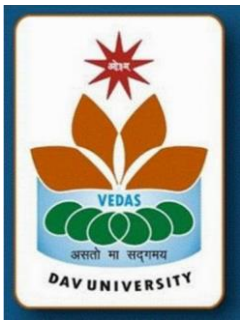
DAV UNIVERSITY JALANDHAR



Course Scheme
For

Five Year Integrated B. Tech-M.Tech.
In
Electronics and Communication Engineering

1st To 10th SEMESTER Examinations 2021–2022
Session Onwards
Syllabi Applicable For Admissions in 2021

Scheme of Courses
Integrated B.Tech. – M.Tech. (Electronics & Communication Engineering)
Semester-1*

S. no	Course Code	Course Title	L	T	P	Cr	Course Type
1	MTH151A	ENGINEERING MATHEMATICS-I	4	0	0	4	BS
2	CHE151A	CHEMISTRY	4	0	0	4	BS
3	CSE101A	COMPUTER FUNDAMENTALS AND PROGRAMMING	4	0	0	4	ES
4	EVS100A	ENVIRONMENTAL STUDIES	4	0	0	0	MC
5	MEC101A	ENGINEERING DRAWING	2	0	4	4	ES
6	ENG151B	BASIC COMMUNICATION SKILLS	3	0	0	3	HSMC
7	CHE152	CHEMISTRY LAB	0	0	2	1	BS
8	CSE103	COMPUTER FUNDAMENTALS AND PROGRAMMING LAB	0	0	2	1	ES
9	ENG152A	BASIC COMMUNICATION SKILLS LAB	0	0	2	1	HSMC
		TOTAL	21	0	10	22	

**Before the commencement of the classes of regular courses a two to three weeks induction program for newly admitted students is proposed*

Scheme of Courses
Integrated B.Tech. – M.Tech. (Electronics & Communication Engineering)
Semester-2

S. no	Course Code	Course Title	L	T	P	Cr	Course Type
1	MTH152A	ENGINEERING MATHEMATICS-II	4	0	0	4	BS
2	PHY151B	ENGINEERING PHYSICS	4	0	0	4	BS
3	MEC103	MECHANICAL ENGINEERING FUNDAMENTALS	4	0	0	4	ES
4	ELE105	BASIC ELECTRICAL ENGINEERING	4	0	0	4	ES
5	SGS107	HUMAN VALUES AND GENERAL STUDIES	4	0	0	0	MC
6	MEC104	MANUFACTURING PRACTICE	0	0	4	2	ES
7	PHY152	ENGINEERING PHYSICS LAB	0	0	2	1	BS
8	ELE106	BASIC ELECTRICAL ENGINEERING LAB	0	0	2	1	ES
		TOTAL	20	0	8	20	

Note: *At the end of the examination of 2nd Semester the students will undergo compulsory internship of swachh bharat abhiyanfora period of 15 days (100 hrs.) duration in villages approvedbyuniversity. Every student will submit the Report on internship within two weeks from the start of teaching for 3rd Semester. The marks for this will be included in the 3rd Semester.*

Scheme of Courses
Integrated B.Tech. – M.Tech. (Electronics & Communication Engineering)
Semester-3

S. no	Course Code	Course Title	L	T	P	Cr	Course Type
1	ECE201	DIGITAL ELECTRONICS	4	0	0	4	PCC
2	ECE202	ELECTRONIC DEVICES AND CIRCUITS	4	0	0	4	PCC
3	ELE201	CIRCUIT THEORY	4	0	0	4	PCC
4	CSE201	OBJECT ORIENTED PROGRAMMING	4	0	0	4	ES
5	MTH252A	ENGINEERING MATHEMATICS III	4	0	0	4	BS
6	ECE204	DIGITAL ELECTRONICS LABORATORY	0	0	2	1	PCC
7	ECE205	ELECTRONIC DEVICES AND CIRCUITS LABORATORY	0	0	2	1	PCC
8	CSE205	OBJECT ORIENTED PROGRAMMING LABORATORY	0	0	4	2	ES
9		SWACHH BHARAT SUMMER INTERNSHIP	0	0	0	2	HSM C
		TOTAL	20	0	8	26	

Scheme of Courses
Integrated B.Tech. – M.Tech. (Electronics & Communication Engineering)
Semester-4

S. no	Course Code	Course Title	L	T	P	Cr	Course Type
1	ECE203A	ELECTRONICS MEASUREMENTS AND INSTRUMENTATION	3	0	0	3	PCC
2	ECE207A	ANALOG COMMUNICATION SYSTEMS	4	0	0	4	PCC
3	ECE209	SIGNALS AND SYSTEMS	4	0	0	4	PCC
4	ECE210	ELETROMAAGNETIC FIELD THEOTY	4	0	0	4	PCC
5	ECE211	ANALOG ELECTRONICS	4	0	0	4	PCC
6	ECE206	ELECTRONICS MEASUREMENTS AND INSTRUMENTAATION LAB	0	0	2	1	PCC
7	ECE212A	ANALOG COMMUNICATION SYSTEMS LABORATORY	0	0	3	2	PCC
8	ECE213	SIGNALS AND SYSTEMS LABORATORY USING MATLAB	0	0	2	1	PCC
9	ECE214A	ANALOG ELECTRONICS LABORATORY	0	0	2	1	PCC
		TOTAL	19	0	9	24	

Note: *At the end of the examination of 4th Semesterthestudentswill undergo compulsory industrial training for a period of 4 weeks duration in reputed industries. Every student will submit the Training Report within two weeks from the startofteaching for 5th Semester. The marks for this will be included in the 5th Semester.*

Scheme of Courses
Integrated B.Tech. – M.Tech. (Electronics & Communication Engineering)
Semester-5

S. no	Course Code	Course Title	L	T	P	Cr	Course Type
1	ECE301	MICROPROCESSORS AND MICROCONTROLLER	4	0	0	4	PCC
2	ECE302	DIGITAL COMMUNICATION SYSTEM	4	0	0	4	PCC
3	ECE333	PROBABILITY THEORY AND STOCHASTIC PROCESSES	3	0	0	3	PCC
4	ECE336	COMPUTER ARCHITECTURE	4	0	0	4	PCC
5	ICE208	LINEAR CONTROL SYSTEM	4	0	0	4	PCC
6	ECE306A	MICROPROCESSORS AND MICROCONTROLLERLABORATORY	0	0	2	1	PCC
7	ECE307A	DIGITAL COMMUNICATION SYSTEM LABORATORY	0	0	2	1	PCC
8	ECE317	IC APPLICATIONS LABORATORY	0	0	2	1	PCC
9	ECE315A	INDUSTRIAL TRAINING-I	0	0	0	2	PWSI
		TOTAL	19	0	6	24	

Scheme of Courses
Integrated B.Tech. – M.Tech. (Electronics & Communication Engineering)
Semester-6

S. no	Course Code	Course Title	L	T	P	Cr	Course Type
1	ECE309	MICROWAVE AND RADAR ENGINEERING	4	0	0	4	PCC
2	CSE443A	PROGRAMMING WITH PYTHON	4	0	0	4	PCC
3	ECE311	DIGITAL SIGNAL PROCESSING	4	0	0	4	PCC
4	ECEXXX	PROGRAM SPECIALIZATION ELECTIVE-I	4	0	0	4	PEC
5	ECEXXX	PROGRAM SPECIALIZATION ELECTIVE-II	3	0	0	3	PEC
6	ECE312A	MICROWAVE AND RADAR ENGINEERING LABORATORY	0	0	2	1	PCC
7	CSE445A	PROGRAMMING WITH PYTHON LAB	0	0	3	2	PCC
8	ECE314A	DIGITAL SIGNAL PROCESSING LABORATORY	0	0	2	1	PCC
9	ECE316	MINI PROJECT/ELECTRONIC DESIGN WORKSHOP	0	0	3	2	PCC
		TOTAL	19	0	10	25	

Note: *At the end of the examination of 6th Semester the students will undergo compulsory industrial training foraperiodof 6 weeks durationin reputed industries. Every student will submit the training reportwithintwo weeks fromthestartofteaching of 7th Semester. Themarks for this will be included in the 7th semester.*

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Scheme of Courses
Integrated B.Tech. - M.Tech. (Electronics & Communication Engineering)
Semester-7

S. no	Course Code	Course Title	L	T	P	Cr	Course Type
1	ECE461	DIGITAL SYSTEM DESIGN	4	0	0	4	PCC
2	ECEXXX	PROGRAM SPECIALIZATION ELECTIVE-III	4	0	0	4	PEC
3	ECEXXX	PROGRAM SPECIALIZATION ELECTIVE-IV	4	0	0	4	PEC
4	ECEXXX	PG ELECTIVE I	4	0	0	4	PCC
5	ECE462A	DIGITAL SYSTEM DESIGN LABORATORY	0	0	2	1	PCC
6	ECE463	SENSORS LABORATORY	0	0	2	1	PCC
7	ECE400	INDUSTRIAL TRANING II	0	0	0	2	PWSI
8	ECE451	PROJECT	0	0	12	6	PWSI
		TOTAL	16	0	16	26	

Scheme of Courses
Integrated B.Tech. - M.Tech. (Electronics & Communication Engineering)
Semester-8

S. no	Course Code	Course Title	L	T	P	Cr	Course Type
1	ECEXXX	PG ELECTIVE II	4	0	0	4	PEC
2	ECEXXX	PROGRAM SPECIALIZATION ELECTIVE-V	4	0	0	4	PEC
3	ECEXXX	PROGRAM SPECIALIZATION ELECTIVE-VI	4	0	0	4	PEC
4	ECEXXX	PG ELECTIVE III	4	0	0	4	PCC
5	ECEXXX	PG ELECTIVE IV	4	0	0	4	PEC
6	ECE610	DISSERTATION PART -I	0	0	8	4	PROJ
		TOTAL	20	0	8	24	

Scheme of Courses
Integrated B.Tech. - M.Tech. (Electronics & Communication Engineering)
Semester-9

