Teaching Scheme

Program: B.Tech. Electronics & Communication Engineering

SEMESTER-I

Subject Code	Subject Name	Teaching Scheme			Credits	Hrs
		Theory(Hrs)	Pract(Hrs)	Act (Hrs)		
FY410001	Engineering Mathematics – I	3	0	2	4	5
FY410010	Engineering Chemistry	3	0	0	3	3
FY410009	Engineering Material & Applications	3	0	2	4	5
FY410011	Elements of Electrical & Electronics Engineering	3	0	0	3	3
FY410008	Computer Concepts and Programming	3	0	2	4	5
FY410017	Engineering Chemistry Lab	0	2	0	1	2
FY410018	Elements of Electrical & Elect Engg.	0	2	0	1	2
FY410020	Programming Practice	0	4	0	2	4
FY410021	Elements of civil & Environmental Engg	1	0	2	2	3
	Total	16	8	8	24	32

SEMESTER-II

Subject Code	Subject Name	Teaching Scheme			Credits	Hrs
		Theory	Pract	Act		
FY410002	Engineering Mathematics – II	3	0	2	4	5
FY410005	Engineering Physics	3	0	0	3	3
FY410006	Elements of Mechanical Engg.	3	0	0	3	3
FY410003	English Language Communication	3	0	2	4	5
FY410007	Engineering Graphics	2	4	0	4	6
FY410014	Engineering Physics Lab	0	2	0	1	2
FY410015	Elements of Mechanical Engg. Lab	0	2	0	1	2
FY410013	Workshop Practice	0	4	0	2	4
FY410022	Applied Mechanics	3	0	2	4	5
	Total	17	12	6	26	35

SEMESTER-III

Subject Code	Subject Name	Abbr	Teaching Scheme(Credits)			Credits	Hrs
			Theory	Practical	Tutorial		
EC410301	Maths-3	M3	3	0	1	4	5
EC410315	Analog Electronics-I	AE1	3	0	1	4	5
EC410310	Digital Electronics	DE	4	0	0	4	4
EC410316	Circuit And Networks	CAN	3	0	1	4	5
EC410311	Object Oriented Computer Programming	OOCP	3	0	0	3	3
EC410312	Management Concepts and Principles	MCP	3	0	0	3	3
EC410307	Analog Electronics-I Lab	AE1 Lab	0	1	0	1	2
EC410308	Digital Electronics Lab	DE Lab	0	1	0	1	2
EC310313	Circuits & Networks lab	CN Lab	0	1	0	1	2
EC410309	OOCP Lab	OOCP lab	0	1	0	1	2
EC410314	Electronics Workshop	EW	0	1	0	1	2
	Total		**19**	**5**	**3**	**27**	**35**

SEMESTER-IV

Subject Code	Subject Name	Abbr	Teaching Scheme			Credit	Hours
			Theory	Practical	Activity		
EC410401	Maths-4	M4	3	0	1	4	5
EC410402	Analog Electronics-II	AE2	3	0	1	4	5
EC410415	Microprocessor and Interfacing	M& I	3	0	0	3	3
EC410416	Control Theory	CT	3	0	1	4	5
EC410411	Electromagnetic	EM	3	0	0	3	3
EC410417	Project Management	PM	2	0	0	2	2
EC410407	Analog Electronics II Lab	AE2 Lab	0	1	0	1	2
EC410408	Microprocessor and interfacing Lab	M&I Lab	0	1	0	1	2
EC410414	Simulation and Design Tools	SDT	0	1	0	1	2
	Total		**17**	**3**	**3**	**23**	**29**

SEMESTER-V

Subject Code	Subject Name	Abbr	Teaching Scheme			Credits	Hrs
			Theory	Practical	Activity		
EC410501	Analog Communication	AC	3	0	1	4	5
EC410508	Electronic Measurements and Instrumentation	EMI	3	0	0	3	3
EC410503	Microcontroller and interfacing	M& I	3	0	0	3	3
EC410509	Linear Integrated Circuits	LIC	3	0	0	3	3
EC410510	Signal and Systems	S&S	4	0	0	4	4
EC410521/22	Elective -1	EL-1	3	0	0	3	3
EC410506	Analog Communication Lab	AC Lab	0	1	0	1	2
EC410511	Electronic Measurements and Instrumentation lab	EMI Lab	0	1	0	1	2
EC410507	Microcontroller and interfacing Lab	M& I Lab	0	1	0	1	2
EC410523/24	Elective -1Lab	EL-1Lab	0	1	0	1	2
EC410512	Linear Integrated Circuits lab	LIC lab	0	1	0	1	2
EC410513	Miniproject	Proj	0	0	1	1	2
	Total		**20**	**5**	**1**	**26**	**34**

Elective 1

EC410521: Digital System design using HDL
EC410522: Video system Engineering
EC410523: Digital System design using HDL lab
EC410524: Video system engineering lab

SEMESTER-VI

Subject Code	Subject Name	Abbr	Teaching Scheme			Credits	Hrs
			Theory	Practical	Activity		
EC410616	Digital Communication	DC	4	0	0	4	4
EC410603	Microwave Engineering	MT	3	0	0	3	3
EC410610	Optical Communication	OC	3	0	0	3	3
EC410611	VLSI Design	VLSI	3	0	1	4	5
EC410612	Digital Signal Processing	DSP	3	0	1	4	5
EC410623/24	Elective-2	EL-2	3	0	1	4	5
EC410607	Digital Communication lab	DC Lab	0	1	0	1	2
EC410608	Microwave Engineering Lab	MW lab	0	1	0	1	2
EC410613	Optical Communication Lab	OC Lab	0	1	0	1	2
EC41614	VLSI Design Lab	VLSI Lab	0	1	0	1	2
EC410615	Digital Signal Processing Lab	DSP Lab	0	1	0	1	2
	Total		**19**	**5**	**3**	**27**	**35**

Elective 2

EC410623: Advance Micro Controller
EC610624: error correcting codes
:

SEMESTER-VII

Subject Code	Subject Name	Abbr	Teaching Scheme			Credits	Hours
			Theory	Practical	Activity		
EC410701	Antenna & Wave Propagation	AWP	3	0	1	4	5
EC410714	Wireless communication	WC	4	0	0	4	4
EC410709	Image Processing	IP	4	0	0	4	3
EC410710	Data and Communication Networks	DCN	3	0	0	3	3
EC410728/22/23	Elective -3	EL-3	3	0	1	4	5
EC410724/29	Elective-4	EL-4	3	0	0	3	3
EC410705	Antenna & Wave Propagation Lab	AWP Lab	0	1	0	1	2
EC410711	Wireless communication lab	WC lab	0	1	0	1	2
EC410712	Image Processing Lab	IP Lab	0	1	0	1	2
EC710713	Data and Communication Networks Lab	DCN Lab	0	1	0	1	2
EC410726/30	Elective-4 lab	EL-4 Lab	0	1	0	1	2
	Total		**20**	**5**	**2**	**27**	**33**

Elective 3

EC410728: Satellite Communication
EC410722: Embedded Systems
EC410723: Analog Cmos Design

Elective 4

EC410729: Radar and Navigation
EC410730: Radar and Navigation lab
EC410724: Power electronics
EC410726: Power electronics lab

SEMESTER-VIII

Subject Code	Subject Name	Abbr	Teaching Scheme			Credits	Hours
			Theory	Practical	Activity		
EC410803	Major Project	MjP	0	0	20	20	20
	Total		0	0	20	20	20

ज्ञानेन प्रकाशते जगत्
INDUS UNIVERSITY

3RD SEMESTER

ज्ञानेन प्रकाशते जगत्
INDUS UNIVERSITY

SEMESTER-III

Subject Code	Subject Name	Abbr	Teaching Scheme(Credits)			Credits	Hrs
			Theory	Practical	Tutorial		
EC410301	Maths-3	M3	3	0	1	4	5
EC410315	Analog Electronics-I	AE1	3	0	1	4	5
EC410310	Digital Electronics	DE	4	0	0	4	4
EC410316	Circuit And Networks	CAN	3	0	1	4	5
EC410311	Object Oriented Computer Programming	OOCP	3	0	0	3	3
EC410312	Management Concepts and Principles	MCP	3	0	0	3	3
EC410307	Analog Electronics-I Lab	AE1 Lab	0	1	0	1	2
EC410308	Digital Electronics Lab	DE Lab	0	1	0	1	2
EC310313	Circuits & Networks lab	CN Lab	0	1	0	1	2
EC410309	OOCP Lab	OOCP lab	0	1	0	1	2
EC410314	Electronics Workshop	EW	0	1	0	1	2
	Total		**19**	**5**	**3**	**27**	**35**

ENGINEERING MATHEMATICS – III
B.Tech. (All Branches) Semester-3

Total: 15 weeks

Sr. No.	Course Name	Abbre.	Theory hrs	Activity / Tut. hrs	Practical hrs	Total hrs	Credits
1	Engineering Mathematics-3	Maths-3	4	1	0	5	4.5

Learning Objective:

- To provide an ability to see differential equations as a rigorous way of modeling physical phenomena.
- To provide an ability to derive major differential equations from physical principles.
- To provide an ability to understand the role of initial and boundary conditions in determining the solutions of equations.
- To provide an ability to choose and apply appropriate methods for solving differential equations.
- To provide an ability to undertake problem identification, formulation and solution.
- To provide an ability to calculate Laplace transforms and inverse Laplace transforms and uses them to solve differential equations (Initial value problems, Boundary value problems).
- To provide an ability to understand various concepts of Control System -Theory using Laplace Transform.
- To provide an ability to obtain Fourier series for simple periodic functions
- To provide an ability to understand Oscillation and Vibration related problems using Fourier Series and transform
- To provide an ability to obtain solution of the differential equations in form of the series using power series method.
- To provide an ability to communicate effectively with professionals within applied and engineering mathematics as well as with persons working with different scientific-technological applications in an interdisciplinary context.
- To provide an ability to develop abstract, logical and critical thinking and the ability to reflect critically upon their work and work of others.
- To provide an ability to insight their strengths and weakness as learners and to appreciate the value of errors or mistakes as powerful motivators to enhance learning and understanding.
- To provide an ability to interlink various engineering fields with Mathematics.
- To provide mathematical knowledge and skills needed to support their concurrent and subsequent engineering studies.

Unit-1

Differential equations and their applications-II: Solution of Linear differential equations of higher order with constant coefficients, complimentary function and particular integral, Method of variation of parameters, Method of Undetermined coefficients for solving higher order linear differential equations, Linear differential equations with variable coefficients (Cauchy's and Legendre forms), Simultaneous linear differential equations, application of Linear differential equation(Application of Deflection of Beams, Application of Electric circuits)

(Advanced Engineering Mathematics, E.Kreyszig, 8th Ed., Wiley Publication, Ch-2: 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.8, 2.9, 2.10, 2.14, 2.15)

Unit-2

Series solution, Special functions and Partial differential equations with applications: Series Solution of Ordinary Differential Equations, Definition and properties of Bessel's and Legendre's functions.

Formation of partial differential equations, Directly integrable equations, Lagrange's equation, Solutions of special type of non-linear partial differential equations of the first order, Method of separation of variables, solution of one dimensional wave equation, heat equation and Laplace equation.

(Advanced Engineering Mathematics by E. Kreyszig, 8th Ed., Wiley Publication,Ch-4: 4.1 to 4.5)

Unit-3

Laplace transforms: Definition, Linearity property, Laplace transforms of elementary functions, shifting theorem, Inverse Laplace transforms, Laplace transforms of derivatives and integrals, Convolution theorem, Application of Laplace transform in solving ordinary differential equations, Laplace transforms of periodic, Unit step and impulse functions, Introduction to Z-transforms: Definition and Standard Z-transforms, Linearity Property, dumping Rule and some standard results, Some useful Z-transforms. (Advanced Engineering Mathematics, E.Kreyszig, 8th Ed., Wiley Publication, Ch-5)

Unit-4

Fourier series, Fourier Integrals and Fourier Transforms: Fourier series, Drichlet's conditions, Euler's formula. Fourier expansion of periodic functions, Fourier series of even and odd functions, Half range Fourier series.

