module I	**Multidisciplinary Nature of Environmental Studies**
	Definition, Scope and Importance, Need for Public awareness
Module II	**Natural Resources**
	Renewable and Non-renewable Resources, Natural resources and associated problems. a. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people. b. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, Case studies. e. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of

	resources for sustainable lifestyles.
Module III	**Ecosystems**
	Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
Module IV	**Biodiversity and its Conservation**
	Introduction, definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. ***Value of biodiversity***: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at Global, National and Local levels. India as a mega-diversity nation. Hot-spots of biodiversity. ***Threats to biodiversity***: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. ***Conservation of biodiversity***: in-situ and ex-situ conservation of biodiversity.
Module V	**Environmental Pollution**
	Definition, Causes, effects and control measures of ; a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. ***Solid waste management***: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. ***Disaster management***: Foods, earthquake, cyclone and landslides.
Module VI	**Social Issues and Environment**
	Unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies. ***Environmental ethics***: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste

	products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.
Module VII	**Human Population and Environment**
	Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health. Case Studies.
Module VIII	**Field Work**
	Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds.
Text Books:	
1.	Soli J Arceivala and Shyam R. Asolekar, Environmental Studies A Practitioner's Approach, Tata McGraw Hill Education Private Limited, New Delhi, First Edition, 2012.
2.	R. Rajagopalan, Environmental Studies: From Crisis to Cure, Oxford University Press, USA, Second Edition, 2011.
3.	Benny Joseph, Environmental Studies, McGraw Hill Education (India) Private, Second Edition, 2008
Reference Books:	
1.	Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T., Environmental Encyclopedia, Jaico Publ. House, Mumbai, 2001
2.	Jadhav, H & Bhosale, V.M., Environmental Protection and Laws. Himalaya Pub. House, Delhi, 1995
3.	Wanger K.D., Environmental Management. W.B. Saunders Co. Philadelphia, USA, 1998

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER - III**
Course Code	**EC2001S**
Course Title	**ELECTRICAL NETWORKS**

COURSE OUTCOMES

After completion of this course, students should be able to

- Analyse electrical networks using various Theorems.
- Characterise a network in terms of frequency and time domain parameters.
- Represent a network in terms of its two port network parameters.
- Obtain the frequency domain representations using Fourier analysis

COURSE CONTENTS

Module I	**Review**
	DC and AC circuits.
Module II	**Mesh and Node Analysis**
	Mesh and Node Analysis of circuits with independent and dependent sources.
Module III	**Linearity, Superposition and Source Transformation**
	Linearity, Superposition, Current AND Voltage Source Transformation
Module IV	**Network Theorems**
	Thevenin's and Norton's Theorem (with independent and dependent sources), Maximum power transfer theorem.
Module V	**Circuit Analysis**
	Introduction to Graph Theory. Tree, link currents, branch voltages, cut set and tie set. Mesh and Node Analysis, Gauss Elimination Technique, Duality.
Module VI	**Time and Frequency Response of Circuits**
	First and second Order Differential equations, initial conditions. Evaluation and analysis of Transient and Steady state responses using Classical Technique as well as by Laplace Transform (for simple circuits only). Transfer function, Concept of poles and zeros. Frequency response of a system (concepts only).

Module VII	**Two - port Networks**
	Concept of two- port network. Driving point and Transfer Functions, Open Circuit impedance (Z) parameters, Short Circuit admittance (Y) parameters, Transmission (ABCD) parameters. Inverse Transmission (A'B'C'D') parameters. Hybrid (h) parameters. Inter Relationships of different parameters. Interconnections of two - port networks. T and Pi representation. Terminated two - port networks.
Module VIII	**Fourier Series**
	Orthogonal basis functions, Representation of a signal in terms of weighted Orthogonal basis functions, Calculation of weights (coefficients) in MSE sense, Extension to periodic signal in terms of Fourier Series Representation. Complex and Trigonometric Fourier series, Properties of Fourier series, Power Spectral Density
Module IX	**The Fourier Transform (FT)**
	Definition and Properties, FT of basic signals, FT of periodic signals, Energy Spectral Density.
Text Books:	
1.	A Sudhakar and S P Shyammohan, Circuits and Networks, Tata McGraw Hill, thirteenth reprint, 2000.
2.	William H Hayt, Jack E Kemmerly and Steven M Durbin, Engineering Circuit Analysis, McGraw Hill International, sixth edition, 2002.
Reference Books:	
1.	Artice M Davis, Linear Circuit Analysis, Thomson Asia Pvt. Ltd., Singapore, first edition, 2001
2.	M. E. Van Valkenburg, Network Analysis, Prentice Hall of India, third edition.
3.	Raymond A DeCarlo and Pen-Min Lin, Linear Circuit Analysis, Oxford University Press, second edition, 2001.

Programme Name	B. Tech. (Electronics Engineering), SEMESTER - III
Course Code	EC2002T
Course Title	ELECTRONICS CIRCUIT ANALYSIS AND DESIGN - I

COURSE OUTCOMES

After completion of this course, students should be able to

- Describe qualitatively the behaviour and characteristics of various semiconductor devices and circuits.
- Analyse BJT and FET transistor circuits for its DC and AC characteristics.
- Compare and characterise different amplifier circuits.
- Design amplifier circuits using BJT and FET for small applications.