S. no	Course Code	Course Title	L	T	P	Cr	Course Type
1	ECE501	ADVANCE COMMUNICATION SYSTEM	4	0	0	4	PCC
2	ECE502	ADVANCE OPTICAL COMMUNICATION	4	0	0	4	PCC
3	ECEXXX	PG ELECTIVE V	4	0	0	4	PEC
4	VLS502	LOGIC SYNTHESIS USING HDL	4	0	0	4	PCC
5	ECE510	RESEARCH METHODOLOGY	4	0	0	4	PCC
6	ECE504	ADVANCED COMMUNICATION ENGINEERING LABORATORY	0	0	3	2	LC
7	ECE611	DISSERTATION PART-II	0	0	8	4	PROJ
		TOTAL	20	0	11	26	

Scheme of Courses
Integrated B.Tech. - M.Tech. (Electronics & Communication Engineering)
Semester-10

S. no	Course Code	Course Title	L	T	P	Cr	Course Type
1	ECE508	INFORMATION AND COMMUNICATION THEORY	4	0	0	4	PCC
2	ECE612	DISSERTATION PART -III	0	0	24	12	PROJ
		TOTAL	4	0	24	16	

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Abbreviation	Definition
L	Lecture
T	Tutorial
P	Practical
Cr	Credits
BS	Basic Sciences
ES	Engineering Sciences
PCC	Professional core courses
PEC	Professional elective courses
OEC	Open elective courses
HSMC	Humanities, Social Sciences and Management Courses
PWSI	Project, Workshops and Internships

Year	PROGRAM STRUCTURE	BS	ES	MC	PCC	HSMC	PEC	PWSI	LC	PROJ	Total CR
2021	Integrated B.TECH-M.TECH. **ECE**	22	26	0	108	6	39	10	2	20	233

Program Specialization Elective Courses *

S. No.	Course Code	Course Title	L	T	P	Cr	Specialization
1	ECE305	ANTENNA ENGINEERING	4	0	0	4	Communication System
2	ECE332	SATELLITE COMMUNICATION	4	0	0	4	Communication System
3	ECE341	BIO-MEDICAL ELECTRONICS	4	0	0	4	Instrumentation
4	ECE342	POWER ELECTRONICS	4	0	0	4	Instrumentation
5	ECE335	ADAPTIVE SIGNAL PROCESSING	4	0	0	4	Signal Processing
6	ECE433	DIGITAL IMAGE PROCESSING AND PATTERN RECOGNITION	4	0	0	4	Signal Processing
7	ECE310A	EMBEDDED SYSTEMS	4	0	0	4	VLSI
8	ECE334	DIGITAL MEMORY SYSTEMS	4	0	0	4	VLSI
9	ECE422	INFORMATION THEORY AND CODING	4	0	0	4	Communication System
10	ECE432	OPTICAL FIBER COMMUNICATION	4	0	0	4	Communication System
11	ECE331	VIRTUAL INSTRUMENTATION	4	0	0	4	Instrumentation
12	ECE431	MEMS FUNDAMENTALS	4	0	0	4	Instrumentation
13	ECE435	BIOMEDICAL SIGNAL PROCESSING	4	0	0	4	Signal Processing
14	ECE436	AUDIO AND SPEECH PROCESSING	4	0	0	4	Signal Processing
15	ECE434	CMOS CIRCUIT DESIGN	4	0	0	4	VLSI
16	ECE437	NANO ELECTRONICS	4	0	0	4	VLSI
17	ECE442	WIRELESS COMMUNICATION	4	0	0	4	Communication System
18	ECE472	TELECOMMUNICATION SWITCHING AND NETWORKS	4	0	0	4	Communication System
19	ECE441	ELECTRONIC SENSORS AND TRANSDUCERS	4	0	0	4	Instrumentation
20	ECE471	REMOTE SENSING	4	0	0	4	Instrumentation
21	ECE443	MULTIRATE SYSTEMS AND FILTER BANKS	4	0	0	4	Signal Processing
22	ECE473	WAVELET THEORY AND APPLICATIONS	4	0	0	4	Signal Processing
23	ECE444	DIGITAL COMPUTER DESIGN	4	0	0	4	VLSI
24	ECE474	ANALOG CMOS CIRCUIT DESIGN	4	0	0	4	VLSI
25	ECE475	INTERNET OF THINGS	4	0	0	4	Computer Science
26	ECE476	ARTIFICIAL INTELLIGENCE	4	0	0	4	Computer Science
27	ECE477	BIG DATA ANALYSIS	4	0	0	4	Computer Science
25		MOOC COURSE (List Attached)					

*Not Limited to

List of MOOC Courses

S. No.	Course Code	Course Title	L	T	P	Cr	Specialization
1	MOOC	ANALOG IC DESIGN	4	0	0	4	VLSI
2	MOOC	DIGITAL SPEECH PROCESSING	4	0	0	4	Signal Processing
3	MOOC	ANALOG CIRCUITS AND SYSTEMS THROUGH SPICE SIMULATION	4	0	0	4	VLSI
4	MOOC	DIGITAL VLSI TESTING	4	0	0	4	VLSI
5	MOOC	ESTIMATION FOR WIRELESS COMMUNICATIONS - MIMO/ OFDM CELLULAR AND SENSOR NETWORKS	4	0	0	4	Communication System
6	MOOC	GPU ARCHITECTURES AND PROGRAMMING	4	0	0	4	Computer Science
7	MOOC	DEEP LEARNING	4	0	0	4	Computer Science
8	MOOC	MACHINE LEARNING FOR ENGINEERING AND SCIENCE APPLICATIONS	4	0	0	4	Computer Science
9	MOOC	COMPILER DESIGN	4	0	0	4	Computer Science
10	MOOC	INTRODUCTION TO INDUSTRY 4.0 AND INDUSTRIAL INTERNET OF THINGS	4	0	0	4	Computer Science
11	MOOC	PARALLEL ALGORITHMS	4	0	0	4	Computer Science
12	MOOC	EMBEDDED SYSTEMS-DESIGN VERIFICATION AND TEST	4	0	0	4	Computer Science
13	MOOC	SOFTWARE ENGINEERING	4	0	0	4	Computer Science
14	MOOC	COMPUTER NETWORKS AND INTERNET PROTOCOL	4	0	0	4	Computer Science
15	MOOC	SYNTHESIS OF DIGITAL SYSTEMS	4	0	0	4	Computer Science

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Open Elective Courses*

S. no	Course Code	Course Title	L	T	P	Cr
1	ELE801	ELECTRO-MECHANICAL ENERGY CONVERSION	4	0	0	4
2	ELE802	TRANSDUCERS AND SIGNAL CONDITIONING	4	0	0	4
3	CHL801	INDUSTRIAL POLLUTION CONTROL	4	0	0	4
4	CHL802	FUEL CELL TECHNOLOGY	4	0	0	4
5	MEC801	INDUSTRIAL ENGINEERING TECHNIQUES	4	0	0	4
6	MEC802	ENERGY RESOURCES	4	0	0	4
7	CSE801	SOFTWARE ENGINEERING & PROJECT MANAGEMENT	4	0	0	4
8	CSE802	COMPUTER NETWORKS	4	0	0	4
9	ECE801	COMMUNICATION AND MEDIA FOUNDATIONS	4	0	0	4
10	ECE802	ELECTRONIC DISPLAYS	4	0	0	4
11	ECE803	EVERYDAY ELECTRONICS	4	0	0	4
12	CIV801	CONSTRUCTION MATERIALS AND TECHNIQUES	4	0	0	4
13	CIV802	RAILWAY AND TUNNEL ENGINEERING	4	0	0	4
14	MGT001	FUNDAMENTALS OF MANAGEMENT	4	0	0	4
15	MGT002	FUNDAMENTALS OF ADVERTISING	4	0	0	4
16	MGT003	FUNDAMENTALS OF STOCK MARKET	4	0	0	4
17	MGT004	FUNDAMENTALS OF RESEARCH METHODS	4	0	0	4

*Not Limited to

PG Elective*

Sr no	Course code	Course Title	L	T	P	Cr	Specialization
1	ECE503	MICROELECTRONICS	4	0	0	4	VLSI and Embedded Design
2	ECE553	DETECTIONAND ESTIMATION THEORY	4	0	0	4	Signal Processing
3	ECE507	MOBILE AD-HOC NETWORKS	4	0	0	4	Wireless Communication
4	ECE552	OPTO-ELECTRONICDEVICES	4	0	0	4	Optical Communication
5	VLS506	VLSI SUBSYSTEM DESIGN	4	0	0	4	VLSI and Embedded Design
6	ECE561	BIOMEDICAL SIGNAL PROCESSING	4	0	0	4	Signal Processing
7	ECE562	WIRELESS SENSOR NETWORKS	4	0	0	4	Wireless Communication
8	ECE563	OPTICAL NETWORKS	4	0	0	4	Optical Communication
9	VLS507A	VLSI ARCHITECTURES	4	0	0	4	VLSI and Embedded Design
10	ECE571	AUDIO AND SPEECH PROCESSING	4	0	0	4	Signal Processing
11	ECE572	WIRELESS AND MOBILE COMMUNICATION	4	0	0	4	Wireless Communication
12	ECE573	OPTICAL SWITCHINGAND WAVELENGTH ROUTING	4	0	0	4	Optical Communication
13	ECE652	MODERN RADAR SYSTEMS	4	0	0	4	Wireless Communication
14	ECE653	PHOTONICS	4	0	0	4	Optical Communication
15	ECE506	ADVANCE DIGITAL SIGNAL PROCESSING	4	0	0	4	Signal Processing

*Not Limited to

Detailed Syllabus

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Course Title: Engineering Mathematics-I

Course Code: MTH151A

L	T	P	Credits
4	0	0	4

Objective: The aim of this course is to familiarize the students with the theory of matrices which are used in solving equations in mechanics and the other streams. This course also provides a comprehensive understanding of the origin and development of ideas to exhibit the techniques origin and development of ideas to exhibit the techniques of solving ordinary differential equations.

Section-A (15 Hrs)

Rank of matrices, Inverse of Matrices, Gauss Jordan Method, reduction to normal form, Consistency and solution of linear algebraic system of equations, Gauss Elimination Method, Eigen values and Eigen vectors, Diagonalisation of Matrix, Cayley Hamilton theorem. Orthogonal, Hermition and unitary matrices.

Section-B (14 Hrs)

Concept of limit and continuity of a function of two variables, Partial derivatives, Homogenous Function , Euler's Theorem, Total Derivative, Differentiation of an implicit function, chain rule, Change of variables, Jacobian, Taylor's and McLaurin'sseries. Maxima and minima of a function of two and three variables: Lagrange's method of multipliers.