Fourier integral theorem (only statement), Fourier sine and cosine integrals, Complex form of Fourier integral, Fourier transforms, Fourier sine and cosine transforms.
(Advanced Engineering Mathematics, by E.Kreyszig, 8th Ed., Wiley Publication, Ch-10: 10.1 to 10.5, 10.7 to 10.10)

Text books:

1. Erwin Kreyszig: Advanced Engineering Mathematics (8th Ed.) ,Wiley Eastern Ltd., New Delhi.

Reference Books:

1. B. V. Ramana: Higher Engineering Mathematics, Mc Graw Hill, New Delhi.
2. Dr. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi.
3. R K Jain, S R K Iyengar: Advanced Engineering Mathematics. Third Edition, Narosa Publishing House
4. Murray Spiegel: Advanced Mathematics for Engineering & Science: **(Schaum's Outline Series)**,Tata – McGraw Hill Publication

5. Merel C Potter, J L Goldberg: Advanced Engineering Mathematics (3rd Ed.), Oxford India Publication.

Digital resources

1 http://freevideolectures.com/blog/2010/11/130-nptel-iit-online-courses/

2 http://nptel.ac.in/video.php?subjectId=122107036

3 http://ocw.mit.edu/index.htm

4 https://www.khanacademy.org/

Program: B.Tech-Electronics & Communication Engineering **Semester: III**

Subject: Analog Electronics I **Subject Code: EC410302N**

Teaching Scheme				Examination Scheme			
Class Room Contact Hrs	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3	1	4	72	60	30	10	100

Subject learning objective	Students will be able to • To analyze and design electronics circuits using primary components. Diode, Transistor and MOSFET. • To select the appropriate components for circuits by reading data sheets. • To synthesize circuits from graph.

Subject Content

Unit No.	Topics	Unit wise Objective
1	**Diode Circuit Design** Revision of VI Characteristics, Design of Rectifiers, voltage multiplier, full wave rectifier, Peak detector, Diode as GATE ,Small signal analysis of Diode circuits. Varactor Diode, Zener Regulators and Voltage Regulators	• To analyze and Synthesize diode characteristics and application of diode circuits. • To design various applications of Diode circuits. Viz Rectifiers , Peak Detector, Multiplier, Logic Gate Zener Voltage Regulator, Seven Segment LED etc.. • To derive various design formulae for diode circuits.
2	**Transistor Circuit Designs** Revision of Transistor Characteristics, Transistor Biasing Designs, Transistor Inverter Designs, Low Frequency Models ,Amplifier Applications Designs, Frequency limitations, Distortions in Transistor amplifiers,	• To explain the operation of transistor circuits in all modes. • To analyze and design biasing circuits using BJT. • To analyze and synthesize transistor characteristics.

			• To derive design formulae for transistor circuits.
3	**Power Supply Circuits and Power amplifier Designs** Series and Shunt voltage regulator Concepts and Design ,Classification of amplifiers,2nd order and higher order Harmonic Distortions, Class B push pull amplifier, Class C amplifier		• To explain the operation of Power supply and power amplifiers. • To design the regulated power supply and power amplifier.
4	**FET Circuits Design** MOS fundamentals, NMOS CMOS Inverter Designs, MOSFET Differential Amplifiers Designs,		• To explain the operation of FET circuits and chracteristics. • To analyze synthesize and design biasing techniques in FET circuits.
Text books:	[1]	Donald Neamen, "*Electronic Circuit Analysis and Design*", 3rd Ed, TMH	
Reference Books	[1]	David A.Bell, "*Electronic Devices and Circuits*", 5th Edition, Oxford press	
	[2]	Robert Boylestad, L.Nashelsky, "*Electronic devices and Circuit Theory*" 10th Ed., Pearson	
	[3]	Adel S Sedra & Kenneth C Smith, "*Micro Electronic Circuits*" 5th Indian Edition, Oxford University Press,2006	
	[4]	J.Millman, C.Halkias, S.Jit, "*Electronic Devices and Circuits*"3rdEd, TMH	
	[5]	T.L.Floyd, David Buchla, "*Fundamentals of Analog Circuits*"2nd Ed, Pearson, 2012	
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.	
Note			

Program: B.Tech-Electronics & Communication Engineering **Semester: III**

Subject: DIGITAL ELECTRONICS **Subject Code: EC410310**

Teaching Scheme				Examination Scheme			
Class Room Contact Hrs	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
04	00	04	72 Hours	60	30	10	100

Subject learning objective	Students can design the basic digital systems or modules (Adder, Substructures, Counters, and Register etc.) This is required for Microcontroller/Microprocessor architectures.

Subject Content

Unit No.	Topics	Unit wise Objective
1	**Binary Numbers** Introduction to Digital and Analog System, Octal, Decimal and Hexadecimal Numbering Systems,Binary Numbering System, Binary Conversion, Binary Operation, Gray Code, BCD code, Excess Three code **Boolean Algebra** Axioms and Laws of Boolean Algebra De Morgan's Theorem, Duality and Dual Simplification of Boolean Algebra using K-map and Tabulation method	▪ Student will be able to write algorithms for binary code conversion. ▪ Student will develop the skills for working with complex digital circuits.
2	**Logic Gates** Basic Gates: AND, OR, NOT, Universal gates: NAND, NOR, X-OR, X-NOR and BUFFER ,Logic Operations, NAND and NOR implementation, Sum of product and product of sum representation **Logic Families** Introduction, Noise Margins, Fan-in and Fan-out, RTL and DTL logic, Integrated-Injection Logic Emitter-Coupled Logic, Complementary MOS	▪ Student will be able to symbolize digital circuitry using Boolean Algebra. ▪ Student will be able to develop basic logic gates using analog circuitries.
3	**Combinational Logic** Introduction, Code Conversion, Multilevel NAND and NOR circuit, Various types of Adders and Subtractors, Magnitude Comparator, Decoders, Multiplexers, Programmable Logic Array **Sequential Logic** Introduction, Flip-Flops, Triggering of Flip-Flops, Conversion of Flip-Flops	▪ Applied implementation of mathematical operators using logic gates. ▪ Students will able to design memory units for user defined applications.

4	**FSM, Counter and Shifters Design** FSM Design, Ripple Counter(Asynchronous Counter), Synchronous Counter, Serial-in, Serial-out Shift Register, Parallel-in, Serial -out Shift Register, Serial-in, Parallel-out Shift Register, Parallel-in, Parallel-out Shift Register, Universal Shift Register.		▪ Design multilevel digital circuitry using Flip-Flops. ▪ Analyze logic circuits using FSM. ▪ Design counters using FSM and Shift-Registers.
Text books:	[1]	Morris Mano, "*Digital Logic and Computer Design*", Pearson.	
Reference Books	[1]	Ronald J. Tocci, Gregory L. Moss, "*Digital Systems*", 10 Ed, Pearson	
	[2]	D.C.Green, "*Digital Electronics*"5th Ed., Pearson, 2005	
Digital Learning Resources	[1] [2]	http://nptel.ac.in/ (Lectures note and Video Lectures) http://ocw.mit.edu/index.htm (Lecture notes)	
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.	

Program: B.Tech-Electronics & Communication Engineering **Semester: III**

Subject: Circuit and Network **SubjectCode: EC410304N**

Teaching Scheme				Examination Scheme			
Class Room Contact Hrs	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3	1	4		60	30	10	100

Subject learning objective	After completing this subject students will be able to • Analyze circuits with passive components • Determine transient response of RLC circuit • Synthesize various waveform and determine circuit response for particular input • Analyze two port network • Determine equivalent circuit of given network

Subject Content

Unit No.	Topics	Unit wise Objective
1	**Introduction**: Electromotive force, potential, voltage, current, Resistor, capacitor, inductor, Voltage and current sources, Dependent sources, Dot conventions , current directions Network Equations : Nodal analysis, Mesh analysis, Source transformation, Analysis of circuit containing dependent sources, Superposition theorem, Substitution Theorem, Compensation theorem, Thevenin's and Norton's theorem, Maximum power transfer theorem	Analysis of circuits using KCL and KVL. Solve the networks using different theorems
2	**Time domain response of linear circuits:** Mathematical preliminaries, DC response of first order and second order circuits, Initial conditions in the network, Charging and discharging of capacitor, Charging and discharging of inductor, Solution of circuit equations by using Initial Condition	Analysis of first order and second order networks using initial conditions
3	**Laplace transform analysis : Circuit Applications :** Manipulation of impedance and admittance, Equivalent Laplace transform of circuit elements, RLC circuit analysis using Laplace transform, Switching in RLC circuit, Waveform synthesis, Circuit analysis in Laplace transform	Analysis of RLC circuits using Laplace transform
4	**Two Port Network :** Y- Parameter, z-Parameter, h-parameter, ABCD-parameter, Relation between two port parameters,	Analysis of two port network using different parameters

	Parallel connection of two network		
Text books:	[1]	M E Van Valkenburg, “Network Analysis”, PHI	
	[2]	DeCarlo/ Lin, “ Linear Circuit Analysis” 2nd Ed., Oxford University Press	
Reference Books	[1]	K. S. Suresh Kumar, “Electric Circuits and Networks”, Pearson Education	
	[2]	W H Hayt, J E Kemmerly, S M Durbin, “Engineering Circuit Analysis”, 7th Ed,. TMH,2010	
	[3]	Franklin S. Kuo, “ Network Analysis & Synthesis”, Wiley Publication	
Digital Learning Resources	NPTEL and digital MIT video lectures		
Question Paper Pattern for End Sem Exam	Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.		

Program: B.Tech-Electronics & Communication Engineering **Semester: III**

Subject: Object Oriented Computer Programming **SubjectCode: EC410311**

Teaching Scheme				Examination Scheme			
Class Room Contact Hrs	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	0	3		60	30	10	100

Subject learning objective	**After studying this course, Students will able to** – Apply object-oriented approaches to software problems – Isolate and fix common errors in C++ programs – Use existing C++ scientific libraries for signal processing application – Develop small scale and medium scale C++ programs and libraries for engineering applications – Improve problem solving skills

Subject Content

Unit No.	Topics	Unit wise Objective
1	**Introduction** - Basic Concepts of Object-Oriented Programming - Benefits of Object oriented programming - Object Oriented Languages - Application of OOP **Introduction to C++** - Structure of C++ program - Tokens - Keywords - Data types - Expression - Control Structure - Functions in C++ - Function Overloading	**Student will able to** - isolate and fix common programming errors - able to manipulate various data types of C/C++ - compare procedure oriented programming languages with object-oriented programming languages
2	**Class and Objects** - Introduction - Specifying class and objects - Array within a class - Memory allocation	**Student will able to** - develop programs based on user defined data types

	- Objects as Function arguments - Friendly functions - Returning Objects - Pointers to members - Constructors & Destructors - Overloading of constructor - Operator overloading - Inheritance : Extending class	- Develop libraries for scientific and non-scientific purpose - use existing libraries of C/C++ for developing software
3	**Pointers, Virtual Functions, Polymorphism, I/O Operations** - Pointers in C++ - Pointers to objects - Pointers to Derived class - Virtual Functions - C++ streams - Formatted and unformatted I/O Operations - Working with files - Templates in C++	**Student will able to** - do memory management effectively - handle manipulate and analyze data-file - Design generic functions for various applications
4	**Pointers, Virtual Functions, Polymorphism, I/O Operations** - Pointers in C++ - Pointers to objects - Pointers to Derived class - Virtual Functions - C++ streams - Formatted and unformatted I/O Operations - Working with files - Templates in C++	**Student will able to** - Develop generic solutions - Develop new libraries for scientific and non-scientific purpose - develop software for text manipulation - apply advance features of C++ more effectively

Text books:	[1]	Object Oriented programming with C++, E Balagurusamy, Tata MacGraw Hill
Reference Books	[1]	Object-oriented programming in Turbo C++ By Robert Lafore, Galgotia Publication
	[2]	C++: The Complete Reference, 4th Edition, Herbert Schildt, McGraw Hill Publication
Digital Learning Resources		
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.

Program: B.Tech-Electronics & Communication Engineering **Semester: III**

Subject: Management Concepts & Principles **Subject Code: EC410312**

Teaching Scheme				Examination Scheme			
Class Room Contact Hrs	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hours/week	00	3		60	30	10	100

Subject learning objective	It focuses on the basic roles, skills and functions of management, with special attention to managerial responsibility for effective and efficient achievement of goals. The objective is to help the students understand the fundamental concepts and principles of management; the basic roles, skills, and functions of management. It is also intended to give an overview of the historical development, theoretical aspects and practice application of managerial process

Subject Content

Unit No.	Topics	Unit wise Objective
1	**INTRODUCTION TO MANAGEMENT:** Meaning, importance, skills and roles of manager, different levels of management. Functions of management, planning: nature, importance, steps, Organizing: Meaning, process, principles of organizing, staffing:-manpower planning, recruitment, selection, placement. Leadership:-difference between leader & a manager, characterstics of leadership, functions of a leader. Control:-Steps in control process, need for control, benefits of control.	Examine the meaning, importance and nature of management ,understand the functions of management
2	**Management History:** Schools of management:-Classical Approach, Quantitative Approach, Behavioral Approach, System & Contingency Approach	Examine the contribution and limitations of different management approaches
3	**Organizational Structure & Culture:** Types of Structure, Work specialization, Departmentalization, Chain of Command, Span of control, centralization & Decentralization, Concept of Culture, Attributes of Culture, How does culture affect managers & employees?	To understand the different organizational structure and the concept of culture in an organisation
4	**Functional areas of Management:** Marketing Management:-the 4 p's of marketing, demand forecasting (concepts only), market segmentation. Financial management:-meaning, scope, functions, objectives, role of financial manager. Production management:-Meaning,	To examine the functional areas of management

	characteristics, plant location, factors affecting location, plant layout. Strategic management:-Meaning, levelof strategy, corporate strategy.		and the strategies used in different organization.
Text books:	1. 2. 3.	Principles of Management by PC Tripathi & Reddy.] Management –I by Stephen P. Robbins& Stoner. Management-II BY Kotler,Stoner	
Reference Books	1.	L. M. Prasad; Principles of Management; Sultan Chand and Sons,	
	2.	Karminder Ghuman and K. Aswathapa; Management – Concept, Practice and Cases	
Digital Learning Resources		Online Journals and Resources	
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.	