COURSE CONTENTS

Module I	**Semiconductor Materials and Diodes**
	Review of Semiconductor Materials and Properties, The PN Junction, Introduction to Semiconductor Diode Theory. Diode Circuits: DC Analysis and Models, AC Equivalent Circuits, Other Diode Types – Solar Cell, Photodiode, Light–Emitting Diode, Schottky Barrier Diode, Zener Diode, Temperature Effects, Understanding Manufacturer's Specifications
Module II	**Diode Circuits**
	Design of Rectifier Circuits, Half Wave Rectification, Full Wave Rectification, Filter, Ripple Voltage and Diode Current, Voltage Doubler Circuit, Zener Diode Circuits, Clipper and Clamper Circuits, Multiple–Diode Circuits, Photodiode and LED Circuits.
Module III	**Bipolar Junction Transistor**
	Basic Bipolar Junction Transistor, Transistor Structures, NPN Transistor: Forward–active Mode Operation, PNP Transistor : Forward–active Mode Operation, Circuit Symbols and Conventions, Current–Voltage Characteristics, Non ideal Transistor Leakage Currents and Breakdown, DC Analysis of Transistor Circuits, Common–Emitter Circuits, Load Line and Modes Of Operation, Common Bipolar Circuits: DC Analysis, Basic Transistor Applications – Switch, Amplifier, Bipolar Transistor Biasing – Single Base Resistor Biasing, Voltage Divider Biasing and Bias Stability, Integrated Circuit Biasing, Multistage Circuits.
Module IV	**Basic BJT Amplifiers**
	Analog Signals and Linear Amplifiers, The Bipolar Linear Amplifier, Graphical Analysis and AC Equivalent Circuit, Small Signal Hybrid – □ Equivalent Circuit of the Bipolar Transistor, Hybrid – □ Equivalent

	Circuit Including the Early Effect, Expanded Hybrid – □ Equivalent Circuit, Other Small – Signal Parameters And Equivalent Circuits, Basic Transistor Amplifier Configurations, Common Emitter Amplifiers, AC Load Line Analysis, Common Collector Emitter Follower Amplifier, Common Base Amplifier, The Three Basic Amplifier configurations: Summary and Comparison, Multistage Amplifiers, Power Considerations, Environmental Thermal Considerations in Transistor Amplifiers, Manufacturers' Specifications.
Module V	**Field Effect Transistor**
	Junction Field–Effect Transistor, MOS Field–Effect Transistor, MOSFET DC Circuit Analysis, Basic MOSFET Applications: Switch, Digital Logic Gate and Amplifier. Temperature effects in MOSFETs, Input Protection in MOSFET. Power FET (VMOS).
Module VI	**Basic FET Amplifiers**
	The MOSFET Amplifier, Basic Transistor Amplifier Configurations, Common Source Amplifier, Source Follower Amplifier, Common Gate Configuration, Three Basic Amplifier Configuration: Summary and Configuration, Single – Stage Integrated Circuit MOSFET Amplifiers, Multistage Amplifiers, Basic JFET Amplifiers
Text Books:	
1.	Donald A. Neamen, Electronic Circuit Analysis and Design, Second edition, McGraw Hill International edition 2001
2.	Martin Roden , Gordon Carpenter, William Wieserman, Electronic Design, Fourth edition, Shroff Publishers, 2002
Reference Book:	
1.	Donald Schilling & Charles Belove, Electronic Circuits Discrete and Integrated, Third edition, McGraw Hill International edition, 1989
2.	David Bell, Electronic Devices and Circuits, 5E Oxford University Press

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – III**
Course Code	**EC2002P**
Course Title	**ELECTRONICS CIRCUIT ANALYSIS AND DESIGN – I LAB**

COURSE OUTCOMES

After completion of this course, students should be able to

- Design electronic circuits to meet desired specifications.
- Analyse and design electronic circuits such as wave shaping circuits, multistage amplifiers, and power amplifiers.
- Explain basic analog electronic circuit design techniques using diodes, bipolar junction transistors and field effect transistors.

LIST OF EXPERIMENTS

1. To study forward and reverse characteristics of PN junction diode.
2. To study forward and reverse characteristics of Zener diode.
3. To study Zener diode as voltage regulator.
4. To study static and dynamic characteristics of BJT
5. BJT bias circuit – Design, assemble and test.
6. JEET/MOSFET bias circuits – Design, assemble and test.
7. Design, assemble and test of BJT common-emitter circuit – D.C and A.C performance: Voltage gain, input impedance and output impedance with bypassed and un-bypassed emitter resistor.
8. Design, assemble and test of BJT emitter-follower – D.C and A.C performance: A.C. voltage gain, input impedance and output impedance.
9. Design, assemble and Test of JFET/MOSFET common-source and common-drain amplifiers – D.C and A.C performance: Voltage gain, input impedance and output impedance.
10. Frequency response of a common-emitter amplifier: low frequency, high frequency and mid frequency response.