Section -C (14 Hrs)

Formation of ordinary differential equations, solution of first order differential equations by separation of variables, Homogeneous equations, Reduce to Homogenous, exact differential equations, equations reducible to exact form by integrating factors, equations of the first order and higher degree, clairaut's equation.

Section -D (13 Hrs)

Solution of differential equations with constant coefficients: method of differential operators. Non – homogeneous equations of second order with constant coefficients: Solution by method of variation of parameters, Simultaneously Linear differential equation.

References:

1. Grewal, B S. *Higher Engineering Mathematics*. New Delhi: Khanna Publication, 2009. Print.
2. Kreyszig, Erwin. *Advanced Engineering Mathematics*. New Delhi: Wiley Eastern Ltd., 2003. Print.
3. Jain, R K, and K Iyengar S R. *Advanced Engineering Mathematics*, New Delhi: Narosa Publishing House, 2003. Print.
4. Thomas, George B. and Finney Ross L. *Calculus and Analytic Geometry*, New Delhi: Addison Wesley, 1995. Print.

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Course Title: Chemistry

Course Code: CHE151A

L	T	P	Credits
4	0	0	4

Course Objectives:

- The objective of the Engineering Chemistry is to acquaint the student with the basic phenomenon/concepts of chemistry for the development of the right attitudes by the engineering students to cope up with the continuous flow of new technology.
- The student will able to understand the new developments and breakthroughs efficiently in engineering and technology.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals as well as new technology in the field of chemistry.

Section-A

Spectroscopy and its Applications

General Introduction: Introduction, electromagnetic spectrum, absorption and emission spectrum, atomic and molecular spectroscopy, types of molecular spectra, experimental techniques, selection rules, width and intensities of spectral lines.

UV/Visible Spectroscopy: types of electronic Transitions, Chromophores, Auxochromes, Effect of conjugation on Chromophores, Factors affecting λmax and intensity of spectral lines, effect of solvent on λmax, isobestic point, applications.

IR Spectroscopy: Infrared region, fundamental modes of vibrations and types, theory of infrared spectra, vibrational frequency and energy levels, anharmonic oscillator, modes of vibrations of polyatomic molecules, characteristic signals of IR spectrum, finger print region, factors affecting vibrational frequency; applications.

NMR Spectroscopy: Principle and instrumentation, relaxation processes, proton magnetic resonance spectroscopy, number of signals, Chemical shift, Spin-Spin Splitting, coupling constant, applications.

Section-B

Water and its treatment

Introduction, hardness of water, degree of hardness, units of hardness, boiler feed water: specification, scales and sludge formation; priming& foaming, boiler corrosion, caustic embrittlement, treatment of boiler feed water, internal treatment of water; softening of water by lime-soda, zeolite and ion exchange methods, desalination of water; Water for domestic use: purification of water for domestic use.

Corrosion and its Prevention

Introduction; different types of corrosion - wet and dry corrosion; mechanism of wet corrosion; comparison of dry and wet corrosion, Types of electrochemical corrosion: galvanic corrosion, concentration cell corrosion or differential aeration corrosion, waterline corrosion, pitting corrosion, crevice corrosion, stress corrosion, intergranular corrosion; other forms of corrosion: atmospheric corrosion, soil corrosion, microbiological corrosion, erosion corrosion, Filliform corrosion, stray current corrosion, passivity, galvanic series, factors influencing corrosion, various methods of corrosion control.

Section-C

Chemistry in Nanoscience and Technology

Introduction, Materials self-assembly, molecular vs. material self-assembly, hierarchical assembly, self-assembling materials, two dimensional assemblies, mesoscale self-assembly, coercing colloids, nanocrystals, supramolecular structures, nanoscale materials, future perspectives applications, nanocomposities and its applications.

Section-D

Polymers and polymerization

Introduction, monomer and repeating unit, degree of polymerization, functionality, classification of polymers: based on origin, monomers, structure, method of synthesis, tacticity or configuration, action of heat, chemical composition, ultimate form; types of polymerization, specific features of polymers, regularity and irregularity, tacticity of polymers, average molecular weights and size, determination of molecular weight by number average methods, effect of molecular weight on the properties of polymers, introduction to polymer reinforced composites.

References:

1. Kemp, William. *Organic Spectroscopy*. Palgrave Foundations, 1991. Print.

2. Skoog, D. A., Holler, F. J. and Timothy, A. N. *Principle of Instrumental Analysis*. 5th Edition. Saunders College Publishing, Philadelphia, 1998. Print.
3. Poole, C. P. and Owens Jr. F. J. *Introduction to Nanotechnology*. Wiley Inter science, 2003. Print.
4. Foster, L.E. *Nanotechnology Science Innovation & Opportunity*. Pearson Education, 2007. Print.
5. Ghosh, P. *Polymer Science and technology.* 2nd Edition, Tata McGraw Hill, 2008. Print.
6. *Engineering Chemistry*, Second Edition. Wiley, 2013. Print.

Course Title: Computer Fundamentals and Programming

Course Code: CSE101A

L	T	P	Credits
4	0	0	4

Course Objective: To get basic knowledge of computers (hardware and software), its components and Operating systems. To acquire programming skills in C, basic knowledge of Internet

Section-A

Introduction to Computers **(8 Hrs)**

Define a Computer System, Block diagram of a Computer System and its working, memories, Volatile and non-volatile memory, cache, virtual, secondary storage devices-Magnetic Tape, Hard Disk, CD-DVD, Magnetic Disk, Various input devices including keyboard, Mouse, Joystick, Scanners and Various output devices including Monitors, Printers, Plotters

Operating Systems **(7 Hrs)**

Computer Software and its types and Hardware, Operating Systems, their types and functions

Section-B

Working Knowledge of Computer System **(6 Hrs)**

Introduction to word processors and its features, creating, editing, printing and saving documents, spell check, mail merge, creating power point presentations, creating spreadsheets and simple graphs.

Fundamentals of Internet Technology **(8 Hrs)**

Local area networks, MAN and wide area network, Internet, WWW, E-mail, Browsing and Search engines, Internet Connectivity, Network Topology, Hub, Switches, Router, Gateway.

Section-C

Basic Constructs of C **(8 Hrs)**

Keywords, Identifiers, Variables, Data Types and their storage, Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Increment & Decrement Operators, Expressions, Conditional Expressions, Assignment Operators and Expressions, External Variables and Scope of Variables, Structure of C Program.

Control Structures (8 Hrs)

Decision making statements: if, nested if, if – else ladder, switch, Loops and iteration: while loop, for loop, do – while loop, break statement, continue statement, goto statement.

Section-D

Functions (6 Hrs)

Advantages of functions, function prototype, declaring and defining functions, return statement, call by value and call by reference, recursion, and storage classes.

Arrays and Strings (7 Hrs)

Declaration of arrays, initialization of array, accessing elements of array, I/O of arrays, passing arrays as arguments to a function, strings, I / O of strings, string manipulation functions (strlen, strcat, strcpy, strcmp)

References:

1. Jain, V.K. *Fundamentals of Information Technology and Computer Programming.* PHI, Latest Edition. Print.
2. Goel, Anita. *Computers Fundamentals.* Pearson Publications, Print.
3. Kernighan, Brian, and Ritchie, Dennis M. *The C Programming Language.* Prentice Hall, 2007. Print.
4. King, K.N. *C Programming: A Modern Approach.* W.W. Norton Company, 2008. Print.
5. Schildt, Herbert. *C: The Complete Reference.* Tata Mcgraw Hill Publications, 4th edition. Print.
6. Gottfired. P*rogramming in ANSI C, Schaum Series.* TMH publications, 2nd Edition, 1996. Print.

Course Title: Environmental Studies

Course Code: EVS100A

L	T	P	Credits
4	0	0	0

Course Objective: This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

Section-A

The multidisciplinary nature of environmental studies (2 Hrs)

Definition, scope and importance, Need for public awareness

Natural Resources: Renewable and non-renewable resources: (8 Hrs)

Natural resources and associated problems

(a) **Forest resources:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

(b) **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c) **Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

(d) **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

(e) **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.

(f) **Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

a. Role of an individual in conservation of natural resources.
b. Equitable use of resources for sustainable lifestyles.

Ecosystem: (4 Hrs)

(g) Concept of an ecosystem

(h) Structure and function of an ecosystem

(i) Producers, consumers and decomposers

(j) Energy flow in the ecosystem

(k) Ecological succession

(l) Food chains, food webs and ecological pyramids

(m) Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Section -B

Biodiversity and its conservation (4 Hrs)

(a) Introduction – Definition: Genetic, Species and Ecosystem Diversity

(b) Bio-geographical classification of India

(c) Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values

(d) Biodiversity at global, national and local levels

(e) India as a mega-diversity nation

(f) Hot-spots of biodiversity

(g) Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts

(h) Endangered and endemic species of India

(i) Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, global and national efforts.

Environmental Pollution (8 Hrs)

(a) Definition, causes, effects and control measures of:

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear pollution

(b) Solid waste management: Causes, effects and control measures of urban and industrial wastes.

(c) Role of an individual in prevention of pollution

(d) Pollution case studies

(e) Disaster management: floods, earthquake, cyclone and landslides

Section-C

Social Issues and the Environment (7 Hrs)

(a) Population growth, variation among nations, Population explosion – Family Welfare Programmes.

(b) Environment and human health,

(c) From unsustainable to sustainable development

(d) Urban problems and related to energy

(e) Water conservation, rain water harvesting, watershed management

(f) Resettlement and rehabilitation of people; its problems and concerns. Case studies.

(g) Environmental ethics: Issues and possible solutions

(h) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.

(i) Wasteland reclamation

(j) Consumerism and waste products

(k) Environmental Laws: The Environment Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and control of Pollution) Act 1974; The Wildlife Protection Act, 1972; Forest Conservation Act, 1980.