Program: B.Tech-Electronics & Communication Engineering **Semester: III**

Subject: Analog Electronics I(Laboratory) **Subject Code: EC410306N**

Teaching Scheme			Examination Scheme			
Practical	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
- 1.5hrs/week -	1	24	60	-	40	100

LIST OF EXPERIMENTS

Sr.No	Title
1.	To study PN junction diode characteristics.
2.	To study ZENER diode characteristic.
3.	To study half wave rectifier.
4.	To study full wave rectifier.
5.	To study full wave bridge rectifier.
6.	To study characteristics of CE Amplifier using BJT.
7.	To study input characteristic of CC Amplifier using BJT.
8.	To study voltage divider bias amplifier.
9.	To study series voltage regulator.
10.	To study relay driver circuit.
11.	To study characteristics of Common Source amplifier using FET..

Program: B.Tech-Electronics & Communication Engineering **Semester: III**

Subject: DIGITAL ELCTRONICS LAB **Subject Code: EC410307N**

Teaching Scheme			Examination Scheme			
Practical	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
1.5 hrs/week	1	36 Hours	60	-	40	100

LIST OF EXPERIMENTS

Sr.No	Title
1.	VERIFICATION OF VARIOUS TYPES OF LOGIC GATES AND ITS TRUTH TABLE.
2.	VERIFICATION OF DeMORGAN'S THEOREMS.
3.	DESIGN OF HALF AND FULL ADDERS.
4.	DESIGN OF HALF AND FULL SUBSTRACTOR.
5.	VERIFICATION OF DIFFERENT TYPES OF FLIP-FLOPS AND THEIR TRUTH TABLE.
6.	DESIGN LOGIC CIRCUIT FOR CONVERSION OF BCD TO SEVEN SEGMENT NUMBER.
7.	DESIGN LOGIC CIRCUIT FOR OCTAL TO BINARY ENCODER.
8.	DESIGN LOGIC CIRCUIT FOR 8x1 MULTIPLEXER AND 1x8 DEMULTIPLEXER.
9.	DESIGN LOGIC CIRCUIT FOR SHIFT REGISTER.
10.	DESIGN LOGIC CIRCUIT OR COUNTER.

Program: B.Tech-Electronics & Communication Engineering **Semester: III**

Subject: **Circuits & Networks lab** **Subject Code:** **EC310313**

Teaching Scheme			Examination Scheme			
Practical	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
- 1.5 hrs/week -	1		60	-	40	100

LIST OF EXPERIMENTS

Sr.No	Title
1.	Applications of Nodal Analysis
2.	Applications of Mesh Analysis
3.	Applications of Thevenin's Theorem
4.	Applications of Norton's Theorem
5.	Applications of Superposition Theorem
6.	To verify maximum power transfer Theorem
7.	To verify reciprocity Theorem
8.	To find Y-parameters of a given network
9.	To find Z-parameters of a given network
10.	To find ABCD parameters of given network

Program: B.Tech-Electronics & Communication Engineering **Semester: III**

Subject: Object Oriented Computer Programming LAB **Subject Code: EC410309N**

Teaching Scheme			Examination Scheme			
Practical	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
- 2hrs/week -	1		60	-	40	100

LIST OF EXPERIMENTS

Sr.No	Title
1.	Write a functions for following purpose and test them by writing main program 1. To swap two float numbers 2. To find maximum and minimum number from the array of integer numbers 3. To find absolute value of given float number 4. To find volume of sphere 5. To find average of given array of float number 6. To short the given array of double number into ascending order 7. To find average of given array of integer numbers 8. To find factorial of given integer.
2.	Write a program to add two matrix of equal dimensions
3.	Write a class for bank account. The data member of the class are : Name of the account holder, type of account, account number, balance. The member functions are: Display account details, initialize account, deposit amount, withdraw amount after checking current balance. Test your class by using main program
4.	Create a class “Complex” to accept the complex number in rectangle format. Perform basic mathematic operations on complex number using operator overloading concept.
5.	Write a program that contains class “Complex” to accept the complex number in polar as well as in rectangle format and perform basic mathematical operations between the complex numbers.
6.	Write a class to represent a vector of data type double. Include member functions to perform following tasks: To create vector, modify the value of given element, multiply vector by a scalar value, to display vector.
7.	Define a class String that could work as a user defined string type. Include constructor that will enable us to create an uninitialized string and to initialize an object with string constant at the time of creation. Include function that adds two

	strings to make third string. Write a complete program to test your class.
8.	Write a program that reads a text file and create an another file that is identical except every sequence of consecutive blank space is replaced by a single space
9.	Write a template for shorting array in descending order. Write a program to test template.
10.	Write a program for solving system of linear equations using Gauss Elimination method.

Program: B.Tech- Electronics & Communication Engineering **Semester: III**

Subject: Electronics Workshop Lab **Subject Code: EC410314**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
-	1.5 hrs/week -	-	1			-		

Learning Objectives:

To familiarize with commonly used Active and Passive Electronic Components.
To Selection of components, wiring, soldering, de-soldering, testing and troubleshooting.
To design basic building Blocks commonly used in making Projects.
To construct a simple Utility Project.
To provide the students with more hands-on experience and also enable them to develop and test simple PCB circuits.

Experiment List

Experiment	Title	Learing Outcomes
1.	**To study digital multimeter:** a) Measurement of AC & DC Voltages b) Measurement of Current c) Measurement of active and passive electronic components.	To measure voltage and Current. To measure active and passive components and test it.
2.	**To study Cathode Ray oscilloscope:** a) To study various controls of CRO b) To measure amplitude, time period and frequency of time varying signals c) To study lissajous pattern to understand phase difference between two signals and ratio of frequencies	To operate various control of CRO. To measure amplitude, time period, frequency and phase difference of the signals.
3.	**To study Function Generator:** a) To study various controls of function generator	To operate various controls of function generator. To configure function generator with

	b) To configure function generator to output 10Vpp and 1 kHz sine-wave c) To configure function generator to output 2Vpp and 50% duty cycle square wave.	different functions (Sine, Square and Triangle) of different amplitude and frequency.
4.	**To Study usability of breadboard:** a) Design and implement half-wave rectifier on breadboard. b) Design and implement full-wave rectifier on breadboard.	To design different circuit on breadboard.
5.	**To study soldering techniques:** a) Stripping and tinning of standard wires b) Mounting component plated through hole c) Hand-wire soldering	To make perfect mounting of component and soldering.
6.	**To study the simulation method using CAD tools:** a) To simulate half wave and full-wave rectifier using CAD tools b) To prepare schematic as well as PCB design using CAD tools.	To simulate, prepare schematic and PCB design of different circuits using CAD tools.
7.	**Design, simulation and Implementation of analog/digital/mix mode project:** Students are expected to design any analog/digital/mix mode application of their choice. Perform simulation using software tools. PCB design, fabrication of PCB, testing and implementation should be done. Documentation of the project is to be done in standard IEEE format. Project report should include abstract in maximum 100 words, keywords, introduction, design, simulation, implementation, results, conclusion and references.	To design, testing, troubleshooting and also implement the electronics circuit. To Prepare a documentation of their project in IEEE standard.

ज्ञानेन प्रकाशते जगत्
INDUS UNIVERSITY

4TH SEMESTER

SEMESTER-IV

Subject Code	Subject Name	Abbr	Teaching Scheme			Credit	Hours
			Theory	Practical	Activity		
EC410401	Maths-4	M4	3	0	1	4	5
EC410402	Analog Electronics-II	AE2	3	0	1	4	5
EC410415	Microprocessor and Interfacing	M& I	3	0	0	3	3
EC410416	Control Theory	CT	3	0	1	4	5
EC410411	Electromagnetic	EM	3	0	0	3	3
EC410417	Project Management	PM	2	0	0	2	2
EC410407	Analog Electronics II Lab	AE2 Lab	0	1	0	1	2
EC410408	Microprocessor and interfacing Lab	M&I Lab	0	1	0	1	2
EC410414	Simulation and Design Tools	SDT	0	1	0	1	2
	Total		**17**	**3**	**3**	**23**	**29**

SEMESTER-IV

Subject: ENGINEERING MATHEMATICS – IV

Learning Objectives:

- To provide an ability to understand, interpret and use the basic concepts: complex number, analytic function, harmonic function, Taylor and Laurent series, singularity, residue, conformal mapping, and meromorphic function.
- To provide an ability to prove certain fundamental theorems about analytic functions, e.g. Cauchy's integral formula
- To provide an ability to determine the images of curves under simple complex mappings.
- To provide an ability to determine the stability of certain dynamical systems using complex functions.
- To provide an ability to use conformal mapping to solve certain applied problems regarding heat conduction, electrical engineering and fluid mechanics.
- To provide an ability to use Taylor and Laurent expansions to derive properties of analytic and meromorphic functions.
- To provide an ability to compute integrals by means of residues.
- To examine common numerical methods such as finite element and finite difference techniques, including the strengths and weaknesses of particular applications.
- To discuss the concept of approximation in geometric and engineering applications.
- To provide an ability to utilize a systems approach to design and operational performance.
- To provide an ability to formulate mathematical models, choose suitable methods to investigate these models including the efficient use of computer tools.
- To provide an ability to analyze zeros and poles of meromorphic functions, classify singularities
- To provide an ability to identify various mathematical problems and reformulate these in a way suitable for numerical treatment.
- To provide an ability to select a suitable numerical method for the treatment of the given problem.
- To provide an ability to solve various engineering problems including tabular data.
- To provide an estimate of the accuracy of the results.
- To provide an ability to communicate effectively with professionals within applied and engineering mathematics as well as with persons working with different scientific-technological applications in an interdisciplinary context.
- To provide an ability to develop abstract, logical and critical thinking and the ability to reflect critically upon their work and work of others.
- To provide an ability to interlink various engineering fields with Mathematics.
- To provide mathematical knowledge and skills needed to support their concurrent and subsequent engineering studies
- To provide an ability to insight their strengths and weakness as learners and to appreciate the value of errors or mistakes as powerful motivators to enhance learning and understanding.

Subject: ENGINEERING MATHEMATICS – IV **Subject Code:EC410401N**
Total: 15 weeks

Sr. No.	Course Name	Abbre.	Theory hrs	Activity / Tut. hrs	Practical hrs	Total hrs	Credits
1	Engineering Mathematics-4	Maths-4	3	2	0	5	4

Unit-1

Complex Analytic Functions: Complex planes, Curves in complex planes, Concept of neighborhood in the complex plane, Analytic function, Cauchy- Riemann equations (Cartesian and polar forms – without proof), Harmonic functions, conformal mappings, some standard conformal transformations.

Unit-2

Complex Integration: Complex integration, Cauchy's integral theorem and Cauchy's integral formula (without proof), Singularities, Taylor's and Laurent's series, Cauchy-Residue theorem, Residues & Contour integration. Applications of residue to evaluate real integrals.

Unit-3

Probability and Statistics: Introduction to Probability: Theorem of Total Probability, Bayes' Theorem,

Probability Distributions: Binomial Distribution, Poisson distribution, Normal Distribution.

Numerical Methods: Basic Errors.

Solution of Algebraic and Transcendental Equations: Bisection method, Regula-Falsi method, Newton-Raphson method, Convergence condition for these methods.

Numerical methods in Linear Algebra: Gauss-Jacobi, Gauss-seidel method

Largest Eigen values and corresponding Eigen vectors: By power method

Unit-4

Finite differences and Interpolation: Finite differences Forward, Backward & Central difference operators and difference tables. Interpolation, Interpolation Formulae with equal intervals: Newton's forward, Newton's backward, central difference interpolation by Stirling's formulae,

Interpolation Formulae with unequal intervals: Lagrange's & Newton's divided difference interpolation.

Numerical Integration: Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule.

Numerical differentiation: Using Newton's forward and backward interpolation formula,

Numerical Solutions of ordinary differential equations: Taylor's Method, Euler's Method, Improved Euler Method (Heun's Method), Runge-Kutta method of order four.