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER - III**
Course Code	**EC2003T**
Course Title	**DIGITAL COMBINATIONAL CIRCUITS**

COURSE OUTCOMES

After completion of this course, students should be able to

- Represent data in various number systems and perform inter conversions between them.
- Analyse the behaviour of various logic circuits and logic families.
- Design various combinational circuits as per different specifications.
- Numerically analyse various logic circuits and perform Boolean reduction
- Design Parity circuits, Comparators, Adders, Subtractors, ALUs

COURSE CONTENTS

Module I	**Introduction**
	Analog VS Digital systems, digital devices, integrated circuits, programmable logic devices, digital design levels, software aspects of digital design.
Module II	**Number System**
	Positional number systems, Binary and Hexadecimal number systems, general positional number systems conversions, arithmetic operations, representation of negative numbers, arithmetic operations on signed numbers, binary and gray codes, character codes, codes for detecting and correcting errors.
Module III	**Logic Circuits**
	Logic signals and gates, Boolean Algebra, theorems, combinational circuit analysis, combinational circuit synthesis – minimization, Karnaugh Maps, sum of products and product of sums expressions and their minimization, programmed minimization methods – Quine-Mc-Cluskey minimization algorithm, timing hazards – static and dynamic hazards, introduction to VHDL hardware description language.
Module IV	**Logic Families**
	CMOS logic; MOS transistors, basic CMOS inverter circuit, CMOS NAND and NOR gates, fan – in, fan – out, Electrical behavior of CMOS circuits, propagation delay, power consumption, CMOS logic families, bipolar logic introduction, BJT, TTL NAND and NOR gates, fan – in, fan – out, Electrical behavior of TTL circuits, propagation delay, power consumption. CMOS / TTL interfacing, Introduction to Emitter – coupled logic.

Module V	**Combinational Logic Design**
	Introduction to Combinational and Sequential Circuits: Introduction to combinational circuit: Realization of basic combinational functions like comparison, code conversion, decoding, multiplexing, demultiplexing, addition, subtraction. Delays and hazards in combinational circuits.
Module VI	**Combinational Logic Modules and their applications**
	Decoders, encoders, multiplexers, demultiplexers and their applications; Parity circuits and comparators; Arithmetic modules- adders, subtractors and ALU; Design examples
Text Books:	
1.	John F. Wakerley, Digital Design Principles and Practices, fourth edition, Pearson Education India, 2008.
2.	Stephen Brown & ZvonkoVranesic, Fundamentals of Digital logic with VHDL design, first edition, McGraw Hill International edition, 2000.
3.	Moris& Miller (Eds), Designing with TTL Integrated Circuits: Prepared by Staff of Texas Instruments, McGraw Hill International edition, 1981
4.	Khrate , Digital Electronics, Oxford University Press 2015

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER - III**
Course Code	**EC2003P**
Course Title	**DIGITAL COMBINATIONAL CIRCUITS LAB**

COURSE OUTCOMES

After completion of this course, students should be able to

- Design an electronic circuit with electronic devices and components for different applications
- Design a digital system and its application using sequential circuits, counters and shift registers.
- Perform truth table verification of flip flops

LIST OF EXPERIMENTS

1. Realization of Logic Gates using discrete components and ICs.
2. Design of combinational logic circuits (Half Adder, Full Adder, Half Subtractor, Full Subtractor) using fundamental and Universal Logic gates
3. Design of Multiplexer, De-multiplexer,
4. Design of Encoder and Decoder circuits
5. Design of Code Converters
6. Truth-tables verification of Flip-Flops using logic gates.
7. Design of various types of registers.
8. Design of Shift Registers, Ring counter and Johnson counter
9. Design of Synchronous and Asynchronous counters.
10. VHDL for Combinational logic.
11. Study of various parameters of logical families and comparative study of TTL and CMOS.

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – III**
Course Code	**EC2004T**
Course Title	**NUMERICAL TECHNIQUES**

COURSE OUTCOMES

After completion of this course, students should be able to

- Perform an error analysis for a given numerical method.
- Evaluate the roots of equations.
- Solve linear algebraic equations.
- Perform numerical integration and differentiation

COURSE CONTENTS

Module I	**Errors in Numerical Computation**
	Error types, analysis and estimation. Error propagation.
Module II	**Roots of Equations**
	Bracketing Methods – The Bisection method, The False position method. Open Methods – The Newton-Raphson method, The Secant method. (relevant engineering applications)
Module III	**Systems of Linear Algebraic Equations**
	Gauss-Elimination method – Technique, pitfalls, improvement. Gauss-Jordan method. LU decomposition and matrix inversion. Gauss-Seidel method. (relevant engineering applications)
Module IV	**Curve Fitting**
	Interpolation – Newton's divided difference, Lagrange Interpolating polynomials. Approximation - Least square approximation technique, linear regression, and polynomial regression. (relevant engineering applications)
Module V	**Numerical Differentiation and Integration**
	Methods based on interpolation and finite differences. (relevant engineering applications) The Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule. (relevant)
Text Books:	
1.	Seven C Chopra, Raymond C Canale, Numerical Methods for engineers, fourth edition, Tata McGraw Hill, 2002
2.	Robert J Schillig, Sandra L Harris, Applied numerical Methods for Engineers First Edition Thomson AsiaPvt. Ltd., 2002

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – III**
Course Code	**EC2004P**
Course Title	**NUMERICAL TECHNIQUES LAB**

COURSE OUTCOMES

After completion of this course, students should be able to

- Use wide range of standard numerical methods to solve complex engineering problems.
- Utilize Matlab as a programming tool in solving engineering problems.
- Demonstrate their ability to identify and address experimental uncertainty.
- Progress towards ongoing independent development of applying experimental and numerical methods to real engineering situations.