(l) Issues involved in enforcement of environmental legislation

(m) Public Awareness

Section-D

Human Population and Environment (5 Hrs)

(a) Population Growth and Variations among Nations

(b) Population Explosion

(c) Human Rights

(d) Value Education

(e) HIV / AIDS

(f) Women and Child Welfare

(g) Role of Information Technology in Environment and Human Health

(h) Case Studies

Field Work **(5 Hrs)**

(a) Visit to a local area to document environmental assets river/ forest/ grassland/hill/mountain

(b) Visit to a local polluted site – Urban / Rural / Industrial / Agricultural

(c) Study of common plants, insects, birds

(d) Study of simple ecosystems-Pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

Suggested Readings:

1. Odum, E P. *Basic Ecology*. Japan: Halt Saundurs, 1983. Print.
2. Botkin, D B, and Kodler E A. *Environmental Studies: The Earth as a living planet.* New York: John Wiley and Sons Inc., 2000. Print.
3. Singh, J S, Singh, S P, and Gupta S R. *Ecology, Environment and Resource Conservation.* New Delhi: Anamaya Publishers, 2006. Print.
4. De, A K. *Environmental Chemistry*. New Delhi: Wiley Eastern Ltd., 1990. Print.
5. Sharma, PD. *Ecology and Environment*. Meerut Rastogi Publications, 2004. Print.

Course Title: Engineering Drawing

Course Code: MEC101A

L	T	P	Credits
2	0	4	4

Course Objectives:

- Use techniques to interpret the drawings and to draw orthographic projections of objects
- To learn projections of various lines, planes, solids and their sectioning.
- To develop lateral surfaces of the 3D objects.

Course Outcome:

- Students will learn a universal language for engineers.
- They will learn the concept of first angle and third angle projection.
- Will learn to develop lateral surface for engineering objects.
- Will learn to read drawing, use and application of various line types.

Section-A

Drawing Techniques (8 Hrs)

Introduction to drawing instruments, various types of lines and their convention, principles of dimensioning, Engineering symbols, Gothic lettering in single stroke as per SP-46 code (Vertical and inclined)

Scales (6 Hrs)

Concept of scaling, construction of plane and diagonal scales

Projection of Points (6 Hrs)

Concept of plane of projections (Principle planes), First and third angle projections; projection of points in all four quadrants, shortest distance problems

Section-B

Projection of Lines and Planes (12 Hrs)

Projection of line parallel to both planes, perpendicular to one plane, inclined to one and both the reference planes and their traces. Plane perpendicular to one plane inclined to one and both the reference planes and their traces. Concept of profile plane and auxiliary planes, To find the true length, α, β, θ and Φ.

Projection of Solids (10 Hrs)

Right and oblique solids; solids of revolution and polyhedrons, projection of solid with axis perpendicular to one plane and parallel to one or both reference planes. Projection of solid with axis inclined to one or both reference planes.

Section-C

Sectioning of Solids (8 Hrs)

Theory of sectioning, types of section planes, their practice on projection of solids, Sectioning by auxiliary planes, to find true section of truncated solids.

Development of Surfaces (8 Hrs)

Method of Development, Development of surfaces: Parallel line and Radial line method. Development of oblique solids, Development of curved surfaces.

Section-D

Orthographic and Isometric Views (9 Hrs)

Draw orthographic views from isometric view or vice-a-versa, Missing line and missing view

Overview of Computer Graphic (9 Hrs)

Demonstrating knowledge of the theory of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects, Isometric Views of lines, Planes, Simple and compound, set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; Use of layers.

References:

1. Jolhe, D A. *Engineering Drawing*. New Delhi: Tata McGraw-Hill, Print.
2. Gill, P S. *Engineering Drawing.* Ludhiana: S.K. Kataria and Sons, Print.
3. French, T E, and Vierck, CJ. *Graphic Science*. New York: McGraw-Hill, Print.
4. Zozzora, F. *Engineering Drawing.* New York: McGraw Hill, Print.

Course Title: Basic Communication Skills

Course Code: ENG151A

L	T	P	Credits
3	0	0	3

Course Objective:

- To enhance students' vocabulary and comprehensive skills through prescribed texts.
- To hone students' writing skills.

Learning Outcomes: Students will be able to improve their writing skills as well as will enrich their word power

Section– A

Applied Grammar (Socio-Cultural Context)

1. Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection
2. Tenses (Rules and Usages in Socio-cultural contexts)
3. Modals: Can, Could, May, Might, Will, Would, Shall, Should, Must, Ought to
4. Passive/Active
5. Reported/Reporting Speech

Section– B

Reading (Communicative Approach to be followed)

1. J M Synge: Riders to the Sea (One Act Play)
2. Anton Chekhov : Joy (Short Story)
3. Swami Vivekanand : The Secret of Work (Prose)

Section– C

Writing

1. Essay Writing and Letter Writing
2. Report Writing
3. Group Discussion & Facing an Interview

References:

a. Books

1. Kumar, Sanjay and Pushp, Lata. *Communication Skills*. India: OUP, 2012. Print.

2. Vandana, R. Singh. *The Written Word* by. New Delhi: Oxford University Press, 2008. Print.

b. Websites

1. www.youtube.com (to download videos for panel discussions).
2. www.letterwritingguide.com.
3. www.teach-nology.com
4. www.englishforeveryone.org.
5. www.dailywritingtips.com.
6. www.englishwsheets.com.
7. www.mindtools.com.

Course Title: Chemistry Lab

Course Code: CHE152

L	T	P	Credits
0	0	2	1

Course Objectives:

This course is intended to learn the basic concepts of Engineering Chemistry Laboratory. The present syllabus has been framed as per the recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in Engineering chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals.

List of Practical's:

1. Verify Lambert Beer's law using spectrophotometer and $CoCl_2$ or $K_2Cr_2O_7$ solution.
2. Determine the strength of HCl solution by titrating against NaOH solution conductometerically.
3. Determination of the strength of HCl solution by titrating against NaOH using pH meter.
4. Determination of total hardness of water (tap) using standard EDTA solution and Eriochrome black T indicator.
5. Determination of alkalinity of water.
6. Determination of surface tension of given liquid by using Stalagmometer.
7. Determination of residual chlorine in a water sample.
8. Determination of Flash & Fire point of given a given lubricating oil by Pensky-Marten's apparatus.
9. Determination of the viscosity of given lubricating oil by using Redwood Viscometer.
10. Preparation of a polymer phenol/urea formaldehyde resin.
11. Determination of moisture, volatile matter and ash content in a given sample of coal by proximate analysis.
12. Determination of dissolved oxygen present in given sample of water.

References:

1. Levitt, B.P. *Findlay's Practical Physical Chemistry*, 9th edition, Longman Group Ltd., 1973. Print.
2. Yadav, J.B. *Advanced Practical Physical Chemistry*, Print.
3. Vogel, A. I. *A textbook of Quantitative Inorganic Analysis*, Longman Gp. Ltd., 4th edition, 2000. Print.

Course Title: Computer Fundamentals and Programming Lab

Course Code: CSE103

L	T	P	Credits
0	0	2	1

Instruction for Students: The students will be attending a laboratory session of 2 hours weekly and they have to perform the practical related to the following list.

1. Practical know-how of various internal and external Hardware components of a computer (including basic working of peripheral devices).
2. Introduction to Operating Systems; installing Windows; basics of windows.
3. Working knowledge of Internet.
4. Introduction to word processor and mail merge.
5. Introduction to MS-Excel.
6. Working on MS-PowerPoint.
7. Introduction to basic structure of C program, utility of header and library files.
8. Implementation of program related to the basic constructs in C
9. Programs using different data types in C
10. Programs using Loops and Conditional Statements in C
11. Programs using functions by passing values using call by value method.
12. Programs using functions by passing values using call by reference method.
13. Programs using arrays single dimension in C.
14. Program to implement array using pointers
15. Programs related to string handling in C

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Course Title: Basic Communication Skills Lab

Course Code: ENG152

L	T	P	Credits
0	0	2	1

Course Objective:

- To improve fluency in speaking English.
- To promote interactive skills through Group Discussions and role plays.

Learning Outcome: Students will get exposure to speaking through the above mentioned interactive exercises. In addition, they will develop a technical understanding of language learning software, which will further improve their communicative skills.

Section-A Speaking/Listening

1. Movie-Clippings (10 Hrs)
2. Role Plays (10 Hrs)
3. Group Discussions (10 Hrs)

References:

1. Gangal, J. K. *A Practical Course in Spoken English.* India: Phi Private Limited, 2012. Print.
2. Kumar and Pushp Lata. *Communication Skills*. India: OUP, 2012. Print.

Websites

1. www.youtube.com (to download videos for panel discussions).
2. www.englishforeveryone.org
3. www.talkenglish.com
4. www.mindtools.com

Course Title: Engineering Mathematics-II

Course Code: MTH152A

L	T	P	Credits
4	0	0	4

Objective:

The objective of the course is to equip the students with the knowledge of concepts of vectors and geometry and their applications. A flavour of pure mathematics is also given to the readers.

Section-A (13 Hrs)

Functions of Complex Variables: Complex Numbers and elementary functions of complex variable De-Moivre's theorem and its applications. Real and imaginary parts of exponential, logarithmic, circular, inverse circular, hyperbolic, inverse hyperbolic functions of complex variables.Summation of trigonometric series (C+iS method)

Section-B (15 Hrs)

Integral Calculus: Rectification of standard curves; Areas bounded by standard curves; Volumes and surfaces of revolution of curves;

Multiple Integrals: Double and triple integral and their evaluation, change of order of integration, change of variable, Application of double and triple integration to find areas and volumes. Centre of gravity and Moment of inertia

Section-C (15 Hrs)

Vector Calculus: Scalar and vector fields, differentiation of vectors, velocity and acceleration

Vector differential operators: Del, Gradient, Divergence and Curl, their physical interpretations. Line, surface and volume integrals

Application of Vector Calculus: Flux, Solenoidal and Irrotational vectors. Gauss Divergence theorem, Green's theorem in plane, Stoke's theorem (without proofs) and their applications

Section-D (14 Hrs)

Infinite Series: Convergence and divergence of series, Tests of convergence (without proofs): Comparison test, Integral test, Ratio test, Raabe's test, Logarithmic test, Cauchy's root test and

Gauss test. Convergence and absolute convergence of alternating series, Uniform Convergence and Power Series

References:

1. Grewal, B.S. *Higher Engineering Mathematics*. New Delhi: Khanna Publication, 2009. Print.
2. Kreyszig, Erwin. *Advanced Engineering Mathematics*. New Delhi: Wiley Eastern Ltd., 2003. Print.
3. Jain, R. K. and K Iyengar S R. *Advanced Engineering Mathematics*. New Delhi: Narosa Publishing House, 2003. Print.
4. Thomas, George, and Finney, Ross L. *Calculus and Analytic Geometry*. New Delhi: Addison Wesley, 1995. Print.