Text books:

1. Erwin Kreyszig: Advanced Engineering Mathematics (8th Edition)
Wiley Eastern Ltd., New Delhi.

Reference Books:

1. R. V. Churchill and J. W. Brown: Complex variables and applications (7th Edition), McGraw-Hill (2003).
2. B. V. Ramana: Higher Engineering Mathematics, Mc Graw Hill, New Delhi.
3. Merel C Potter, J L Goldberg: Advanced Engineering Mathematics (3rd Edition) Oxford India Publication.
4. Dr. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi.
5. R K Jain, S R K Iyengar: Advanced Engineering Mathematics. Third Edition, Narosa Publishing House.
6. Murray Spiegel: Advanced Mathematics for Engineering & Science: (Schaum's Outline Series) ,Tata McGraw Hill Publication
7. M. K. Jain, S. R. K. Iyengar and R. K. Jain: Numerical methods for scientific and Engineering computation, New age Publication.

Digital resources

1 http://freevideolectures.com/blog/2010/11/130-nptel-iit-online-courses/

2 http://nptel.ac.in/video.php?subjectId=122107036

3 http://ocw.mit.edu/index.htm

4 https://www.khanacademy.org/

Program: B.Tech-Electronics & Communication Engineering **Semester: IV**

Subject: Analog Electronics –II **Subject Code: EC410402N**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3	-	1hrs/week	4	60	60	25	15	100

Subject Content

Unit No.	Topics
1	High frequency model of Transistor & Multistage amplifiers Hybrid Pi Model for CE transistor, hybrid Pi conductance and Hybrid Pi capacitance, validity of Hybrid Pi model, variation of hybrid Pi parameter, CE short Circuit current gain, current gain with resistive load, Single stage CE transistor amplifier response , gain bandwidth product, Decibel, multi stage amplifier gain, n stage cascaded amplifier, RC coupled transistor amplifier, transformer coupled transistor amplifier, direct coupled transistor amplifier, impedance coupled transistor amplifier, Cascode amplifier, boot strapped Darlington circuit, Comparison of different types of coupling
2	**Multistage Amplifiers:** Classification of Amplifiers, Distortion in Amplifiers, Frequency Response of an Amplifier, Step Response of an Amplifier, Bandpass of Cascaded Stages, RC Coupled Amplifier, Low Frequency Response of an RC Coupled Stage, Effect of an Emitter Bypass Capacitor on Low- Frequency Response, High-Frequency Response of Two Cascaded CE Transistor Stages, Multistage CE Amplifier, Cascade at High Frequencies.
3	Feedback Amplifiers Classification of Amplifiers, Feedback Concept, Transfer Gain with Feedback, General Characteristics of Negative Feedback Amplifiers, Input Resistance, Output Resistance, Analysis of a Feedback Amplifier, Voltage series, current series, current shunt and voltage shunt feedback amplifier
4	**Stability & Oscillators** Stability, Gain and Phase Margins, Basic operation of oscillator, Barkhausian criteria, Sinusoidal Oscillators, Phase-Shift Oscillator, Resonant Circuit Oscillators, Wien Bridge Oscillator, Crystal Oscillators. Hartley and Colpitt's oscillator
	Analog to Digital and Digital to Analog Converters: Digital to Analog Conversion, R-2R ladder type DAC, Weighted resistor type DAC, Analog to Digital Conversion, Counter type, Flashtype, Dual slope and Successive approximation ADCs.

Text books:		[1]Millman & Halkias, "*Integrated Electronics*", McGraw Hill [2] Millman and Halkias, "*Electronic Devices and Circuits*", McGraw Hill
Reference Books		[1] Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 9th Ed. Pearson Education..
Digital Learning Resources		NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course . Student has to answer total FIVE full questions choosing at least one from each unit.
Note		Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

Program: B.Tech-Electronics & Communication Engineering **Semester: IV**

Subject: Microprocessor & Interfacing **Subject Code: EC410403N**

Teaching Scheme				Examination Scheme			
Class Room Contact Hrs	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3	1	4	5	60	30	10	100

Subject learning objective	The objective of the course is to expose to the students to the architecture and instruction set of typical 8-bit microprocessor. Students will learn Assembly language Programming of 8085 processor. Students will learn Input-output techniques and important programmable support chips used in microprocessor-based systems.

Subject Content

Unit No.	Topics	Unit wise Objective
1	Introduction to Microprocessor, Microprocessor systems with bus organization, Microprocessor Architecture & Operations, 8085 Microprocessor Architecture, Address, Data And Control Buses, Pin Functions, Demultiplexing Of Buses, Generation Of Control Signals, Instruction Cycle, Machine Cycles, T-States	Student will get idea of how Microprocessor works, Get idea about pin finctions of 8085 and how to use them.
2	Instruction set, Addressing Modes, Data Transfer Instructions Arithmetic Instructions, Logical Instructions ,Branching Instructions,Stack and Subroutine, Writing Assembly Language Programs, Memory and I/O Interfacing, Decoding Methods, Basic Interfacing Concepts, Interfacing Output Devices, Interfacing Input Devices, Memory Mapped I/O and Peripheral Mapped I/O	Students will be able to write assembly language programs and can interface memory and I/O device with 8085 processor.
3	Counter and Time delay, Different Methods of generating Time delay Programs, Restart Conditional call and Return Instructions, Advanced Subroutine Concepts, Interrupts , Serial I/O and Data Communication, 8085 Interrupts, 8085 Vectored and Non-Vectored Interrupts, Restart as Software Instructions, Basic Concepts in Serial I/O, 8085 Serial I/O lines SID & SOD	Students will be able to write program's using subroutine and interrupt service routine, can write programs for serial I/O
4	Programmable Interface Devices, The 8255 Programmable Peripheral Interface, The 8279 Keyboard / Display Interface The 8253 Programmable Interval Timer, Digital to Analog	Students will be able to interface varoius programmable

	Converters, Analog to Digital Converters, 8259 Programmable Interrupt Controller, Direct Memory Access and 8237 DMA controller		pheripheral IC's with the 8085 Microprocessor and can build Microprocessor based System.
Text books:	[1]	Microprocessor Architecture, Programming, and Applications with the 8085 - Ramesh S. Gaonkar Pub: Penram International.	
Reference Books	[1]	8085 Microprocessor: Programming And Interfacing by N.K Shrinath , Phi Learning Pvt. Ltd.	
	[2]	Microcomputers and Microprocessors: The 8080,8085 and Z-80 Programming, Interfacing and Troubleshooting by John E. Uffenbeck.	
Digital Learning Resources	[1]	Online Course on Microprocessor , NPTEL http://www.nptel.ac.in/courses/108107029/	
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.	

Program: B.Tech-Electronics & Communication Engineering **Semester: IV**

Subject: Control Theory **Subject Code: EC410410**

Teaching Scheme				Examination Scheme			
Class Room Contact Hrs	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3 hrs/week	2hrs/week	4		60	30	10	100

Subject learning objective	To develop the techniques to analyze the response and stability of systems with applications to design electronic control systems.

Subject Content

Unit No.	Topics	Unit wise Objective
1	**Introduction** Introduction, Open-loop system and its examples, Closed-loop system and its examples, Open-loop vs Closed-loop **Mathematical Modeling** Modeling of Mechanical system, Modeling of Electronic and electrical system, Modeling of Liquid-level system, Transfer function of system, Modeling in state-space **Block diagram and Signal Flow graph** Block diagram formulation, Block diagram reduction, Signal Flow graph, Mason's Gain formula	Students are able to obtain transfer function for electrical, mechanical and electromechanical systems. Obtain overall transfer function of an inter connected system
2	**Transientresponse analysis** Standard test signals,First-order and second order systems, Higher order systems, Transient response of system, Steady-state error for unit , ramp and parabolic inputs.	Ability to analyze and design basic control system to achieve transient/steady state related performance goals
3	**Time domain Stability Analysis** RH stability criteria, Effect of Proportional, derivative and integral control, MATLAB simulations **Root Locus** Introduction, Rules for constructing the root locus, System analysis with the help of Root-locus Root-locus plot using MATLAB	Ability to analyze stability of a control system
4	**Frequency Response Analysis** Introduction, Specification for frequency response, Polar-plots, Bode plots, Nyquist plots	Analyze the stability of control system and parameters affecting the performance of control

	Stability analysis, MATLAB simulations		system
Text books:	[1]	Katsuhiko Ogata, "*Modern Control Engineering*", 4th Ed, Prentice Hall of India.	
	[2]	Benjamin C.Kuo, "*Automatic Control Systems*", John Wiley & Sons	
Reference Books	[1]	Norman S Nise, "*Control system Engineering*", 4th Ed., Wiley-India Edition	
	[2]	I J Nagrath, M Gopals "*Control system Engineering*", 5th Ed.,	
Digital Learning Resources		NPTEL and MIT digital Video lectures	
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.	
Note		Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.	

Program: B.Tech-Electronics & Communication Engineering **Semester: 4th**

Subject: Electromagnetic **Subject Code: EC410411**

Teaching Scheme				Examination Scheme			
Class Room Contact Hrs	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3	2	4	5	60	30	10	100

Subject learning objective	To obtain an understanding of Maxwell's equations and be able to apply them to solving some practical electromagnetic problems. To get in-depth knowledge of the transmission line and waveguide modes

Subject Content

Unit No.	Topics	Unit wise Objective
1	Introduction to electrostatics and magnetostatics	1.Describe mathematically expressions for a number of electric- and magnetic phenomena 2. Getting the basic knowledge of different electromagnetic laws 3. Calculate electric and magnetic fields from different stationary charge and current distributions
2	Maxwell's equations, Boundary conditions, Proof of boundary conditions on E, D, H and B, Complete boundary conditions in scalar form, Boundary conditions in vector form, Time varying potentials, Retarded potentials	1.Describe and apply Maxwell's equations for time varying fields 2. Derive boundary conditions and use them to solve problems
3	**Introduction to Waves:** The wave equation, waves inside the perfect dielectric, waves inside the lossy matter, rectangular	1.Apply Maxwell's equations

	wave function, cylindrical wave function and spherical wave function		to derive the wave equations/solutions for the propagation of uniform plane waves 2. Describe how the fields behave in different types of media and solve practical problems
4	**Transmission Lines:** Relation of field and circuit analysis, Characteristic impedance, voltage and current relationships, impedance discontinuities and standing waves, impedance matching, Smith chart, pulse propagation in transmission lines, lossy lines.		1. The waves inside the transmission line and important parameters are described
Text books:	[1]	Ramo, S., Whinnery J.R., and van Duzer, T: Fields and Waves in Communication Electronics, 3rd ed., Wiley Eastern	
	[2]	R. F. Harrington," Time harmonics Electromagnetic fields" IEEE Press Series, 2001	
Reference Books	[1]	Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th edition, 1955	
	[2]	William H Hayt ,Jr. Jhon H. Buck, "Engineering Electromagnetic" Tata-McGraw-Hill, 2001	
	[3]	Edward C Jordan, Keith G Balmain," Electromagnetic waves and radiating systems, Prentice-Hall, 2006	
Digital Learning Resources		NPTEL and MIT digital Video lectures	
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.	

Program: B.Tech- Electronics & Communication Engineering **Semester: IV**

Subject: Project Management **Subject Code: EC410412**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
2hrs/week	-	1hrs/week	3	45	60	25	15	100

Subject learning outcome	After competing this course the student will be able to Understand the steps involved in successfully carrying out a project Write a project proposal Plan and execute projects in a professional way • Acquire proficiency in using project management tool, such as Microsoft Project, to plan and track the project schedule • Schedule tasks, optimize the time and monitor the progress of a project

Subject Content

Unit No	Topic	Learning outcome A student will be able to	Book reference
1	Project definition and phases Definition and objectives of a project and its difference with routine operation, Phases of a project, project life cycle, initiation, planning, execution, control and closing	Discriminate between a project and operation Identify the phases of a project and the tasks involved	[1] Ch1
	Initiation of a project Need recognition, goal definition and evaluation, defining general expectations and scope, team selection, Requirement analysis, creating a project proposal	Identify the requirements and set a goal Decide the scope of work Prepare a proposal Build a team	[1] Ch 3
2	Resource planning Identify the resources required and estimate budget, schedule and manpower, quality requirement	Identify resources required Estimate the budget	[1] Ch 4

		Estimate the duration Define quality to be achieved	
	Project planning Preparing the work plan, WBS, tasks and milestones. Sequencing the tasks. Assigning human resource, estimating the cost	Prepare Work Breakdown Structure Identify tasks and assign resources, define the goal of each task Define the schedule and budget for each task	[1] Ch 6
3	Scheduling Estimating task duration, deciding dependency relation between tasks	Estimate the task duration Sequence the tasks and compute the floats	[1] Ch 5
	Project control techniques Network diagrams, Gantt charts, PERT, CPM, Review meetings	Prepare network diagram Using Microsoft Project Prepare Gantt charts Apply PERT and CPM techniques to monitor progress	[1]Ch.9
4.	Risk analysis and mitigation Identifying risks, Costing, Planning alternate solutions	Foresee the risks of failures Plan risk mitigation Estimate cost of risk mitigation	[1] Ch 7
	Project closing Project report	Evaluate and verify performance, quality Prepare final project report	[1] Ch 14
Text books	1. E.W.Larson and C.F.Gray. "Project Management, The managerial process", 6th Ed., McGraw Hill,		
Reference Books	Olaf Passenheim, "Project Management" Bookboon		

	"A guide to the Project Management Body of Knowledge", 5th Edition, PMI, 2013
Evaluation	University examination, Mid-semester tests, Continuous evaluation through class tutorials/ Quizzes
Digital Learning Resources	NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam	Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course . Student has to answer total FIVE full questions choosing at least one from each unit.
Note	Activity Based Learning shall be Tutorial / /Mini project/Quizzes etc.