LIST OF EXPERIMENTS

1. Design a simulation which shows how the bisection method works for finding roots of an equation f(x) =0.
2. Design a simulation to illustrate the Newton-Raphson method of finding roots of an equation f(x) =0.
3. Design a simulation to illustrate the convergence of the Secant method of finding roots of an equation f(x) =0.
4. To develop a computer program to solve the set of non-linear equations using Gauss Seidal load flow algorithm.
5. To simulate and determine polynomial using method of Least Square Curve Fitting.
6. Write a function program that calculates the midpoint rule approximation for ∫f on the interval [a, b] with n subintervals. The inputs should be f, a, b and n.
7. Simulate the error of a trapezoid method integral.

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER - III**
Course Code	**EC2005A**
Course Title	**ECONOMICS FOR ENGINEERS**

COURSE OUTCOMES

After completion of this course, students should be able to

- Student shall know elementary principles of economics and would be able to use tools that are likely to find useful in their profession when employed in industry.
- Student shall know the current economic parameters /indicators/ policy debates.

COURSE CONTENTS

Module I	Basic Principles and Methodology of Economics. Demand/Supply – elasticity –Government Policies and Application. Theory of the Firm and Market Structure. Basic Macro-economic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes *(12 Lectures)*
Module II	Public Sector Economics –Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy – Inflation and Phillips Curve. *(11 Lectures)*
Module III	Elements of Business/Managerial Economics and forms of organizations. Cost & Cost Control –Techniques, Types of Costs, Budgets, Break even Analysis, Capital Budgeting. Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money. Business Forecasting – Elementary techniques. Statements – Cash flow, Financial. Case Study Method. *(11 Lectures)*
Module IV	Indian economy Brief overview of post-independence period – plans. Post reform Growth, Structure of productive activity. Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment–Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors. *(11 Lectures)*
Text Books:	
1.	Mankiw Gregory N.(2002), Principles of Economics, Thompson Asia
2.	V. Mote, S. Paul, G. Gupta(2004), Managerial Economics, Tata McGraw Hill
3.	Misra, S.K. and Puri (2009), Indian Economy, Himalaya

4.	Pareek Saroj (2003), Textbook of Business Economics, Sunrise Publisher

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER - IV**
Course Code	**MA2013S**
Course Title	**MATHEMATICS FOR ELECTRICAL ENGINEERS - II**

COURSE OUTCOMES

After completion of this course, students should be able to

- Perform operations on matrices including transformation and reduce to Canonical form.
- Solve problem on vectors using different theorems.
- Understand Bessel function and solve problems on Legendre polynomials.
- Apply properties of Z transform and it's inverse to solve Engineering Problems.

COURSE CONTENTS

Module I	**Matrices**
	1.1 Eigen values Eigen vectors of square matrix. 1.2 Cayley Hamilton's theorem and function of square matrix. 1.3 Similarity Matrices, Modal Matrix 1.4 Function of Square a Matrix, Minimal Polynomial and Minimal Equation of a Matrix, Derogatory and Non-Derogatory Matrices. 1.5 Quadratic forms : Linear Transformation , Linear Transformation of Quadratic forms , Congruence of a square Matrix 1.6 Reduction to Canonical form under Congruent and Orthogonal Transformation of Quadratic form, rank, index, signature and class value of Quadratic form.
Module II	**Vector Calculus and Analysis**
	2.1 Scalar and vector point functions, Directional derivative, Curl and Divergence, Conservative, Irrotational and Solenoid field. 2.2 Line integral, Green's theorem for plane regions and Properties of Line integral. 2.3 Stoke's theorem, Gauss's divergence theorem (without proof) related identities and deductions.
Module III	**Bessel Functions**
	3.1 Bessel's Equation**, Solution's of Bessel's function,** Bessel's Function of Jn(x). 3.2 Recurrence formula Jn(x), Equation Reducible to Bessel's equation 3.3 Orthogonality of Bessel's functions, A Generating function for Jn(x), 3.4 Trigonometric Expansion involving Bessel's functions, 3.5 Bessel's Integral, Legendre's Equation, Legendre's Polynomial, General solution of Legendre's Equation, Rodrigue's Formula, A Generating function of Legendre polynomial, Orthogonality of Legendre polynomial.