Course Title: Engineering Physics

Course Code: PHY151B

L	T	P	Credits
4	0	0	4

Course Objective: The aim of this course on physics is to make the student of engineering understand the basic concepts of physics which will form the basis of certain concept in their respective fields.

Section-A (15 Hrs)

PHYSICAL OPTICS:

Interference: Division of wave front, Fresnel's biprism, division of amplitude, Newton's rings and applications.

Diffraction: Difference between Fraunhofer and Fresnel diffraction, Fraunhofer diffraction through a slit, plane transmission diffraction grating, its dispersive and resolving power.

Polarization: Polarized and unpolarized light, double refraction, Nicol prism, quarter and half wave plates.

Section-B (15 Hrs)

LASER: Spontaneous and stimulated emission, Laser action, Characteristics of laser beam, concept of coherence, He-Ne laser, Semiconductor laser, Ruby laser and applications, Holography.

FIBRE OPTICS: Propagation of light in fibres, numerical aperture, single mode and multimode fibres, applications

Section-C (13 Hrs)

DIELECTRICS:

Molecular Theory, polarization, displacement, susceptibility, dielectric coefficient, permittivity, relations between electric vectors, Gauss's law in the presence of a dielectric, energy stored in an electric field, Behavior of dielectric in alternating field and clausius-Mossotti equation.

Section-D (18 Hrs)

QUANTUM MECHANICS: Difficulties with Classical physics, Introduction to quantum mechanics simple concepts, Black Body radiation, Planck's Law of radiation and its limitations, Group velocity and phase velocity, Schrodinger's wave equations and their applications.

NANOPHYSICS: Introduction to Nanoscience and Nanotechnology, Electron confinement, Nanomaterials, Nanoparticles, Quantum structure, CNT, Synthesis of Nanomaterials and Application of Nanomaterials.

SUPER CONDUCTIVITY: Introduction (experimental survey), Meissner effect, Type I and type II superconductors, London equation, Elements of BCS theory, Applications of superconductors.

Reference Books:

1. Sear, F.W. *Electricity and Magnetism.* London: Addison-Wesley, 1962. Print.
2. Resnick and Halliday. *Physics.* New York: Wiley, 2002. Print.
3. Lal, B. and Subramanyam, N. *A. Text Book of Optics.* New Delhi: S. Chand and Company Limited, 1982. Print.
4. Jenkins, and White. *Fundamental of Physical Optics*. New York: Tata McGraw-Hill, 1937. Print.
5. Griffiths, D*. Introduction to Electrodynamics.* New Delhi: Prentice Hall, 1998. Print.
6. Beiser, A. *Perspective of Modern Physics.* New Delhi: McGraw Hill Ltd., 2002. Print.

Course Title: **Mechanical Engineering Fundamentals**

Course Code: MEC103

L	T	P	Credits
4	0	0	4

Course Objectives:

- To impart the knowledge of various thermodynamics and design principles.
- To provide the knowledge of different pressure measuring devices.
- To provide the information of different power transmission, power producing and power absorbing devices.

Learning Outcomes:

- Students will be able to know about the different thermodynamic processes and design principles.
- Student will able to know the about different pressure measuring units and devices.
- Students will able to recognize the different power transmission devices and machine elements and their applications.
- Students will able to know about various power producing and power absorbing devices and their working.

Section-A

Fundamental Concepts of Thermodynamics (8 Hrs)

Introduction, Thermodynamic System and its types, Boundary and its types, Surroundings, Thermodynamic properties, State, Path, process and cycles, Thermodynamic Equilibrium, Working Substance, Microscopic and Macroscopic Analysis, Units and Dimensions, Quasi Static Process, Reversible and Irreversible processes, Point Function and Path Function, Mechanical and Thermodynamic work, P-dv Work (Displacement Work), Work is a Path Function, Equations for work done in various processes

Laws of Thermodynamics (7 Hrs)

Zeroth law of Thermodynamics, Temperature, Thermometry (Measurement of temperature), Temperature Scales, Energy, Potential and Kinetic Energies at Micro and Macro Level, Internal Energy, Law of conservation of energy, Joule's Experiment, First law of thermodynamics (Open and Closed System), Energy – A property of system, Enthalpy, Entropy, Heat, Heat vs Temperature, specific heat, Heat Capacity, Specific heat at constant volume, Specific heat at constant pressure, Adiabatic Index, Limitations of first law of thermodynamics

Section-B

Pressure and its Measurement **(7 Hrs)**

Pressure Concept and Definition, Pressure conversion Table, Atmospheric pressure, Standard Atmospheric Pressure, Gauge Pressure, Vacuum Pressure, Absolute pressure, Properties of fluid, Pressure head of a Liquid, Pascal's Law, Pressure measurement: Mechanical Gauges and Manometers, Mechanical Gauges: (Bourdon tube pressure gauge, Diaphragm pressure gauge, Dead weight), Manometers: (Principle/Advantage/Limitation/ Classification), Piezometer, Single U tube manometer (Numerical for Vacuum and Gauge pressure), [Simple problems on above topics]

Heat Transfer **(6 Hrs)**

Introduction, Heat Transfer and Thermodynamics, Applications, Thermal Conductivity, Thermal Resistance, Modes of heat transfer, Spectrum of electromagnetic radiation, Surface emission properties, Absorptivity, Reflectivity and Transmissivity, Fourier law, Newton's law of cooling, Stefan Boltzmann's Law, Heat Exchangers (Applications, Selection, Classification), Thermal Insulation (Properties of insulation, Types of Insulations, Thermal Insulating Materials)

Section-C

Power Absorbing Devices **(4 Hrs)**

Power Absorbing Devices, Difference between Hydraulic pump, Air compressor, Fan, Blower, Pump (Function, Selection, Applications), Classification of Pump, Positive displacement and Dynamic Pumps, Reciprocating Pumps and its types, Rotary Pumps and its types, Centrifugal Pump, Axial Pump

Power Producing Devices

Boiler **(4 Hrs)**

States of matter, Changing State of Matter, Sublimation, Effect of temperature during change of Phase, Steam boiler, Application, Classification of boilers, Types of boilers (Brief Description), Essentials of a good boiler, Advantages of superheating the steam, Comparison between Water tube and Fire tube boilers, Function of boiler Mountings and Accessories

Internal Combustion Engines **(4 Hrs)**

Heat Engine, Types of Heat Engine, Advantages, Disadvantages and Applications, Classification of IC Engine, Engine Components (Location, Function and Material), Basic Terminology used in IC engine, Four stroke Cycle Engines (SI and CI), Two stroke Cycle Engines (SI and CI)

Section-D

Principles of Design **(8 Hrs)**

Need of design, Product Life Cycle, Material properties and selection, Factors affecting material selection, Stress and Strain and its types, Hooke's law, Modulus of Elasticity, Longitudinal and Lateral Strain, Poisson's ratio, Stress- Strain Curve for ductile material and brittle material, Factor of Safety, Centre of Gravity, Centroid, Centroid of areas of plain, Figures (Without Derivation), Centroid of areas of composite sections (Without Derivation), Moment of Inertia, Radius of gyration, Theorem of perpendicular axis, Theorem of parallel axis, MI of L, I and T sections, [Simple problems on above topics]

Power Transmission Devices and Machine Elements **(8 Hrs)**

Individual and group drive system (advantages and Disadvantages), Belt drive (Types: V and Flat Belts and their Applications, Advantages and Disadvantages), Ropes drive (Types: Fiber and Wire Ropes and their Applications, Advantages and Disadvantages), Chain drive (Applications, advantages and Disadvantages, Sprockets), Gear drive (Types of Gears), Power transmission shafts, Types of shafts, Application of shafts, Axle, Keys (Function, Classification).

References:

1) Rajan, T.S. *Basic Mechanical Engineering*, New Delhi: New Age Publishers, 2012.Print
2) Singh, Sadhu. *Principles of Mechanical Engineering*, New Delhi: S Chand Publishers, 2010. Print.
3) Manglic, V.K. *Elements of Mechanical Engineering*, New Delhi: PHI, 2013. Print.
4) Pathak, G. K. *Basic Mechanical Engineering*, New Delhi: Rajsons Publications, 2014.Print.
5) Kumar, Parveen. *Basic Mechanical Engineering*, New Delhi: Pearson Education. 2014. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: Basic Electrical Engineering

Course Code: ELE105

L	T	P	Credits
4	0	0	4

Course Objective:

- To impart basic knowledge of DC and AC Circuit Analysis and Network Theorems,
- To impart knowledge of Magnetic Circuits and various electrical devices & amp;
- To impart knowledge of Installation of MCB, ELCB, MCCB, DC Machines, AC Machines etc.

Learning Outcomes:

- Apply the knowledge of Electrical Engineering principles to solve DC and AC circuits.
- Formulate and analyze electrical circuits. Understand basic principles of electromagnetism to implement in electrical machines and transformers.
- Identify and select various electrical machines according to the applications.
- Apply the ethical principles for troubleshooting & installation of safety devices as per norms of engineering practice

Section-A

D.C Circuit Analysis:

Voltage source, current source, dependent and independent sources, analysis of D.C circuit by KCL and KVL , Nodal and Mesh analysis, Superposition theorem, Maximum Power Transfer Theorem, Thevenin and Norton Theorems.

Section-B

A.C Circuit Analysis:

Review of single phase A.C. circuit under sinusoidal steady state, RMS Value , Average Value, Form factor, Peak factor solution of RL, RC, R.L.C. Series circuit, the j operator, complex representation of impedance, solution of series circuit, series resonance, 3 phase A.C. Circuit, star and delta connections, line and phase quantities solution of 3 phase circuits, balance supply voltage and balanced supply voltage and balance load, Phasor diagram, measurement of power and power factor.

Section-C

Magnetic Circuit & Transformers:

B-H Curve, saturation leakage and fringing. Hysteresis and eddy currents. Single phase

transformer, basic concepts constructional, voltage, current Transformation, Ideal transformer and its phasor diagram, voltage regulation, OC/SC test, losses and efficiency, Autotransformer.