Program: B.Tech-Electronics & Communication Engineering **Semester: IV**

Subject: Analog Electronics-II Lab **Subject Code: EC410407N**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
-	2hrs/week	-	1	30	40	-	60	100

LIST OF EXPERIMENTS

Sr.No	Title
	Measuring frequency response of CE amplifier
	Measuring frequency response of CC amplifier
	Measuring the response of two stage RC coupled amplifier
	Design voltage series feedback amplifier
	Design Current Series feedback Amplifier
	Design Phase shift Oscillator
	Design Hartley Oscillator
	Design Colpitt Oscillator
	Design Wien Bridge Oscillator
	Design ADC
	Design DAC

Program: B.Tech-Electronics & Communication Engineering **Semester: IV**

Subject: Microprocessor and interfacing Lab **Subject Code: EC410408N**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
-	2hrs/week	-	1	30	40	-	60	100

EC410408 Microprocessor and interfacing Lab

Teaching Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**
	2hours/week	--	1

SR.NO	TITLE
1	Introduction to 8085 microprocessor kit
2	Programming based on Data transfer operations
3	Programming based on Arithmetic and logical operations
4	Programming based on Branch operations
5	Programming based on Delay and counter techniques
6	Programming based on Stack and Subroutines
7	To interface 8255 with 8085 microprocessor.
8	To interface 8253 with 8085 microprocessor.
9	To interface 8155 with 8085 microprocessor.
10	To interface 8279 study card with 8085 microprocessor kit

Program: B.Tech-Electronics & Communication Engineering **Semester: IV**

Subject: Simulation & Tools Lab **Subject Code: EC410414**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
-	2hrs/week	-	1	30	40	-	60	100

Subject Content

Unit No.	Topics
1	**MULTISIM:** Introduction to MultiSim software. Basic analyses: DC, AC and Transient. Diode, transistor, fet and mosfet characteristics. CE, CB and CC configuration analysis, Rectifiers and SMPS. Analog and Digital Circuits Design
2	**Introduction to PCB Design** Using OrCAD, Altium, Eagle, PowerPCB or others Package
3	**MATLAB:** Introduction to Matlab, study of matlab functions. Writing simple programs using matlab, for handling arrays, files, plotting of functions etc. Writing M files for Creation of analog & discrete signals, plotting of signals etc.
4	**ULTIBOARD:** Introduction to Ultiboard Design Layout
Reference Books	[1] Rudra Pratap, "Getting started with MATLAB", Oxford University Press, 2010
	[2] R.K.Bansal, A.Goel, M.K.sharma, "MATLAB and its applications in Engineering", Pearson, 2008

ज्ञानेन प्रकाशते जगत्
INDUS UNIVERSITY

5TH SEMESTER

SEMESTER-V

Subject Code	Subject Name	Abbr	Teaching Scheme			Credits	Hrs
			Theory	Practical	Activity		
EC410501	Analog Communication	AC	3	0	1	4	5
EC410508	Electronic Measurements and Instrumentation	EMI	3	0	0	3	3
EC410503	Microcontroller and interfacing	M& I	3	0	0	3	3
EC410509	Linear Integrated Circuits	LIC	3	0	0	3	3
EC410510	Signal and Systems	S&S	4	0	0	4	4
EC410521/22	Elective -1	EL-1	3	0	0	3	3
EC410506	Analog Communication Lab	AC Lab	0	1	0	1	2
EC410511	Electronic Measurements and Instrumentation lab	EMI Lab	0	1	0	1	2
EC410507	Microcontroller and interfacing Lab	M& I Lab	0	1	0	1	2
EC410523/24	Elective -1Lab	EL-1Lab	0	1	0	1	2
EC410512	Linear Integrated Circuits lab	LIC lab	0	1	0	1	2
EC410513	Miniproject	Proj	0	0	1	1	2
	Total		**20**	**5**	**1**	**26**	**34**

Elective 1

EC410521: Digital System design using HDL
EC410522: Video system Engineering
EC410523: Digital System design using HDL lab
EC410524: Video system engineering lab

Program: B.Tech- Electronics & Communication Engineering **Semester: V**

Subject: Analog Communication **Subject Code: EC410501**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-	1hrs/week	4	60	60	25	15	100

Course learning outcome	After competing this course the student will be able to Understand how the information transfer over a longer distance can take place and the techniques involved in such communication. Understand the reliability of communication process in presence of noise. Understand some real-world application of communication systems.

Subject Content

Unit No.	Topics	Learning outcome	Text chapters
1	**Introduction to Signals**: Types of Signals, Signals and Vectors, Signal comparison using correlation, Orthogonal signal set, Fourier Series, Analysis and Transmission of Signals using Fourier Transform, Signal transmission through linear system.	Understanding the basic mathematics of signal and application of Fourier transform in communication	[1] Chapter-2 & Chapter-3
2	**Communication System:** Analog and Digital Messages, Parameters of Communication systems: Signal-to-ratio, Channel Bandwidth, Transmission Bandwidth, Signal Bandwidth, Rate of Communication, Modulation, Redundancy and Coding, Application of Communication	Understanding the need of Communication, Some basic performance parameters of communication systems.	[1] Chapter-1

	Systems		
3	**Amplitude Modulation:** Baseband and Carrier Modulation, Double side band, Double Side band Suppressed Carrier, Amplitude Modulation (AM), Quadrature Amplitude Modulation(QAM), Single Side Band (SSB), Vestigial Side Band (VSB)	Understanding the basic need of modulation and Amplitude modulation and its variants.	[1] Chapter-4
4	**Angle Modulation:** Concept of instantaneous frequency, Bandwidth of angle modulated wave, Generation of FM waves, Demodulation of FM, Phase Modulation	Understanding FM and PM as an alternative to AM.	[1] Chapter-5
5	**Noise:** Introduction, Thermal Noise, Shot Noise, Partition, Noise, Flicker Noise, Performance of AM systems in presence of Noise, Performance of Angle modulated systems in presence of Noise, Pre-emphasis and Deemphasis	Understanding the effect of noise and types of noise affecting the communication systems.	[2] Chapter-
6	**Receivers:** Superheterodyne Receiver, Tracking, Tuning, Sensistivity, Gain, Image Rejection, AGC, Adjacent channel selectivity, FM receiver	Understanding the working of AM radio and FM radio	[1] Chapter-4 & Chapter-5
7	**Recent Trends and Development in Analog Communication :** Applications of AM, FM and PM, FM Broadcast Radio, Frequency Stabilizers	Understanding the recent applications of subject in real world.	Recent research papers
Text books:	[1]Modern digital and analog Communication systems“, B. P. Lathi, Oxford, University Press., 4th Ed, 2010.		
	[2]Electronic Communications”, Dennis Roddy and John Coolen, Pearson, 4th edition, 2011.		
Reference Books	[1]	Communication Systems, Simon Haykins, 5th Edition, John Willey,India Pvt. Ltd, 2009.	

	[2]	Taub & Schilling: Principles of Communication Systems, Tata McGraw-Hill
	[3]	Leon W.Couch, II: Digital and Analog Communication Systems, Pearson, Education (Seventh Edition)
Digital Learning Resources		NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course . Student has to answer total FIVE full questions choosing at least one from each unit.
Note		Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

Program: B.Tech- Electronics & Communication Engineering **Semester: V**

Subject: Electronic Measurements and Instrumentation **Subject Code: EC410502**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-	1hrs/week	4	60	60	25	15	100

Subject learning outcome	After competing this course the student will be able to • Evaluate the performance parameters of electronic and communication systems • Prepare test plans to verify the specifications • Design test procedures for verification of system/sub-system specifications • Design custom test instruments

Subject Content

Unit No.	Topics	Learning outcome	Book Reference
1	Basics Parameters, Units of measurements, Accuracy, Resolution, Precision	Student will know the difference between various parameters	[1] Ch.1, Ch.2
	Sensors and Transducers Various types of sensors, Signal Conditioners, Data Acquisition systems	Student will be able to choose a suitable sensor for a give application	
2	Analog measurements Voltage, Current and Power, Impedance, Resistance, Capacitance, Inductance, Time and Phase, Gain and loss, Frequency, Frequency response, Noise power, Noise figure, Non-linearity, Group Delay, Distortion, Video Measurements	Student will know the characteristics of parameters specified in analog electronic systems	[1] Ch.8, Ch.9, Ch.16,
	Digital measurements Jitter, BER, Eye diagram,	Student will know the characteristics of parameters specified in digital communication systems	

3	Signal Sources Audio and RF Oscillators, Data Generators, Pattern Generators, Video Signal Generator	Student will be able to select a proper source for simulating input signals	[1] Ch.13
	Measuring Instruments DVM, Oscilloscopes, DSO, Spectrum Analyzer, Logic Analyzer, Distortion Analyzer, Network Analyzer, TDR, RF Power Meters,	Student will be able to measure the performance and parameters of systems	[1] Ch.11, Ch.12, Ch.15
4	Interfaces GPIB, HPIB, USB, PCI	Student will be able to compare and select different interfaces to measuring instruments and systems under test	
	Virtual Instruments Software based instrumentation PC based instrumentation	Student will be able to choose between options of measuring instruments and program	

Text books:	[1]	David A. Bell, "Electronic Instrumentation and Measurements", 3rd Ed, Oxford University Press, 2013
Reference Books /Notes	[1]	Oliver and Cage, "Electronic Measurements and Instrumentation", McGraw Hill
	[2]	H.Kalsi, "Electronic Instrumentation", McGraw Hill India, 2004
	[3]	Banerjee, Gopal Krishna, " Electrical and Electronic Measurements", PHI Learning, 2012
	[4]	HP Application Notes, Agilent Application Notes
	[5]	Rohde & Schwarz Application Notes

Digital Learning Resources	NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam	Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course . Student has to answer total FIVE full questions choosing at least one from each unit.
Note	Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

Program: B.Tech- Electronics & Communication Engineering **Semester: V**

Subject: Microcontroller & Interfacing **Subject Code: EC410503**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-	1hrs/week	4	60	60	25	15	100

Course learning outcome	After competing this course the student will be able to • Develop software for microcontroller systems using assembly & C programming language. • Demonstrate an ability to use both polling and interrupt-driven approaches for interfacing a microcontroller with peripheral devices. • Develop and analyze software to interface a microcontroller with common peripheral devices, such as switches, visual displays, digital-to-analog converters, analog-to-digital converters, D.C Motor, Stepper Motor.