	3.6 Recurrence formula for pn(x).
Module IV	**Z Transform**
	4.1 Z-Transform, Properties of z-transform, Theorem, change of Scale, Shifting property. 4.2 Inverse Z-Transform solution of Difference Equation, Multiplication by k, Division by k, Initial value, Final value, Partial sum. 4.3 Convolution, Convolution property of Casual Sequence, Transform Important Sequence. 4.4 Inverse of Z-transform by Division, By Binomial Expansion and partial fraction, Partial fraction. 4.5 Inversion by residue method, Solution of Difference Equation.
Text Books:	
1.	Advanced Engineering Mathematics. H. K. Dass S. Chand & Co. Ltd-3rd Edition
2.	Advanced Engineering Mathematics. Erwin Kreyszig, 9th edition
3.	A Text Book of Engineering Mathematics. N.P. Bali & Dr. Manish Goyal, Laxmi Publication, Eight Edition
Reference Books:	
1.	Higher Engineering Mathematics, B. V. Ramana, McGraw Hill Education Publication, Delhi
2.	Engineering Mathematics- T. Veerarrajan Tata McGraw-Hill- IInd Edition
3.	Engineering Mathematics, Babu Ram, Pearson , 1st Edition.
4.	Engineering Mathematics, Srimanta Pal & Subodh C.Bhunia, OXFORD University Press.

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – IV**
Course Code	**EC2011S**
Course Title	**SIGNALS AND SYSTEMS**

COURSE OUTCOMES

After completion of this course, students should be able to

- Understand basic concepts of linear systems and how they interact with continuous-time and discrete time signals.
- Understand Z-domain descriptions of signals and systems, for use in solving difference equations.
- Design a sampling and reconstruction system to meet specific requirements
- Analyse continuous-time and discrete time signals and systems.

COURSE CONTENTS

Module I	**Introduction to signals & Systems (CT and DT domain)**
	Definition of Signal, Signal classification, Signal manipulations, Periodicity in CT (Continuous Time) & DT(Discrete Time) domain, Concept of a system, System representations & classification, Concept of Impulse Response, Convolution in CT and DT domain
Module II	**Fourier Series & Fourier Transform (CTFS, CTFT, DTFS & DTFT)**
	Concept, properties and uses, Amplitude & phase spectra, Energy Spectral Density, Power Spectral Density
Module III	**Laplace Transforms**
	Definition & properties of Two-sided & one-sided Laplace Transform, Region of Convergence (ROC), System transfer function, Relationship with Fourier Transform & mapping, Zero state & zero input responses
Module IV	**Z Transform**
	Definition & properties of Two-sided & one-sided Z Transform, Region of Convergence (ROC), Relationship with Fourier and Laplace Transform , & mapping, Inverse Z Transform
Module V	**Introduction to CT Systems**
	System Transfer function & Impulse response, Differential Equations
Module VI	**Introduction to DT Systems**
	Difference equation, FIR & IIR systems, System transfer function, System realization: Direct forms, Cascade & parallel forms, Linear and circular Convolution, BIBO stability.

Module VII	**Time Domain Analysis of DT Systems**
	System Transfer function & Impulse response, Difference equation, Solution of a difference equation, zero input & zero state response calculations
Text Books:	
1.	S. Haykin, Signals and Systems , Wiley Eastern Publication
2.	J.G. Proakis, D. G. Manolakis, Digital Signal Processing: Principles, Algorithms and applications, Prentice Hall of India.
3.	Ashok Ambardar, Analog and Digital Signal Processing, Thomson Learning, second edition
4.	Oppenheim and Schafer with Buck, Discrete- Time Signal Processing, Prentice Hall of India

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – IV**
Course Code	**EC2013T**
Course Title	**Digital Sequential Circuits**

COURSE OUTCOMES

After completion of this course, students should be able to

- Classify and analyse different types of sequential circuits.
- Analyse and design flip-flop based digital applications
- Comprehend, analyse and design FSMs
- Do hardware description of synchronous sequential circuits in VHDL and describe different VHDL constructs
- Describe architectures of different programmable logic devices such as (FPGA and CPLD) and structure of different types of memories and use them in digital design.

COURSE CONTENTS

Module I	**Introduction**
	Introduction to sequential circuits, Types: synchronous and asynchronous sequential logic circuits, Comparison between sequential and combinational circuits
Module II	**Sequential Logic systems**
	Definition of state machines, state machine as a sequential controller; Basic sequential circuits- latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, T flip-flop; Timing hazards and races; Analysis of state machines using D flip-flops and JK flip-flops; Design of state machines - state table, state assignment, transition/excitation table, excitation maps and equations, logic realization; Design examples
Module III	**State machine design approach**
	Design of state machines - state table, state assignment, transition/excitation table, excitation maps and equations, logic realization; Designing state machine using ASM charts; Designing state machine using state diagram; Design examples
Module IV	**Sequential logic modules and their applications**
	Multi-bit latches and registers, counters, shift register, application examples.
Module V	**Memory Devices & Programmable Logic Devices**
	Read-only memory, read/write memory - SRAM and DRAM PLAs, PALs and their applications; Sequential PLDs and their applications; State-machine design with sequential PLDs; Introduction to field

	programmable gate arrays (FPGAs)
Text Books:	
1.	John F. Wakerley, Digital Design Principles and Practices, fourth edition, Pearson Education India, 2008.
2.	Stephen Brown &ZvonkoVranesic, Fundamentals of Digital logic with VHDL design, first edition, McGraw Hill International edition, 2000.
3.	Moris& Miller (Eds), Designing with TTL Integrated Circuits: Prepared by Staff of Texas Instruments, McGraw Hill International edition, 1981