Section-D

Rotating Electrical Machines:

Basic concepts, working principle and general construction of DC machines (motor/generators), torque and EMF expression. Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor.

Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Various faults in Battries, Elementary calculations for energy consumption, power factor improvement and battery backup.

References:

1. Sukhija, and Nagsarkar, T.K. *Basic Electrical and Electronics Engineering.* Oxford University Press, 2012. Print.
2. Husain, and Harsoon, Ashfaq. *Fundamentals of Electrical Engineering*. 4th Edition, Dhanpat Rai and Co., 2013. Print.
3. Mittle, V.N. *Basic Electrical Engineering*. Tata McGraw Hill Publication. 2nd Edition, Print.
4. Theraja B.L., and Theraja A.K. *A Text Book of Electrical Technology*, Volume-I, S. Chand Publication. Print.
5. Jena, Debashisha. *Basic Electrical Engineering.* 1st edition, Wiley India Publication, 2012. Print.
6. Theraja, and Sedha, R.S. *Principles of Electric Devices and Circuits.* S. Chand Publication, 1st edition, 2006. Print.

DAV UNIVERSITY, JALANDHAR

Course Title: Human Values and General Studies

Course Code: SGS107B

L	T	P	Credits
4	0	0	0

Course Objectives

a) To sensitize students about the role and importance of human values and ethics in personal, social and professional life.

b) To enable students to understand and appreciate ethical concerns relevant to modern lives.

c) To prepare a foundation for appearing in various competitive examinations

d) To sensitize the students about the current issues and events of national and international importance

e) To provide opportunity to the students to study inter disciplinary subjects like Geography, Science, Economy, Polity, History, International Relations etc.

Section-A

Human Values

1. **Concept of Human Values:** Meaning, Types and Importance of Values. **(2Hrs)**
2. **Value Education :** Basic guidelines for value education **(2Hrs)**
3. **Value crisis and its redressal** **(1Hrs)**

Being Good and Responsible

1. Self Exploration and Self Evaluation **(2Hrs)**
2. Acquiring Core Values for Self Development **(2Hrs)**
3. Living in Harmony with Self, Family and Society **(3Hrs)**
4. Values enshrined in the Constitution: Liberty, Equality, Fraternity and Fundamental Duties. **(3Hrs)**

Section-B

Value – based living

1. Vedic values of life **(2Hrs)**
2. *Karma Yoga* and *Jnana Yoga* **(2Hrs)**
3. *AshtaMarga* and *Tri-Ratna* **(2Hrs)**

Ethical Living:

1. Personal Ethics **(2Hrs)**
2. Professional Ethics **(3Hrs)**
3. Ethics in Education **(2Hrs)**

Section-C

General Geography

World Geography **(3Hrs)**

The Universe, The Solar System, The Earth, Atmosphere, The World we live in, Countries rich in Minerals, Wonders of the World, Biggest and Smallest.

Indian Geography **(3Hrs)**

Location, Area and Dimensions, Physical Presence, Indian States and Union Territories, Important sites and Monuments, Largest-Longest and Highest in India.

General History **(3Hrs)**

Glimpses of India History, Ancient Indian, Medieval India, Modern India, Various Phases of Indian National Movement, Prominent Personalities, Glimpses of Punjab history with special reference to period of Sikh Gurus

Glimpses of World History **(3Hrs)**

Important Events of World History, Revolutions and Wars of Independence, Political Philosophies like Nazism, Fascism, Communism, Capitalism, Liberalism etc.

Indian Polity: Constitution of India **(3Hrs)**

Important Provisions, Basic Structure, Union Government, Union Legislature and Executive, State Government: State Legislature and Executive, Indian Judiciary, The Election Commission, Panachayati Raj System, RTI etc.

General Economy **(3Hrs)**

The process of liberalization, privatization, globalization and Major World Issues, Indian Economy, Indian Financial System, Major Economic Issues, Economic Terminology.

Section-D

General Science **(3Hrs)**

General appreciation and understandings of science including the matters of everyday observation and experience, Inventions and Discoveries

Sports and Recreation **(3Hrs)**

The World of Sports and recreation, Who's Who is sports, Major Events, Awards and Honours. Famous personalities, Festivals, Arts and Artists

Current Affairs (3Hrs)

National and International Issues and Events in News, Governments Schemes and Policy Decisions

Miscellaneous Information

Who is who (2Hrs)

Books and Authors, Persons in News, Awards and Honours, Abbreviations and Sports

References:

1. Tripathi A. N. *Human Values*. New Delhi: New Age International Publishers, , Third Edition, 2009. Print.
2. Surbiramanian, R. *Professional Ethics.* New Delhi: Oxford University Press, 2013. Print.
3. Anand, Rishabh. *Human Values and Professional Ethics.* New Delhi: SatyaPrakashan, 2012. Print.
4. Bhalla, Sanjeev. *Human Values and Professional Ethics.* New Delhi: Satya Prakashan, 2012. Print.
5. Soryan, Ritu. *Human Values and Professional Ethics.* New Delhi: Dhanpat Rai & Co. Pvt. Ltd., First Edition, 2010. Print.
6. Jayshree, and Raghavan, B. S. *Human Values and Professional Ethics.*, S. Chand & Co. Ltd. , 2007. Print.
7. Singh, Yogendra and Garg, Ankur. *Human Values and Professional Ethics.* Aitbs publishers, 2011. Print.
8. Kumar, Vrinder. *Human Values and Professional Ethics*. Ludhiana: Kalyani Publishers, , 2013. Print.
9. Gaur, Sangal, and Bagaria, G.P. *Human Values and Professional Ethics.* New Delhi: Excel Books, 2010. Print.
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11. Radhakrishnan, and George, Allen. *Indian Philosophy*. New York: S & Unwin Ltd., Humanities Press INC, 1929. Print.

12. Dwivedi, A. N. *Essentials of Hinduism, Jainism and Buddhism.* New Delhi:Books Today, 1979. Print.
13. Bhan, Suraj. *Dayanand : His life and work. New Delhi:* DAVCMC, 2001. Print.
14. Dwivedi, Kapil Dev. *Esence of Vedas.* Hoshiarpur: Katyayan Vedic SahityaPrakashan, 1990. Print.
15. Chaubey,B.B. *Vedic Concepts.* Hoshiarpur: Katyayan Vedic SahityaPrakashan, , 1990. Print.
16. Aggarwal, R. S. *Advance Objective General Knowledge.* S. Chand Publisher, 2013. Print.
17. Sen, S. *Concise General Knowledge Manual* 2013. Unique Publishers, 2013. Print.
18. Verma, R. P. *Encyclopedia of General Knowledge and General Awareness*, Penguin Books Ltd., 2010. Print.
19. Thorpe, Edgar and Thorpe, Showick. *General Knowledge Manual 2013-14.* Delhi: The Pearson, Print.
20. Mohanty, Muktikanta*. General Knowledge Manual 2013-14*, Delhi: Macmillan Publishers India Ltd., Print.
21. India 2013, Government of India (Ministry of Information Broadcasting), Publication Division, 2013. Print.
22. Methew, Mammen. *Manorama Year Book 2013-14.* Malayalam Manorama Publishers, Kottayam, 2013. Print.
23. *Spectrum's Handbook of General Studies* – 2013-14, New Delhi: Spectrum Books (P) Ltd., Print.

CURRENT AFFAIRS

Magazines

Yojna*. Economic and Political Weekly.* The Week, India Today, Frontline, Spectrum.

Competition Success Review, Competition Master, Civil Services Chronicle, Current Affairs, World Atlas Book

Newspapers

The Hindu, Times of India, The Hindustan Times, The Tribune

DAV UNIVERSITY, JALANDHAR

Course Title: **Manufacturing Practice**

Course Code: MEC104

L	T	P	Credits
0	0	4	2

Course Objective:

1. Know basic workshop processes, Read and interpret job drawing.
2. Identify, select and use various marking, measuring, holding, striking and cutting tools & equipment's
3. Operate and control different machines and equipment's.

Learning Outcomes:

After passing the course, students will be able to:

1. Explain and strictly adhere to the rules and safety regulations for work in the mechanical workshop
2. Properly operate the manufacturing equipment in the mechanical workshop
3. Create and document a typical process plan for manufacturing of a product in the mechanical workshop
4. Read and use a manufacturing drawing as a definition for the manufacturing of a part
5. Use gauging equipment to verify that a manufactured part fulfills the requirements specified on a manufacturing drawing
6. Account for common materials and standard material dimensions used for blanks
7. Select proper tools and cutting data for a given material and manufacturing process
8. Realize when your knowledge is insufficient and assistance should be requested

1. CARPENTRY SHOP
    a) Preparation of half lap joint
    b) Preparation of Mortise and Tenon Joint
    c) Preparation of a Dove & Tail joint
    d) To prepare a White board duster
2. Welding Shop:
    a) Preparation of Joint by Arc Welding
    b) Preparation of Joint by using Gas Welding

c) Preparation of Joint by MIG/ TIG Welding

d) Preparation of Joint by Spot/ Seam Welding

3. Smithy Shop
    a) To Forge the L – Hook
    b) To Forge a Chisel
    c) To Forge a Cube from a M.S Round
    d) To forge a screw driver
4. Fitting Shop
    a) Filing a dimensioned rectangular or square piece and prepare a sq. fitting
    b) Preparation of T fitting male part
    c) Preparation of U fitting Female part
    d) Internal thread Cutting in Square piece and external thread cutting on a rod and assembling as a paper weight
5. Foundry Shop:
    a) To make a Mould of solid pattern
    b) To prepare a mould of sleeve fitting using gating system
    c) To make a Mould of Split Pattern using Cope & Drag
    d) To check the Hardness of the Mould
    e) To check the Moisture Content in the Molding Sand
    f) To check the Compressive Strength of Molding Sand
6. Sheet-Metal Shop
    a) Preparation of a funnel from G.I. sheet
    b) Preparation of a book rack stand from G.I. Sheet
    c) Preparation of a leak proof tray with inclined edges from G.I. Sheet
    d) Preparation of a square pen stand from G.I. Sheet with riveting at corners
7. Machine Shop
    a) To make a job using step turning and grooving
    b) To make a job using knurling and threading
    c) To make a multi operation job on a Lathe machine
    d) To make V – slot by using shaper machine
8. Electrical Shop
    a) Layout of electrical tube light wiring

b) Layout of stair case wiring using two way switch

c) Testing and rectification of simulated faults in electrical appliances such as 'Electric Iron' Ceiling Fan. Electric kettle

d) To fabricate a circuit for the electrical wiring of, Fan with regulator and Bulb through a main switch and its testing using a series lamp

References:

1. Johl, K. C. *Mechanical Workshop Practice.* Prentice Hall India, 1st Edition, 2010. Print.
2. Bawa, H.S. Workshop Technology. New Delhi: Tata McGraw Hill, 7th Edition, 2004. Print.