Sr. No	Course Content	Hours
1	**8051 Microcontroller and Assembly Language Programming** Microcontroller and Embedded Processor Overview of 8051 family Architecture of 8051 Assembling and Running of 8051 Programs Program Counter ,Stack Pointer PSW and Register Banks and Stack ROM and RAM Space	10
	8051 Programming in Assembly Language 8051 addressing modes Arithmetic and Logical instructions and Programs Jump, Loop and Call instructions BCD, ASCII and other Application Programs	
	8051 Hardware Connection , Intel Hex file & I/O Port Programming	

	Pin Description of the 8051 Design and test of 8051 Minimum Module Explaining Intel Hex File I/O Programming I/O bit Manipulation Programming	
2	**8051 Programming in C** Data Types and Time Delays in 8051 C I/O Programming in 8051 C Logic Operation in 8051 C Data Conversion Programs in 8051 C Access code ROM space in 8051 C Data Serialization Using 8051 C	10
	8051 Timer & Counter Programming in Assembly and C 8051 Timer Programming 8051 Counter Programming Programming Timer and Counter in C 8051 C	
3	**8051Timer , Serial & Interrupt Programming in Assembly and C** Basics of Serial Communication 8051 Connection to RS-232 8051 Serial Port Programming in Assembly Serial Port programming in C 8051 Interrupt Programming Timer Interrupts Programming External Hardware Interrupts Programming the serial communication interrupts Interrupt Priority Interrupt Programming in C	10

	8051 Interfacing 8051 interfacing with external ROM, flash memory and RAM LCD interfacing Key-board interfacing	
4	**8051 Interfacing** Parallel and serial ADC, DAC interfacing RTC interfacing, RTC programming in C, Alarm, SQW, and IRQ features of the DS12887 chip. Relays and Opt isolators, Stepper motor interfacing, DC motor interfacing and PWM.	10
	Introduction to Arduino What is Arduino? Introduction to Arduino Uno Interfacing LED's , LCD Pheripherla interfacing with Arduino	

Text books:

8051 Microcontroller and Embedded system using Assembly and C, 2nd Edition, Muhammad Ali Mazidi, Janice GillispieMazidi and RolinMcKinlay, Pearson Eduction

The 8051 Microcontroller, Architecture, programming and applications, 2nd Edition, Kenneth J Ayala, Penram International Publishing Pvt. Ltd

Reference books:

Microprocessor and Microcontroller fundamentals. The 8085 and 8051 Hardware and Software by William Kleitz

8051 Microcontroller: Internals, Instructions, Programming and Interfacing 1st Edition by SubrataGhosal ,Pearson Education

Program: B.Tech- Electronics & Communication Engineering **Semester: V**

Subject: Linear Integrated Circuits **Subject Code: EC410508**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
4hrs/week	-	-	4	60	60	25	15	100

Course learning outcome	After competing this course the student will be able to • Understand operational amplifiers • Able to select op-amp and other linear integrated circuits for specific application, and design circuits using the ICs • Able to analyze circuits and determine their limitations

Subject Content

Unit No.	Topics	Learning outcome	Text chapters
1	Operational Amplifier Introduction, Parameters, Performance, datasheet, Frequency response, compensation, noise	Understand the operational amplifier, its characteristics, advantages and limitation, Be able to select proper application specific op-amp	[1] ch 1,2,5,6
2	Application of Op-Amp DC amplifiers, difference amplifier, instrumentation amplifier, ac amplifier, current source and sink, current amplifier, DC voltmeter circuit, Ohmmeter circuit, Log and antilog amplifiers, Switching circuit with op-amp, voltage level detectors, Schmitt trigger, integrator and differentiators.	Analyze op-amp based circuit and able to find the limitations Able to design op-amp based circuits for specific application.	[1]ch 3, 4, 7, 8
3	Signal Processing Circuits Precision rectifiers, limiting circuits, clamping circuit, peak detectors, sample and hold circuits. Signal generation using 555 timer IC, VCO, Delay timers, sequential timers, Pulse-tone oscillator,	Able to design signal processing circuit with Op-Amp and other liner ICs	[1] ch 9, 10,11, 12

	7555 CMOS timer, IC function generators. Active filter design and analysis		
4	Voltage Regulators, Audio Power Amplifiers and Data converters Voltage regulator basics, IC liner voltage regulators, switching regulators, Basics of audio amplifier, performance improvement of audio power amplifier, IC and MOSFET power amplifier, Basics of ADC and DAC	Be able to design audio amplifier, efficient power supply. Be able to design analog front end of microprocessor based circuits	[1] ch 13, 14, 15
Text books:	[1] David A. Bell, "Operational Amplifier and Liner ICs", 3/e, Oxford University Press, 2013		
	[2] Ramakant Gayakwad "Op-amps and Linear Integrated Circuits", 4/e, PHI		
Reference Books	[1] Sergio Franco "Design with Operational Amplifiers and Analog Integrated Circuits", Tata Mcgraw-hill 2009 Edition		
	[2] D. Roy Choudhury and Shail B. Jain, "Linear Integrated Circuits", 3/e New Age International Publishers		
	[3] R. Schaumann, and M E. Van Valkenburg, "Design of Analog Filers", Oxford University Press		

Digital Learning Resources	NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam	Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.
Note	Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

Program: B.Tech- Electronics & Communication Engineering **Semester: V**

Subject: Digital System Design using HDL **Subject Code: EC410521**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-	-	4	45	60	25	15	100

Subject learning outcome	After competing this course the student will be able to • design complex digital systems in HDL at different levels of abstraction • partition a digital system into different subsystems • transfer a design from a version possible to simulate to a version possible to synthesize • identify principal parts in programmable circuits (PLD, FPGA, ASIC) and implement complex digital systems in programmable circuits

Subject Content

Unit No.	Topics	Learning outcome	Book Reference
	VHDL		
1	**Language Elements:** Identifiers, Data Objects, Data Types, Operators.	Student will know the different VHDL language elements.	[1] Ch.1, Ch.2 Ch.3
	Behavioral Modeling: Entity Declaration, Architecture Body, Process Statement, Variable Assignment Statement, Signal Assignment Statement, Wait Statement, If Statement, Case Statement, Null Statement, Loop Statement, Exit Statement, Next Statement, Assertion Statement	Student will be able to design digital system using Behavioral style of modeling	[1] Ch.4
2	**Dataflow and Structural:** Concurrent Signal Assignment Statement, Concurrent versus Sequential Signal Assignment, Delta Delay, Multiple Drivers, Conditional Signal Assignment Statement, Selected Signal Assignment Statement, Block Statement, Concurrent Assertion Statement, Component Declaration, Component Instantiation, generic and generate statements	Student will be able to design digital system using Dataflow and Structural style of modeling Student will be able to identify synthesizable statements	[1] Ch.5,6,7

	Verilog		
3	**Basics of Verilog:** Verilog as an HDL , Levels of design description, Concurrency, Simulation And Synthesis , Functional Verification ,System Tasks, Programming language Interface , Module	Student will know the basic structure of Verilog language	[2] Ch.1,2,3
	Gate Level Modeling: Gate level Primitives, Module structure, Instances of primitives, Delays models, Port types.	Student will be able to design digital system using Gate Level Modeling and Data flow modeling.	[2] Ch.4,5
	Modeling At Data Flow Level: Continuous assignment, Delays and continuous assignments, assignment to vectors, operators		[2] Ch.6
4	**Behavioral Modeling:** Operations and assignments, Procedures, Assignments with delays, Blocking and Non-blocking assignments, types of constructs, loops, Functions, Tasks and User-defined primitives.	Student will be able to design digital system using Behavioral Modeling Student will be able to identify the constructs most suitable for the design	[2] Ch.7,8,9
Text books:	[1]	J. Bhasker "A VHDL primer", Prentice Hall	
	[2]	Samir Palnitkar "Verilog hdl: a guide to digital design and synthesis, second edition ", Prentice Hall	
Reference Books /Notes	[1]	VHDL, Analysis and Modeling of Digital Systems *by Navabi, Z. Second Edition, McGraw-Hill.*	
	[2]	HDL Chip Design: A Practical Guide for Designing, Synthesizing & Simulating Asics & Fpgas Using VHDL or Verilog " by Douglas J. Smith	

Digital Learning Resources	NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam	Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course . Student has to answer total FIVE full questions choosing at least one from each unit.
Note	Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

Program: B.Tech- Electronics & Communication Engineering **Semester: V**

Subject: Video System Engineering **Subject Code: EC410522**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-	-	4	45	60	25	15	100

Course learning outcome	Students will be able to Understand working of TV Understand concepts of compatibility and complexity Understand world wide standards of TV. Understand real application of widely used electronics circuit design Know fundamentals of data compression Process audio and video peripherals

Subject Content

Unit No.	Topics	Learning outcome	Text chapters
1	**Fundamental Concept of Television** Camera tube, TV Transmitter and Receiver, Image continuity, Scanning, Need of scanning, Sawtooth current for scanning, Progressive scanning, Interlaced scanning, Fields, Frame Field and Line frequencies, Active lines, Kell factor, Resolution, Bandwidth, Determination of Number of scanning lines, Synchronization, Blanking, Composite video signal, Positive and Negative polarities of CVS, H-Blanking pulse, Vertical Blanking pulse, Modulation requirement of TV, TV Channels used in India, RF spectrum	Understand working principle of camera tube Scanning requirements Proper modulation technique to transmit composite TV signal	[1] Ch1, Ch2,Ch3, Ch4 [2] Ch13

2	**Monochrome Receiver and Circuits** Elements of monochrome receiver, Importance of the Inter-carrier frequency in TV receivers, Electronic Tuner, IF system, Surface Acoustic Wave Filter, Video Detector Circuit, Circuit for Cancellation of Noise, Trap circuits, Keyed AGC circuit, DC restoration, Deflection circuits, Sync Separator, Vertical and Horizontal Deflection circuits, Phase splitter, AFC, Sound section of TV receiver.	Understand requirement of each essential circuits for quality video representation Also get the knowledge of sound separation at receiver side	[1]Ch8
3	**TV signal Transmission and Reception** **Colour Signal Transmission and Reception** TV Signal propagation, Interference suffered by TV channels, Bandwidth for color signal transmission, Modulation of color Difference signals, Weighting factors, Formation of the Chrominance signal, NTSC color TV system, PAL color Television system, SECAM system, Merits and Demerits of NTSC,PAL and SECAM systems **Digital TV transmission and Reception** Digitizing video, Chroma Sub sampling, Basics of video compression(MPEG-x, H.26x), Digital VTR, HDTV, Video Interfaces (Composite, Component, S-Video, DV,SDI, HDMI, DVI),Digital color TV receiver, Display Technologies.	Know the types of interference and its effect on picture Understand the color information transmission with optimum use of bandwidth Working principles of various World famous color systems Get the idea of recent digitization of TV transmission Also find the support for handling digitize video data on various display technologies	[1]Ch9,Ch25,Ch26 [2] Ch14
4	**Video Recording** Principle of Video recording, Relation between Tape speed and Bandwidth, Problems in Video Recording on Tape, Need of Frequency Modulation, Recording of Luminance and Colour signals on the same Track, Reproduction of Video signal on VCR,Recording on VCD and DVD.	Understand the recording techniques for composite TV video signal Know the reproduction of recorded luminance and color information from	[2]Ch16

		VCR,VCD and DVD	
Text books:	[1]	R.R. Gulati, “Modern Television Practice”,	
	[2]	R.G. Gupta, “Audio Video Systems”,	
Reference Books	[1]	R.G. Gupta, “Television Engineering and Video Systems”, Tata Mc-Graw-Hill.	
	[2]	A Veera Lakshmi and R Srivel, “Television and Video Engineering”,	
	[3]	John Watkinson, “ Guide To Compression”,	

Digital Learning Resources	NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam	Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course . Student has to answer total FIVE full questions choosing at least one from each unit.
Note	Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

ज्ञानेन प्रकाशते जगत्
INDUS UNIVERSITY

6TH SEMESTER

SEMESTER-VI

Subject Code	Subject Name	Abbr	Teaching Scheme			Credits	Hrs
			Theory	Practical	Activity		
EC410616	Digital Communication	DC	4	0	0	4	4
EC410603	Microwave Engineering	MT	3	0	0	3	3
EC410610	Optical Communication	OC	3	0	0	3	3
EC410611	VLSI Design	VLSI	3	0	1	4	5
EC410612	Digital Signal Processing	DSP	3	0	1	4	5
EC410623/24	Elective-2	EL-2	3	0	1	4	5
EC410607	Digital Communication lab	DC Lab	0	1	0	1	2
EC410608	Microwave Engineering Lab	MW lab	0	1	0	1	2
EC410613	Optical Communication Lab	OC Lab	0	1	0	1	2
EC41614	VLSI Design Lab	VLSI Lab	0	1	0	1	2
EC410615	Digital Signal Processing Lab	DSP Lab	0	1	0	1	2
	Total		**19**	**5**	**3**	**27**	**35**

Elective 2

EC410623: Advance Micro Controller
EC610624: error correcting codes
:

Program: B.Tech- Electronics & Communication Engineering **Semester: VI**

Subject: Digital Communication **Subject Code: EC410602**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-	-	3	45	60	25	15	100

Course learning outcome	On successful completion of this course student will be able to Study representation of signals and discuss the process of sampling, quantization and coding. Understand baseband and band pass signal transmission and reception techniques. • Learn error control coding for the encoding and decoding of digital data streams over noisy channels for their reliable transmission. • Design variable length codes for a given message source to increase efficiency.