Programme Name	B. Tech. (Electronics Engineering), SEMESTER – IV
Course Code	EC2013P
Course Title	Digital Sequential Circuits LAB

COURSE OUTCOMES

After completion of this course, students should be able to

- Implement digital sequential circuits using ICs.
- Describe digital sequential circuits in any hardware description language.
- Program an FPGA or CPLD

LIST OF EXPERIMENTS

1) Truth Table verification of

   i) RS Flip Flop

   ii) T type Flip Flop.

   iii) D type Flip Flop.

   iv) JK Flip Flop.

   v) JK Master Slave Flip Flop. To simplify the given expression and to realize it using Basic gates and Universal gates

2) To realize and study of Shift Register.

   i) SISO (Serial in Serial out)

   ii) SIPO (Serial in Parallel out)

   iii) PIPO (Parallel in Parallel out)

   iv) PISO (Parallel in Serial out) To design and set up the following circuit using IC 7483.

3) Design and set up a Sequence Generator using IC 7495.

4) To realize and study Ring Counter and Johnson counter.

5) To design and test 3-bit binary asynchronous counter using flip-flop IC 7476 for the given sequence.

6) To design and test 3-bit binary synchronous counter using flip-flop IC 7476 for the given sequence.

7) To design IC 74193 as a up/down counter.

8) To design IC 7490 as a decade counter with BCD count sequence.

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – IV**
Course Code	**EC2012T**
Course Title	**ELECTRONICS CIRCUITS ANALYSIS AND DESIGN – II**

COURSE OUTCOMES

After completion of this course, students should be able to

- Compute and characterise the frequency response of BJT and FET
- Design and analyse various types of power amplifiers
- Design and analyse various types of differential and multistage amplifiers
- Design and analyse various types of feedback amplifiers

COURSE CONTENTS

Module I	**Frequency Response of Amplifiers**
	Amplifier Frequency Response, System Transfer Functions, S – Domain Analysis, First – Order Functions, Bode Plots, Short–Circuit and Open–Circuit Time Constants, Frequency Response: Transistor Amplifiers with Circuit Capacitors, Frequency Response: Bipolar Transistor, Frequency Response: The FET, High Frequency Response of Transistor Circuits. Sinusoidal Oscillators: The phase shift Oscillator, The Wien Bridge Oscillator, The Tuned Circuit Oscillator, The Colpitts Oscillator and Hartley Oscillator.
Module II	**Output Stage and Power Amplifiers**
	Power Amplifiers, Power Transistors – Power BJTs, Power MOSFETs, Heat Sinks, design of heat sinks, Classes Of Amplifiers – Class–A Operation, Class–B Operation, Class–AB Operation, Class–C Operation, Class–A Power Amplifiers, Class–AB Push Pull Complementary Output Stages.
Module III	**Differential and Multistage Amplifiers**
	The Differential Amplifier, Basic BJT Differential Pair, Basic FET Differential Pair, Differential Amplifier with Active Load, BICMOS Circuits, Gain Stage and Simple Output Stage, Simplified BJT Operational Amplifier Circuit, Differential Amplifier Frequency Response.The Darlington Amplifier and Cascade Amplifier.
Module IV	**Feedback and Stability**
	Introduction to Feed Back, Basic Feedback Concepts, Ideal Close–Loop Gain, Gain Sensitivity Bandwidth Extension, Noise Sensitivity, Reduction of Nonlinear Distortion, Ideal Feedback Topologies, Series–Shunt, Shunt–Series, Series–Series, Shunt–Shunt Configurations, Voltage (Series – Shunt) Amplifiers, Current (Shunt – Series) Amplifiers, Trans Conductance

	(Series – Series) Amplifiers, Trans Resistance (Shunt – Shunt) Amplifiers, Loop Gain, Stability of The Feedback Circuit, The Stability Problem, Bode Plots: One – Pole, Two – Pole, and Three – Pole Amplifiers, Nyquist Stability Criterion, Phase and Gain Margins, Frequency Compensation Basic Theory, Closed Loop Frequency Response, Miller Compensation.
Text Books:	
1.	Donald A. Naeman, Electronic Circuit Analysis and Design, Second Edition, McGraw Hill International Edition 2001.
2.	Martin Roden, Gordon Carpenter, William Wieserman, Electronic Design, Fourth edition, Shroff Publishers,2002.
Reference Books :	
1.	Donald Schilling and Charles Belove, Electronic Circuits Discrete and Integrated, Third edition, McGraw Hill International Edition, 1989
2.	Adel Sedra and, Kenneth Smith, Microelectronic Circuits, Fourth edition, Oxford University Press, 1998.