Course Title: Engineering Physics Lab

Course Code: PHY152

L	T	P	Credits
0	0	2	1

Objective: The laboratory exercises have been so designed that the students learn to verify some of the concepts learnt in the theory courses. They are trained in carrying out precise measurements and handling sensitive equipment.

Note:

- Students are expected to perform at least eight-ten experiments out of following list. The experiments performed in first semester cannot be repeated in second Semester.
- The examination for both the courses will be of 3 hours duration

List of Experiments:

Experimental skills: General Precautions for measurements and handling of equipment, representation of measurements, Fitting of given data to a straight line, and Error analysis, Significant figures and interpretation of results.

1. To determine the Refractive Index of the Material of a given Prism using Sodium Light.
2. To determine the Dispersive Power and resolving power of the Material of a given Prism using Mercury Light.
2. To determine wavelength of sodium light using Fresnel Biprism.
3. To determine wavelength of sodium light using Newton's Rings.
4. To determination Wavelength of Sodium Light using Michelson's Interferometer.
5. To determine the wavelength of Laser light using Diffraction of Single Slit.
6. To determine the wavelength of (1) Sodium and (2) Mercury Light using Plane Diffraction Grating.
7. To determine the (1) Wavelength and (2) Angular Spread of HeNe Laser using Plane Diffraction Grating.
8. To study the wavelength of spectral lines of sodium light using plane transmission grating.
9. To study the specific rotation of sugar solution Laurent's half shade polarimeter method
10. To study the numerical aperture and propagation losses using HeNe laser Optical fibre set up.

11. To compare the focal length of two lenses by Nodal slide method.
12. To find the unknown low resistance by Carey Foster bridge.
13. To determine the beam divergence of the HeNe laser.
14. To study the Meissner's effect in superconducting sample.
15. To study the Faraday law of electromagnetic induction.
16. To study the capacitance by flashing/quenching of Neon bulb kit
17. To compare the two unknown capacitances of two capacitors by using DeSauty's bridge.
18. To find our out the unknown inductance by using the Anderson's bridge method.
19. To study the numerical aperture and propagation losses for He-Ne laser by using the optical fibre set up for
20. To study the Planck's constant by using photoelectric cell method.

Course Title: Basic Electrical Engineering Laboratory

Course Code: ELE106

L	T	P	Credits
0	0	2	1

Course Objective: This course provides a practical aspect of Circuit Analysis using Ohm's law, Kirchhoff's laws and network theorems, to understand the constructional detail of Electrical machines.

List of Experiments

1. To verify Ohm's Law, Kirchhoff's Current Law and Kirchhoff's Voltage Law.
2. To verify Thevenin's and Norton's theorems.
3. To verify Superposition theorem.
4. To verify Maximum Power Transfer theorem.
5. To plot frequency response of a series R-L-C circuit and determine resonant frequency and Q-factor for various values of R, L and C
6. To plot frequency response of a parallel R-L-C circuit and determine resonant frequency and Q-factor for various values of R, L and C.
7. To perform direct load test of a transformer and plot efficiency versus load characteristics.
8. To perform open circuit and short circuit test on transformer.
9. To perform speed control of DC motor.
10. Measurement of power in a three phase system by two wattmeter method.
11. To plot the V-I characteristics of PN-junction diode.
12. To verify the truth table of logic gates.
13. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors. Meggers.
14. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor)

DAV UNIVERSITY, JALANDHAR

Course Title: **Digital Electronics**

Course Code: ECE201

L	T	P	Credits
4	0	0	4

Course Objectives

- Understand concepts of combinational and sequential circuits.
- Analyze the synchronous and asynchronous logic circuits.
- Understand concepts of memory, programmable logic and digital integrated circuits.
- Design Combinational and sequential systems.

Section-A

Number System and Binary Code (15 Hours)

Introduction, Binary, Octal, Hexadecimal & some nonstandard Number :- Conversions, Addition, Subtractions, Multiplication, Division, Weighted- Non weighted codes, Signed - unsigned numbers, Binary Subtractions using 1's and 2's compliment, ASCII code, Excess 3 code, Grey code, BCD code and BCD additions & BCD Subtractions.

Section-B

Minimization of logic function (12 Hours)

Review of gates: - OR, AND, NOT, NOR, NAND, EX-OR, EX-NOR, Universal gates.

Basic theorem of Boolean algebra, Sum of Products and Product of Sums, canonical form, Minimization using: - Boolean algebra and K-map.

Section-C

Combinational Circuits (9 Hours)

Introduction, Combinational circuit design, Encoders, decoders, Adders, Sub tractors and Code converters, Parity checker, seven segment display, Magnitude comparators. Multiplexers, De-multiplexer, Implementation of Combinational circuit using MUX & De-MUX.

Sequential Circuits (8 Hours)

Introduction, flip flops, Clocked flip flops, SR, JK, D, T and edge triggered flip-flops, Conversions of Flip flops, Shift Registers, Type of Shift Registers, Ring Counter, Twisted Ring Counter, Counters, Counter types, counter design with state equation and state diagrams.

Section-D

D/A and A/D Converters **(5 Hours)**

Introduction, Weighted register D/A converter, binary ladder D/A converter, steady state accuracy test, monotonicity test, D/A accuracy and resolution, A/D converter:- Simultaneous, Counter type, Continuous, Successive approximation, Single and dual slope A/D converter, A/D accuracy and resolution.

Semiconductor Memories **(4 Hours)**

Introduction, Memory organization, Classification and characteristics of memories, Sequential memories, ROMs, R/W memories, Content addressable memories, PLA and PAL.

Logic Families **(4 Hours)**

RTL, DCTL, DTL, TTL, ECL, CMOS and its various types, Comparison of logic families.

References:

1. Morris, Mano. *Digital Design*. Prentice Hall of India Pvt. Ltd.
2. Donald P.Leach & Malvino, Albert Paul. Digital Principles and Applications. New Delhi, Tata McGraw Hill. 2003. 5 ed.
3. Jain, R.P. *Modern Digital Electronics*. Tata McGraw–Hill. New Delhi, 2003. 3rd ed.,
4. Floyd ,Thomas L. *Digital Fundamentals.* Pearson Education. New Delhi. 2003
5. Tocci, Ronald J., Neal S. Widmer, Gregory L. & Moss, *Digital System -Principles and Applications.* Pearson Education.
6. Roth. *Fundamentals of Logic Design*. Cengage Learning.

DAV UNIVERSITY, JALANDHAR

Course Title: Electronics Devices and Circuits

Course Code: ECE202

L	T	P	Credits
4	0	0	4

Course Objective:

The purpose of this course is to provide a basis for understanding the characteristics, operation and limitations of semiconductor devices. After successful completion of the course, students will be able:

- To understand the physical construction, working and operational characteristics of Semiconductor devices.
- To understand the operation of power supply circuits built using, rectifiers and special diodes.
- To do operating point calculations, working and design of basic amplifiers, Low frequency and High frequency amplifiers.
- To understand basic working & design of wave shaping circuits.

Section-A

Semiconductors: (8 Hours)

Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors

Semiconductor Diodes (10 Hours)

PN junction Diode - VI characteristics, Rectifiers-half wave and full wave, clippers, clampers, Special purpose diodes and solar cells.

Section-B

BJT and MOSFET (10 Hours) BJT-construction, operation, characteristics, biasing schemes. MOSFET-construction, operation, characteristics. MOS capacitor, Biasing schemes – CS, CG, CD, Diode connected configurations.

Section-C

BJT MOSFET Amplifier Stages and Frequency Response (10 Hours)

BJT small signal analysis, frequency analysis and amplifier configurations. MOSFET small signal model, amplifier configurations and low and high frequency response.

Section-D

Integrated circuit fabrication process (7 Hours)

Fabrication process: oxidation, doping, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process**.**

References

1. Boylestad, Nashelsky. *Electronic Devices and Circuit Theory.* Pearson Education, 7th Indian Reprint (Latest Edition). 8th Ed
2. Floyd, Thomas L. *Electronic Devices.* Pearson Education Inc. Delhi. Sixth Edition,
3. Sedra, Adel S., Smith & Kenneth C. *Microelectronic Circuits.* New York. Oxford University Press. Fourth Edition.
4. Millman, Jacob & Halkias, Christos C. *Integrated Electronics.* New Delhi. Tata McGraw Hill.
5. Streetman, Ben J. Banerjee, Sanjay. *Solid State Electronic Devices.* PHI. 5th Ed.
6. D. Neamen, D. Biswas "*Semiconductor physics and devices*," McGraw Hill Education

DAV UNIVERSITY, JALANDHAR

Course Title: Circuit Theory

Course Code: ELE201

L	T	P	Credits
4	0	0	4

Objective:

The objective of the course is to enable the students to understand the basic concepts related to Network Theorems for AC and DC Networks, Network Analysis and Synthesis, Circuit Theory and Filters and their applications.

Section-A

Circuit Concepts and Network Theorems

Energy Sources, Independent and dependent sources, Source transformation, Kirchhoff's Laws, Nodal and Mesh analysis in electric circuits, A.C. and D.C. Network Theorems: Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum Power Transfer theorem, Millman's theorem, Reciprocity theorem, Substitution theorem, Compensation theorem, Tellegen's theorem, Numerical Problems.

Section-B

Graph Theory

Concept of network graph, terminology used in network graph, relation between twigs and links, formation of incidence matrix, tie-set matrix, cut-set matrix, Kirchhoff's voltage law into topological form, Kirchhoff's current law into topological form, relationship between branch voltage matrix, twig voltage matrix and node voltage matrix, relation between branch current matrix and loop current matrix.