Subject Content

Unit No.	Topics	Learning outcome	Text chapters
1	Introduction to Digital Communication SystemsCommunication System Model, Typical Digital communication System, Advantage of Digital communication Probability and random process Information, Probability, Random Variables, Mean and variance, Conditional Probability of independent events, Relation between probability and probability Density , Releigh Probability Density , CDF, PDF, Random Variables, correlation between Random Variables, Linear mean square Estimation, Central limit theorem, Error function and Complementary error function Discrete and Continuous Variable, Gaussian PDF, Threshold Detection, Statistical Average,Chebyshev In Equality, Autocorrection.	Student will understand the advantages of digital systems over analog counterparts and calculate the mean and variance of some common continuous and discrete distributions	[1] Ch1, Ch3
2	Information Theory : Introduction, Concept & Measure of information, statistics of discrete channel, Error Free Communication Over a noisy channel, Shannon Theorem, The channel capacity of a Discrete Memory less Channel, Optimum	Student will find the capacity of given channel and design	[1]Ch4, Ch9

	System, The channel capacity of a Continuous Channel, Source Coding. Error Control Coding: Introduction, Linear block code, cyclic code, convolution code, Burst Error Correcting and detecting code	variable length codes for a given message source to increase efficiency and application of error correction coding in modern communicatio n and broadcast system	
3	Base Band Modulation : PAM Signals, Digital multiplexing ,line coding,Digitizing Analog signals - sampling,Quntization,Encoding, Alising, Nyquist first and second criterion for zero ISI, PCM, DPCM, ADPCM, Uniform and Non-uniform Quantization, Quantization Error in PCM,Delta Modulation, Adaptive Delta Modulations ,SNR Calculation, Non-uniform Quantization	Student will able to compute the average energy per symbol in baseband pulse modulated data and learn the effect of filtering on the digital waveform.	[1]Ch5,Ch 7
4	Digital Modulation Techniques : QAM, BPSK, QPSK, DPSK, MSK, M-ary-FSK, M-ary-PSK, BFSK of various digital modulation techniques and scrambling Digital Demodulation Techniques: Coherent and non-coherent detection of ASK, FSK, PSK, QPSK,DPSK. Noise Figure, Signal to noise Ratio, performance of communication system with channel noise.	Students will understand band-pass modulation schemes and compute the bandwidth of baseband and band-pass modulation signals also compare different modulation	[1]Ch7, Ch8

		schemes	
Text books:		Digital communication-Theory, Techniques and Applications by R. N. Mutagi, 2nd edition, OXFORD university press.	
		Digital and analog communication system by B.P.Lathi .Zhi Ding (international 4th Edition), OXFORD university press.	
Reference Books		An Introduction to Analog and Digital Communications by Simon Haykin, Wiley India.	
		Principle of communication system by Taub . Schilling (2nd Edition), TATA McGRAW-HILL.	
		Digital Communications by Simon Haykin, Wiley India.	
		Digital Communication by J. G. Proakis 2002 (TMH)	
Digital Learning Resources		NPTEL and MIT digital Video lectures	
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.	
Note		Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.	

Program: B.Tech- Electronics & Communication Engineering **Semester: VI**

Subject: Microwave Engineering **Subject Code: EC410603**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-	-	3	45	60	25	15	100

Course learning outcome	After competing this course the student will be able to • Obtain an understanding of different microwave components and their parameters • Give the deep knowledge of the different microwave semiconductor devices and also a microwave tubes. • The microwave parameters measurements are also covered.

Subject Content

Sr. No	Course Content	Objective	Hours
	UNIT 1		
1	**Waveguides:** Introduction to Maxwell Equations and Wave equations in different coordinates systems, General formulation for guided waves, basic equation and wave types for uniform systems, rectangular waveguide, circular waveguide, dielectric waveguide.	This chapter providing knowledge of basic passive components of microwave.	12
	UNIT 2		
2	**Parameters of microwave network:** Definition of scattering matrix, characteristics of S-matrix, scattering matrix of a two port network, salient features of S-matrix, salient features of multiport network, losses in microwave circuits, return loss, insertion loss, transmission loss, reflection loss, impedance matrix, short circuit admittance parameters of a π-network, S-matrix of series element in the transmission line	Getting the basic knowledge of different parameters of microwave network.	7

UNIT 3			
3.	**Microwave Passive Components:** Waveguide Attenuators, Waveguide Tees (E-Plane and H-Plane), Directional Coupler, Magic Tee, Waveguide bends and corners. S-matrix for E-plane Tee junction, S-matrix for H-plane Tee junctions, S-matrix for directional coupler. **Semiconductor Microwave Devices:** PIN diode, step recover diode, varactor diode, IMPATT diode, TRAPATT diode, BARITT diode, QWITT diode, CCD	This chapter is used to understand the operation and application of various microwave semiconductor device	7
UNIT 4			
4	**Microwave Tubes:** Limitation of conventional tubes, principle of operation of two cavity klystron, reflex Klystron principle of operation, velocity modulation in reflex klystron, Applegate diagram with gap voltage for a reflex klystron. Principle of operation of magnetron, hull cutoff condition, advantages of slow wave devices, principle of operation of TWT.	Operation principles of various microwave tubes are described.	6
5	**Microwave Measurements:** VSWR, Frequency, Guide Wavelength, Coupling and Directivity measurements.	The measurements of the fundamental microwave parameters are described.	4

Text book	[1]	Microwave Engineering, David. M. Pozar, Wiley Publication
	[2]	Microwave Devices and Circuits, S. Y. Liao, PHI
Reference Books	[1]	Ramo,S., Whinnery J.R.,andvan, Duzer,T:Fields and Waves in Communication Electronics, 3rd ed., Wiley Eastern
	[2]	Foundations for Microwave Engineering, R. R. Collin, McGraw Hill

	[3]	**Edward C Jordan**, **Keith G Balmain**," **Electromagnetic waves and radiating systems,** Prentice-Hall, 2006
Digital Learning Resources		NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.
Note		Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

Program: B.Tech- Electronics & Communication Engineering **Semester: VI**

Subject: Optical Communication **Subject Code: EC410610**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-	1hrs/week	4	60	60	25	15	100

Course learning outcome	On completion of this course the student will be able to • Analyze the performance of both digital and analogue optical fiber systems • Understand the operating principles of light sources, detectors and amplifiers • Use the optical components and subsystems in optical fiber network • To design a simple optical communication link

Subject Content

Unit No.	Topics	Learning outcome	Text chapters
1	**Introduction to Optical Fiber Communication:** Historical Development, Optical spectral bands, Advantage of Optical Fiber Communication, Fundamental Data Communication Concepts, Key Elements of Optical Fiber Communication	Students will be able to specify and select proper fiber cable as per requirement and measure fiber optic losses	[1] Ch 1 [2]Ch1
	Optical Fiber Waveguide and Structures: Ray Theory Transmission, Basic Optical laws and Definitions, Optical Fiber Modes , Single Mode Fibers, Step Index Fibers, Graded Index Fibers		[1]Ch2 [2]Ch2
	Transmission Characteristics of Optical Fibers: Attenuation, Material absorption losses in silica glass fibers, Linear scattering losses, Nonlinear scattering losses, Fiber bend loss, Dispersion		[1]Ch3 [2]Ch3
2	**4. Optical Sources:** Basic concepts, Semiconductor Physics, LED: Operation	Students will be able to select optical	[1]Ch4

	principal, LED structure, LED power and efficiency, Modulation, LASER: Operation principal, Semiconductor injection laser, Laser Structure and modes, Threshold Gain, Figure of merit, Modulation	source as per the application and requirement and connect them to the fiber	[2]Ch6 & Ch7
	5. Power Launching and coupling: Source to fiber power launching, Lensing schemes for coupling improvement, Fiber to fiber joints, LED coupling to single mode fibers, Fiber splicing, Optical connectors		[1]Ch5
3	**6. Optical Detectors:** Operation principal of Photodiode, types, characteristics, figure of merits , photodiode materials, photodetector noise, detector response time, temperature effects on gain, comparison of photodetectors	Students will be able to specify an optical detector in a receiver and measure the performance.	[1]Ch6 [2]Ch8
	7. Optical Receiver: Receiver Operation, Noise, Receiver structures, Digital receiver performance, Coherent detection, Link power budget, Rise time budget, Bit error rate		[1]Ch7 &Ch8
	8. Optical Amplifiers: Basic operation and application, Types of optical amplifiers, Semiconductor optical amplifiers, Erbium –Dopped amplifier, Raman amplifier, Amplifier noise, Optical SNR	Students will be able to use optical amplifier and basic components of optical network. They also understand the advanced optical communication systems	[1]Ch11 [2]Ch10
	9. WDM and Optical Networks: WDM principal, Optical couplers, Isolators & Circulators, Fiber Grating Filters, Add/Drop Multiplexer, SONET/SDH, Optical Switching		[1]Ch13
	10. Free Space Optical Communication: Introduction, Propogation Concepts, Challenges, Advantage, Disadvantages, Applications		

Text books	[1]	Gerd Keiser, “Optical Fiber Communications”, 5th Ed. Mc Graw Hill,
	[2]	John M. Senior, “ Optical Fiber Communication”, PHI/Pearson
Reference Books	[1]	D. Mymbaev & L.Lowell, Scheiner, “Fiber Optical Communication Technology”, Pearson
	[2]	G. Agrawal, “Fiber optic Communication Systems”, John Wiley and Sons

Digital Learning Resources	NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam	Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.
Note	Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

Program: B.Tech- Electronics & Communication Engineering **Semester: VI**

Subject: VLSI Design **Subject Code: EC410611**

Subject learning outcome	After completing this course the student will be able to • Calculate the R-C delay using Elmore's delay method. • Analyze the delay of the data path using logical effort techniques • Design complex logic gates using different logic styles like CMOS, Pass Transistor Logic, Transmission Gate etc.. • Design the sequential circuits at transistor level • Design the arithmetic building blocks • Test the different design for stuck at faults

Subject Content

Unit No.	Topics
1	**Basics of MOSFET** • MOSFET I/V Characteristics • MOSFET C/V Characteristics • Second Order Effects **The CMOS Inverter** • CMOS Voltage Transfer Characteristics • The Static Behavior: Noise Margins, Switching Threshold • Power, Energy, and Energy Delay • Performance of CMOS Inverter: The Dynamic Behavior **Objectives**: Student will be able to design CMOS inverter based on given specifications like noise margins, power and delay.
2	**Circuit Characterization and Performance Estimation** • Delay Estimation • Logical Effort and Transistor Sizing • Power Dissipation **Combinational Circuit Design** • CMOS Logic • Pass Transistor Logic, • Transmission Gate Logic, • Ratioed Logic **Objective**: Student will be able to • Calculate the R-C delay using Elmore's delay method. Student will be able to answer following questions for multi stage design. - What is the best circuit topology for a function?

	- How many stages of logic give least delay? - How wide should the transistors be? • Design any complex logic function using different logic topologies.
3	**Sequential Circuit Design** • Static Latches and Registers • Dynamic Latches and Registers • Pulse Registers • Nonbistable Sequential Circuit **Objective**: Student will be able to design latches, flipflops and sequential circuit at transistor level.
4	**Designing Arithmetic Building Block** • The Adder • The Multiplier • The Shifter **Testing and Verification** • Fault Models • Design for Testability **Objective:** Student will be able to • Design adder, multiplier with different architecture styles like RCA, CLA, CSA etc.. • Decide test vectors to test the design for stuck-at faults using controllability and observability concepts.
Text books:	Neil H. E. Weste, David Money Harris "CMOS VLSI Design: A circuit and Systems Prespective" Pearson, 3rd edition.
Reference Books /Notes	Jan M. Rabaey " Digital integrated circuits: a design perspective" Prentice-Hall 2nd edition
Digital Learning Resources	NPTEL and MIT digital Video lectures

ज्ञानेन प्रकाशते जगत्
INDUS UNIVERSITY

7TH SEMESTER

SEMESTER-VII

Subject Code	Subject Name	Abbr	Teaching Scheme			Credits	Hours
			Theory	Practical	Activity		
EC410701	Antenna & Wave Propagation	AWP	3	0	1	4	5
EC410714	Wireless communication	WC	4	0	0	4	4
EC410709	Image Processing	IP	4	0	0	4	3
EC410710	Data and Communication Networks	DCN	3	0	0	3	3
EC410728/22/23	Elective -3	EL-3	3	0	1	4	5
EC410724/29	Elective-4	EL-4	3	0	0	3	3
EC410705	Antenna & Wave Propagation Lab	AWP Lab	0	1	0	1	2
EC410711	Wireless communication lab	WC lab	0	1	0	1	2
EC410712	Image Processing Lab	IP Lab	0	1	0	1	2
EC710713	Data and Communication Networks Lab	DCN Lab	0	1	0	1	2
EC410726/30	Elective-4 lab	EL-4 Lab	0	1	0	1	2
	Total		**20**	**5**	**2**	**27**	**33**

Elective 3

EC410728: Satellite Communication
EC410722: Embedded Systems
EC410723: Analog Cmos Design

Elective 4

EC410729: Radar and Navigation
EC410730: Radar and Navigation lab
EC410724: Power electronics
EC410726: Power electronics lab

Program: B.Tech- Electronics & Communication Engineering **Semester: VII**

Subject: Digital Signal Processing **Subject Code: EC410612**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-	1hrs/week	4	60	60	25	15	100

Subject learning outcome	After competing this course the student will be able to • Describe the difference between analog, continuous-time, discrete time and digital signals and Describe basic operation involved in A/D and D/A conversion. • Design digital FIR and IIR Filters.