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – IV**
Course Code	**EC2012P**
Course Title	**ELECTRONICS CIRCUITS ANALYSIS AND DESIGN – II LAB**

COURSE OUTCOMES

After completion of this course, students should be able to

- Differentiate the response of BJT and MOSFET at low frequency and RF frequency using modelling.
- Get familiarized with various RF devices, PLLs,
- Get familiarized with various RF synthesizer architectures and frequency dividers.

LIST OF EXPERIMENTS

1. Design of Voltage Shunt Feedback Amplifier.
2. Frequency Response of CE Amplifier with and Without Feedback.
3. Design of Current Shunt Feedback Amplifier.
4. Design of RC Phase Shift Oscillator.
5. Design of Radio Frequency Oscillators (Hartley and Colpitt's Oscillators).
6. Frequency Response of Two stage RC – Coupled Amplifier.
7. Design of Voltage Shunt Feedback Amplifier.
8. Frequency Response of CE Amplifier with and Without Feedback.
9. Measurement of Parameters of Common Emitter Amplifier.
10. Design of RC Phase Shift Oscillator.
11. Design of Wien Bridge Oscillator.
12. Design of Hartley and Colpitt's Oscillator.

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – IV**
Course Code	**EC2014T**
Course Title	**MEASUREMENTS AND INSTRUMENTATION**

COURSE OUTCOMES

After completion of this course, students should be able to

- Describe the working principle of various test and measurement equipment.
- Describe the working principle of various signal generators and analysers.
- Describe the working principle of various digital measurement equipment's.
- Describe various data acquisition techniques and fiber optic based measurements.

COURSE CONTENTS

Module I	**Basic Measurement Concepts**
	Measurement systems – Static and dynamic characteristics – units and standards of measurements – error :-accuracy and precision, types, statistical analysis – moving coil, moving iron meters – multimeters – Bridge measurements : – Maxwell, Hay, Schering, Anderson and Wien bridge.
Module II	**Basic Electronic Measurements**
	Electronic multimeters – Cathode ray oscilloscopes – block schematic – applications – special oscilloscopes :– delayed time base oscilloscopes, analog and digital storage oscilloscope, sampling oscilloscope – Q meters – Vector meters – RF voltage and power measurements – True RMS meters.
Module III	**Signal Generators And Analysers**
	Function generators – pulse and square wave generators, RF signal generators – Sweep generators – Frequency synthesizer – wave analyzer – Harmonic distortion analyzer – spectrum analyzer :- digital spectrum analyzer, Vector Network Analyzer –Digital L,C,R measurements, Digital RLC meters.
Module IV	**Digital Instruments**
	Comparison of analog and digital techniques – digital voltmeter – multimeters – frequency counters – measurement of frequency and time interval – extension of frequency range – Automation in digital instruments, Automatic polarity indication, automatic ranging, automatic zeroing, fully automatic digital instruments, Computer controlled test systems, Virtual instruments

Module V	**Data Acquisition Systems And Fiber Optic Measurements**
	Elements of a digital data acquisition system – interfacing of transducers – multiplexing – data loggers – computer controlled instrumentation – IEEE 488 bus – fiber optic measurements for power and system loss – optical time domain reflectometer.
Text Books:	
1.	Albert D.Helfrick and William D.Cooper – Modern Electronic Instrumentation and Measurement Techniques, Pearson / Prentice Hall of India, 2007.
2.	Ernest O. Doebelin, Measurement Systems- Application and Design, TMH, 2007.
3.	Joseph J.Carr, Elements of Electronics Instrumentation and Measurement, Pearson Education, 2003.
4.	Alan. S. Morris, Principles of Measurements and Instrumentation, 2nd Edition, Prentice Hall of India, 2003.
5.	David A. Bell, Electronic Instrumentation and measurements, Prentice Hall of India Pvt Ltd, 2003.

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER - IV**
Course Code	**EC2014P**
Course Title	**MEASUREMENTS AND INSTRUMENTATION LAB**

COURSE OUTCOMES

After completion of this course, students should be able to

- Handle and use various instruments and calibrate them for proper measurements.
- Extend voltmeter and ammeter.
- Simulate simple measurement systems.

LIST OF EXPERIMENTS

1. Extension of Voltmeter
2. Extension of Ammeter
3. Analysis of a wave using spectrum analyser
4. Measurement using RLCQ meter
5. Simulation of any simple measurement system using lab view
6. Measurement of unknown resistance using maxwells bridge
7. Measurement of unknown resistance using weins series and parallel bridge
8. To generate various signals using arbitrary waveform generator

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – IV**
Course Code	**EC2015T**
Course Title	**MICROPROCESSOR AND MICROCONTROLLER**

COURSE OUTCOMES

After completion of this course, students should be able to

- Describe architecture of a typical microprocessor and microcontroller.
- Design a microprocessor system consisting of a microprocessor / microcontroller, memory, I/ O and other relevant devices.
- Design and implement assembly language programs for 8085 / 8051 microprocessor / microcontroller.
- Design and implement I/O data transfer techniques

COURSE CONTENTS

Module I	**Introduction**
	Introduction to Microprocessors, Microcontrollers and Assembly Language.
Module II	**8085 Microprocessor Architecture and Memory Interfacing**
	The 8085 architecture, Instruction cycles, machine cycles and T states. Concept of wait states. Memory interfacing with timing considerations. Clock, Reset and buffering circuits.
Module III	**8085 Assembly Language Programming**
	The 8085 programming model, Instruction classification, Instruction and Data format, process of writing, assembly and execution of simple assembly language programs.
Module IV	**Programming Techniques**
	Data transfer operations, Arithmetic & Logic operations, Branch operations, Writing assembly language programs, Debugging a program. Looping, Counting and indexing, counters and timers, Code conversion, BCD arithmetic and 16 bit data operations. Software Development Systems and Assemblers. Concept of Stack and subroutines, parameter passing techniques, Re-entrant and recursive subroutines.
Module V	**Parallel I/O Data Transfer Techniques**
	Basic interfacing concepts, Interfacing input and output devices with examples, Memory mapped I/O and I/O mapped I/O. I/O data transfer classification, Programmed I/O, Interrupt driven program controlled I/O, Interrupt Requirements, Single level interrupt, Multi-level interrupt, Vectored interrupt. 8085 interrupt structure and operation. 8259A programmable interrupt controller features and operation – single and

	cascaded. Hardware I/O (Direct Memory Access).
Module VI	**Intel MCS 51 family**
	Introduction to Single chip microcontrollers of Intel MCS 51 family. Architectural and operational features. Instruction set. CPU timing and machine cycles. Interrupt structure and priorities. Internal Timer / counters, serial interface. Interfacing of external memory. Power saving modes.8051 variants. 89C51 devices
Text Books:	
1.	Ramesh S Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Sixth edition, Penram International Publishing (India), 2013.
2.	Kenneth Short, Microprocessors and Programmed Logic, second edition, Prentice Hall of India, 1987.
3.	Kenneth Ayala, The 8051 Microcontroller & Embedded Systems Using Assembly and C, Cengage Learning, first edition, 2010
4.	Muhammad A Mazidi, The 8051 Microcontroller and Embedded Systems: Using Assembly and C, second edition, 2008

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – IV**
Course Code	**EC2015P**
Course Title	**MICROPROCESSOR AND MICROCONTROLLER LAB**

COURSE OUTCOMES

After completion of this course, students should be able to

- Understand and use microprocessor circuits and kits.
- Design and implement assembly language programs for 8085 / 8051 microprocessor / microcontroller.
- Design and program parallel data transfer techniques

LIST OF EXPERIMENTS

1. Any five programs on Data transfer operations, Arithmetic & Logic operations

2. Any three programs on parallel data transfer techniques including usage of interrupts

Programme Name	**B. Tech. (Electronics Engineering), SEMESTER – IV**
Course Code	**HM2001L**
Course Title	**PRESENTATION AND COMMUNICATION SKILLS**

COURSE OUTCOMES

After completion of this course, students should be able to

- Speak with confidence, being aware of the various aspects of professional speaking
- Get an understanding of the communication requirements of placement procedures and develop necessary skills for the enhancement of the same
- Get trained in the technical writing skills and write professional documents like e-mails, reports, proposal and research papers
- Work in teams and make professional presentations
- Develop a bank of professional vocabulary
- Demonstrate knowledge of professional ethics

COURSE CONTENTS

Module I	Basics of Business Communication a. Concept and meaning of communication b. Verbal and non-verbal communication c. barriers to the process of communication d. Channels of communication e. Role of communication in the age of information technology
Module II	Professional grooming and etiquette; cross-cultural communication
Module III	Grammar, vocabulary and summarization techniques a. Common errors b. Use of articles, prepositions, subject - verb agreement c. Punctuation and capitalization d. Technical vocabulary: business idioms, phrasal verbs e. Summarization
Module IV	Speaking a. Intonation b. Modulation c. Basics of public speaking d. Gaining confidence
Module V	Presentation Skills a. Public speaking b. Oral presentation c. Graphic presentation

Module VI	Career Oriented Communication a. Resume, Language and format of job application b. Job Interviews i. Purpose and process ii. How to prepare for interviews iii. Language and style to be used in interview iv. Types of interview questions and how to answer them c. Group Discussion: structure, dynamics and techniques of effective participation
Module VII	Technical Writing a. Technical writing process b. Style and organization in technical writing c. objectivity, clarity, precision as defining features of technical communication d. Language and format of various types of business letters, reports; proposals, e-mails, minutes of meeting, research paper
Module VIII	Language Laboratory a. Listening and comprehension skills b. Reading Skills c. Sound Structure of English d. Intonation patterns
Text Books:	
1.	Business Communication by Hory Shankar Mukharjee, OUP
2.	Effective Technical Communication by Asharaf Rizvi, The McGraw Hill
3.	Business Communication by Meenakshi Raman, Prakash Singh, OUP
Reference Books:	
1.	Basic Managerial Skills for All by E.H. McGrath, PHI Learning Pvt Ltd
2.	Professional Ethics by R. Subramanian, OUP
3.	https://learnenglish.britishcouncil.org/en/english-grammar