Subject Content

Unit No.	Topics
1	**INTRODUCTION** • Signals, systems and signal processing, • concept of frequency in continuous and discrete time signals • Periodic Sampling & Frequency domain representation of sampling, • Reconstructions of band limited signals from its samples • general applications of DSP **Discrete-Time signals and systems:** • Discrete-Time Signals, Discrete-Time Systems, LTI Systems, • Properties of LTI Systems, Linear Constant Co-efficient Difference equations, • linear convolution and its properties • Frequency domain representation of Discrete-Time Signals & Systems. • Representation of sequences by discrete time Fourier Transform, (DTFT), Properties of discrete time Fourier Transform, and correlation of signals, Fourier Transform Theorems.
2	**THE Z-TRANSFORM AND ITS APPLICATION TO THE ANALYSIS OF LTI SYSTEMS** • Properties of ROC for Z-transform, • Inverse Z-transform, • Frequency response of LTI system, • System functions for systems with linear constant-coefficient Difference equations, • Freq. response of rational system functions relationship between magnitude & phase,

	• All pass systems, inverse systems, Minimum/Maximum phase systems, systems with linear phase	
	Structures of Discrete-Time Systems: • Block Diagram representation of Linear Constant-Coefficient Difference equations, • Structures of IIR Systems, • Basic Structures for FIR Systems	
3	**DISCRETE- FOURIER TRANSFORM (DFT)** • Discrete Fourier Transform (DFT), • Relationship between the DTFT and DFT and their inverses, • DFT properties, Linear and circular convolution, Linear filtering methods based on DFT.	
	FAST FOURIER TRANSFORM[F.F.T] • Direct computation of DFT, DIT & DIF - FFT using radix 2 – Butterfly structure. • Decimation in Time[D.I.T] • Decimation in frequency[D.I.F] • Introduction to basic butterfly computation in radix-4 FFT algorithm, • Goertzel algorithm and Chirp-Z Transform algorithm, Effect of Quantisation in DFT	
4	**IIR FILTER DESIGN** • Analog filter design – Butterworth and Chebyshev approximations; • Discrete time IIR filter from analog filter • IIR filter design by impulse invariance, bilinear transformation, Approximation of derivatives-(HPF,BPF,BRF) filter design using frequency translation • Warping, prewarping - Frequency transformation. **FIR FILTER DESIGN** • Linear phase FIR filter • Filter design using windowing techniques, • Frequency sampling techniques • Finite word length effects in digital Filters	
	Architecture of DSP Processors: • Harward architecture, pipelining, Multiplier-accumulator (MAC) hardware, • Architectures of fixed and floating point (TMSC6000) DSP processors.	
Text books:		John G. Proakis & Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth edition, Pearson education / Prentice Hall, 2007
Reference Books /Notes		Alan V.Oppenheim, Ronald W. Schafer & Hohn. R.Back, "Discrete Time Signal Processing", Pearson Education, 2nd edition, 2005
		Digital Signal Processing: A Computer-Based Approach, S. K. Mitra, McGraw-Hill, Third edition, 2006

Digital Learning Resources		NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.
Note		Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

Program: B.Tech- Electronics & Communication Engineering **Semester: VII**

Subject: Antenna and Wave propagation **Subject Code: EC410701**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-	1hrs/week	4	60	60	25	15	100

Course learning outcome	The objective of this subject is to deliver an in-depth knowledge of the basic antennas. Also give the practical design consideration and simulation of various antennas for different applications. The basic theoretical concepts for the radio wave propagation are also covered.

Subject Content

Unit No.	Topics	Learning outcome	Text chapters
1	**Overview of antennas:** antenna parameters, radiation pattern, radiation intensity, directivity, gain, antenna efficiency, half-power beamwidth, beam efficiency, bandwidth, polarization, input impedance, antenna radiation efficiency and antenna field zones.	Basics parameters of the antenna theory are covered.	CH1,2
2	**Radiation integral and fundamental antennas:** vector potential, E and H field for electric and magnetic current sources, far field radiation, duality theorem, reciprocity and reaction theorems, Fourier transform: relation between far-field pattern and source distribution. Retarded potential, radiation form current element and dipole, radiation patterns, impedance.	Mathematics behinds antenna radiation is covered. Some important theorems regarding antenna is described.	CH3,4,5
3	**Aperture antennas:** field equivalence principle: Huygens principle, radiation equations, rectangular apertures, circular apertures, Babinet's principle, introduction to diffraction of fields	Basic theorems related to understand the mechanism of the aperture antenna are described.	CH12
4	**Horn antennas:** E-plane sectoral horn,	All types of horns with their	CH13

	aperture fields, radiated fields, directivity, H-plane sectoral horn, aperture fields, radiated fields, directivity, pyramidal horn, conical horn, corrugated horn, phase centre calculation in horn antennas.	parameters are described.	
5	**Reflector antennas:** plane reflector, corner reflector, parabolic reflector, front fed parabolic reflector, dual symmetrical and offset reflectors (Cassegrain & Gregorian antenna).	The reflector antennas and their geometry to design them have been covered.	CH15
	Microstrip antenna: different type's microstrip antennas, advantages and disadvantages, Fractal antenna, electronic bandgap antenna, meta materials, fractal antennas, surface wave antenna.	This chapter gives the basic knowledge of the microstrip antenna and surface wave antenna.	CH14
	Arrays: two-element array, N-element linear array, array/space factor, broadside array, end-fire array, planar array, slotted waveguide array, microstrip array, helical array, introduction active phased array and adaptive arrays.	This chapter is used to understand the different types of arrays.	CH6
	Wave propagation: ground wave propagation, terrain and earth curvature effects, tropospheric propagation, fading, diffraction and scattering, ionospheric propagation, refractive index, critical frequencies, maximum usable frequency, effects of magnetic field.	The basic concepts of the radio wave propagation are covered.	SECOND TEXT BOOK CH15

Text books:	[1]	Antenna Theory: Analysis And Design – C A Balanis - Wiley, John & Sons, 2005.
	[2]	Antennas and wave propagation- J D Krauss- Mcgraw-Hill Higher Education, 2012.
Reference Books	[1]	Electromagnetic Wave And Radiating Systems- Edward C. & Balmain, Keith G. Jordan. Prentice Hall of India, 2004.

	[2]	Modern Antenna Design – Thomas A Milligan- IEEE Press,2003

Digital Learning Resources	NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam	Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.
Note	Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

Program: B.Tech- Electronics & Communication Engineering **Semester: VI**

Subject: Wirelesses communication **Subject Code: EC410708**

Teaching Scheme					Examination Scheme			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
3hrs/week	-		3	60	60	25	15	100

Course learning outcome	Students will be able to Understand the era of wireless communication system Get the knowledge of all important concept of wireless systems Implement the propagation model for different environments Understand the working of today's GSM and CDMA architecture Know the recent trends in wireless communication systems

Subject Content

Unit No.	Topics	Learning outcome	Hours	Text chapters
1	**Elements of Cellular Radio System Design** Introduction of cellular system, General description of problem, Concept of frequency reuse channels, Interferences, Handoff mechanism, Umbrella concept, Trunking and Grade of Service, Techniques to improve coverage and capacity in cellular system	Evolution of wireless communication Understand the all important concept regarding the wireless communication	9	[1] Ch1,3
2	**Frequency Management and Channel Assignment** Frequency management, Frequency-spectrum utilization, Set-up channels, Definition of channel assignment, Fixed channel assignment, Nonfixed channel assignment algorithms, Traffic and channel assignment, Value of implementing handoffs, Initiation of a handoff, delaying a handoff, Forced handoffs, power-difference handoffs, Mobile	Study the Frequency assignment strategies Develop proper handoff implementation scheme	8	[1]Ch3

	assisted handoff and soft handoff, Introduction to dropped call rate, Formula of dropped call rate			
3	**Multiple access techniques and Propagation models of Mobile Radio** FDMA, TDMA, CDMA, OFDM, Radio wave propagation, Transmit and receive signal models, Free-Space path loss, Ray tracing, Empirical path-loss models, Shadow fading, Combined pathloss and shadowing, Outage probability under path loss and shadowing, cell coverage area.	Know the fundamental of multiple access techniques Find the propogation model to calculate the losses in the system Implement some basic propagation model in Lab.	12	[1]Ch4,5,9
4	**Digital Cellular Systems** GSM architecture, GSM channel types, GSM speech coding, Location tracking and call setup, security, Data services, Supplementary service data, GSM location update, Mobility databases, Failure restoration, CDMA architecture, RAKE receiver, Frequency and channel specifications, PDC,PHS,WCDMA,GPRS system architecture, Introduction to Wi-Fi, WiMAX, ZigBee Networks, Software defined radio, UWB radio, Wireless Adhoc network and mobile portability, Security issues and challenges in a wireless network.	Study the practical wireless system GSM and CDMA. Get the knowledge of some recent trends in wireless communication systems.	11	[1]Ch11
Text books:		Mobile Cellular Telecommunications analog and digital systems, William C. Y. Lee. 2nd Edition, MGH.		
		Wireless Communication", Theodore S. Rappaport, Prentice hall.		
Reference Books		Wireless and Mobile Network Architecture by YI-Bang Lin and Imrich Chlamtac, Wiley publication.		

		"Wireless Communications and Networking ",Vijay Garg, Elsevier	
		Mobile and personal Communication system and services by Rajpandya, IEEE press(PHI).	
		Wireless communication, TL Singal	
		Wireless digital communication', Kamilo Feher, PHI.	
Digital Learning Resources		NPTEL and MIT digital Video lectures	
Question Paper Pattern for End Sem Exam		Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course . Student has to answer total FIVE full questions choosing at least one from each unit.	
Note		Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.	

Program: B.Tech- Electronics & Communication Engineering **Semester: VII**

Subject: Image and Video Processing **Subject Code: EC410709**

Teaching Scheme					**Examination Scheme**			
Class Room Contact Hrs	**Practical**	**Activity Based Learning**	**Credits**	**Total hours/ Semester**	**University Examination**	**Mid Sem Examination**	**Continuous Evaluation**	**Total Marks**
4hrs/week	-	1hrs/week	4	60	**60**	25	15	100

Subject learning outcome	Fundamentals of Image Enhancing the quality of Image by Spatial and Frequency domain techniques Basics of color Image Processing Digital video Fundamentals and Compression standards for Image and Video

Subject Content

Unit No.	**Topics**	**Learning outcome**	**Text chapters**
1	**Introduction to Image Processing:** Image Sampling, quantization, Resolution, Classification of digital images, Image types, basic of Image processing systems, Application of Digital Image Processing. **Image Transforms:** 2D-DFT, Walsh, Hadamard, Haar, Slant, DCT, KL, Wavelet.	To get the knowledge of Image and its digital representation Understanding the need of image transforms	[1] CH-1 [1] CH-4
2	**Image Enhancement:** **Spatial Domain: I**ntensity Transform functions, Histogram processing, Spatial filters **Frequency Domain:** Basics of filtering in Frequency domain, Spatial domain filters.	Application of image enhancement to improve the interpretability of the information present in images for human viewers	[1] CH-5
3	**Image restoration and reconstruction:** Noise models, Restoration in presence of	Understand the difference between color and	[1] CH-11

	noise in spatial and frequency domain, Estimating of degradation function. **Color-Image Processing:** Color Models, Color-image quantization, Histogram of color image, Color image filtering, Pseudo-Color Image processing, color transformations.	monochrome images Processing of Color image for enhancement and representation	
4	**Representation of Digital Video :** Analog Video, Digital Video, Digital Video Processing, Time-Varying Image formation Models, Spatio-Temporal Sampling, International standards for image and video compression (JPEG, JPEG 2000,MPEG1/2/4, H.261, SVC).	Understand the difference between analog video and digital video and how time varying images can be considered as a video. Learn some important compression technique for Image and Video	[1] CH-9 [2] CH-1,2,3, 23

Text books:	1.	Digital Image Processing, S Jayaramanm,S Esakkirajan,T Veerakumar, McGraw Hill 2009.
	2.	Digital Video Processing, A. M. Tekalp, Prentice Hall, 1995.
Reference books:	1.	Digital Image Processing, Gonzalez and Woods, Third Edition, Pearson.
	2.	Multidimensional Signal, Image and Video Processing and Coding, J. W. Woods, Academic Press, 2006
	3.	Video Processing and Communications, Y. Wang, J. Ostermann, and Y.-Q. Zhang, Prentice Hall, 2002.

Digital Learning Resources	NPTEL and MIT digital Video lectures
Question Paper Pattern for End Sem Exam	Question paper will contain 8 questions (2 full questions distributed in 1 unit) covering all the chapters of the course. Student has to answer total FIVE full questions choosing at least one from each unit.
Note	Activity Based Learning shall be Tutorial / Site Visit / Seminar / Practical / Workshop/Mini project/Simulation study etc.

SEMESTER-VIII

Subject Code	Subject Name	Abbr	Teaching Scheme			Credits	Hours
			Theory	Practical	Activity		
EC410803	Major Project	MjP	0	0	20	20	20
	Total		0	0	20	20	20