Section-C

Two Port Network Analysis

Introduction, Network elements, classification of network, network configuration, Open Circuit Impedance Parameters, Short-Circuit admittance parameters, Hybrid Parameters, ABCD Parameters, Inter-Relationships between parameters of two port network, Expression of Input-Output impedances in terms of two port parameters, different types of interconnections of two port networks.

Time and Frequency Domain Analysis: Representation of basic circuits in terms of generalized frequency and their response, Laplace transform of shifted functions, transient and steady response, Time domain behaviors from poles and zeros, Convolution Theorem

Section-D

Network Synthesis

Network functions, Impedance and Admittance function, Transfer functions, Hurwitz Polynomials, Positive real functions, LC Network Synthesis, Foster's Canonic Form, Relationship between transfer and impulse response, poles and zeros and restrictions, Network function for two terminal pair network, Sinusoidal network in terms of poles and zeros, Real liability condition for impedance synthesis of RL and RC circuits, Network synthesis techniques for 2-terminal network, Foster and Cauer forms, Foster and Cauer forms.

Filters: Classification of filters, characteristics impedance and propagation constant of pure reactive network, Ladder network, T-section, π-section, terminating half section, Pass bands and stop bands, Design of constant-K, m-derived filters, Composite filters.

References:

1. Chakraborty Abhijit, *Circuit Theory*, 2nd Edition, Dhanpat Rai, 2001.
2. Bird John, *Electrical Circuit Theory and Technology*, Newnes. 2nd Ed.
3. Chaudhury D. Roy, *Networks and Synthesis.* New Age International.
4. Edminister J.A., *Electric Circuits*. Tata McGraw Hill. 2002. 4th Edition.
5. Iyer T.S.K.V., *Circuit Theory*, Tata McGraw Hill, 2006.
6. Mohan, Sudhakar Sham, *Circuits and Networks Analysis and Synthesis*, 2NdEdition, Tata McGraw Hill, 2005.
7. Van Valkenberg, M.E., *Network Analysis and Synthesis*, PHI learning, 2009.

DAV UNIVERSITY, JALANDHAR

L	T	P	Credits
4	0	0	4

Course Title: Object Oriented Programming

Course Code: CSE201

Course Objective: To understand the basic concepts of object oriented programming language.

Learning Outcomes: Students will feel comfortable working with computers and will have practical knowledge about Object-Oriented programming language (C++ Language).

Section-A

Object-Oriented Programming Concepts (9)

- Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm
- Basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism
- Declaring and initializing pointers, accessing data through pointers. 2 hours

Standard Input / Output (5)

- Concept of streams, hierarchy of console stream classes
- Input/output using overloaded operators >> and << of I/O stream classes, formatting output
- Manipulators

Section-B

Functions and Arrays (9)

- Defining a function, Actual and Formal Arguments, Local and global variables
- Nested functions, recursive functions
- Array declaration, character array, multidimensional array, arrays and pointers

Classes and Objects (7)

- Specifying a class, creating class objects, accessing class members
- Access specifiers, static members, nested classes, local classes, abstract classes
- Constructors and Destructors, copy constructor, dynamic constructors, explicit constructors, advantages and disadvantages of constructor and destructor

Section-C

Operator Overloading and Type Conversion **(7)**

- Overloading operators, rules for overloading operators
- Overloading of various operators
- Type conversion

Inheritance **(7)**

- Introduction, defining derived classes
- Types of inheritance, virtual base class
- Pure virtual functions, overriding member functions

Polymorphism **(7)**

- Concept of binding - early binding and late binding
- Virtual functions, abstract classes
- Virtual destructors

Section-D

Exception Handling **(5)**

- Review of traditional error handling, basics of exception handling
- Exception handling mechanism
- Throwing mechanism, catching mechanism

Files **(4)**

- File streams, hierarchy of file stream classes
- Error handling during file operations
- Reading/writing of files, updating files

References:

1. E. Balagurusamy, *Object Oriented Programming with C++*. Tata McGraw Hill.
2. D. Ravichandran. *Programming in C++*
3. Lafore R. *Object Oriented Programming in C++.* Waite Group.
4. Herbert Schildt. *The Complete Reference to C++ Language.* McGraw Hill-Osborne.
5. Bjarne Stroustrup. *The C++ Programming Language.* Addison Wesley.
6. Lippman F. B. *C++ Primer*. Addison Wesley.

DAV UNIVERSITY, JALANDHAR

Course Title: Engineering Mathematics-III
Course Code: MTH252A

L	T	P	Credits
3	1	0	4

Objective:

The objective of the course is to enable the students to understand the basic concepts related to Laplace transforms, Fourier series, ordinary differential and partial differential equations and their applications.

Section-A **14 HOURS**

Fourier series: Periodic functions, Euler's formula. Dirichlet's conditions. Fourier series of discontinuous functions. Fourier series of Even and Odd functions, half range expansions, Fourier series of different wave forms, Complex form of Fourier series. Fourier Transformation.

Section-B **14 HOURS**

Laplace Transforms: Laplace transforms of various standard functions, Linear property of Laplace transforms, Shifting property and change of scale, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to solution of ordinary linear differential equations with constant coefficients, and simultaneous differential equations.

Section-C **14 HOURS**

Partial Differential Equations: Formulation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients.
Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation and their applications, solution by the method of separation of variables.

Section-D **15 HOURS**

Analytic Function: Limits, continuity and derivative of the function of complex variable, Analytic function, Cauchy-Riemann equations, conjugate functions, harmonic functions; **Complex Integration:** Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions (without proofs),

singular points, poles, residue, Integration of function of complex variables using the method of residues.

References:

1. Jain, R. K. & Iyengar, S. R. K. *Advanced Engineering Mathematics*. New Delhi Narosa Publishing House. 2003. 2nd Ed.
2. Singh R, Ravish. & M. Bhatt *Engineering Mathematics a Tutorial Approach*, McGraw Hill.
3. Grewal, B.S *Higher. Engineering Mathematics*. Khanna Publication.40th Edition.
4. Erwin, Kreyszig. *Advanced Engineering Mathematic.* Wiley Eastern Limited. 2006. 8th edition.
5. Zill , Dennis G. & Patrick D. Shanahan. *A first course in complex analysis with applications, Jones and Bartlett Learning*, 2003.

DAV UNIVERSITY, JALANDHAR

Course Title: Digital Electronics Laboratory

Course Code: ECE204

L	T	P	Credits
0	0	2	1

Course Objectives:

To reinforce learning in the accompanying ECE201 course through hands-on experience with digital electronic circuit analysis, design, construction, and testing.

Learning Outcomes:

To develop necessary skill in designing, analyzing and constructing digital electronic circuits**.**

List of Experiments

1. Verification of the truth tables of TTL gates, e.g., 7400, 7402, 7404, 7408, 7432, 7486.
2. Verify the NAND and NOR gates as universal logic gates.
3. Verification of the truth table of the Multiplexer 74150.
4. Verification of the truth table of the De-Multiplexer 74154.
5. Design and verification of the truth tables of Half and Full adder circuits.
6. Design and verification of the truth tables of Half and Full subtractor circuits.
7. Design and test of an S-R flip-flop using NOR/NAND gates.
    a) Verify the truth table of a J-K flip-flop (7476)
    b) Verify the truth table of a D flip-flop (7474)
8. Operate the counters 7490, 7493 and 74194. Verify the frequency division at each stage and with a low frequency clock (say 1 Hz) display the count on LEDs.
9. Verify the truth table of decoder driver 7447/7448. Hence operate a 7 segment LED display through a counter using a low frequency clock.
10. Repeat the above with the BCD to Decimal decoder 7442 and an array of LEDs
11. Design and test D/A converter using R-2R Ladder Network
12. Study and test of A/D converter.

Course Title: Electronics Devices and Circuits Laboratory

Course Code: ECE205

L	T	P	Credits
0	0	2	1

Course Objectives:

To reinforce learning in the accompanying ECE202 course through hands-on experience by examining the electrical characteristics of various semiconductor devices, such as diodes, BJTs and FETs.

Learning Outcomes:

After completion of this course students will be able to understand experimentally the

- The characteristics of diodes, BJT's and FET's.
- The characteristics of transistors under various biasing conditions
- The response of various special purpose electron devices.

List of Experiments

1. To study Characteristics of Half, Full & center tapped rectifiers. To study bipolar transistor as a switch.
2. To plot a load line for a CE amplifier and show effect of input signal on Q-point.
3. To demonstrate use of a BJT in a CE amplifier circuit configuration and study its frequency response.
4. To demonstrate use of a BJT in a CC amplifier circuit configuration and study its frequency response.
5. To demonstrate use of a BJT in a CB amplifier circuit configuration and study its frequency response.
6. To study emitter follower circuit.
7. To demonstrate and study a two stage RC coupled amplifier.
8. To demonstrate and study a Transformer coupled amplifier.
9. To demonstrate working of a JFET and study its V-I characteristics.
10. To experimentally study working of a CS JFET amplifier.

DAV UNIVERSITY, JALANDHAR

Course Title: Object Oriented Programming Laboratory

Course Code: CSE205

L	T	P	Credits
0	0	4	2

Instruction for Students: The candidate will be attending a laboratory session of 4 hours weekly and students have to perform the practical related to the following list.

1. Introduction to basic structure of C++ program, utility of header and library files.
2. Implementation of program related to the basic constructs in C++
3. Programs using different data types in C++
4. Programs using Loops and Conditional Statements in C++
5. Programs using arrays single dimension in C++.
6. Programs using functions by passing values using call by value method and call by reference method.
7. Programs related to string handling in C++
8. Program to demonstrate the objects of the class and their working
9. Programs to implement the working of constructor & destructor
10. Programs to implement the concept of operator overloading
11. Programs to implement Inheritance and its types
12. Programs using early and late binding
13. Programs to show the working of abstract classes
14. Programs to show the working of Exception Handling
15. Program to illustrate the concept of file handling

Course Title: Electronics Measurements and Instrumentation

Course Code: ECE203A

L	T	P	Credits
3	0	0	3

Course Objective:

The main objective of this subject is to help students identify the different latest measurement techniques available for specific engineering applications. This course will lead the students to

- Understand the various measurement techniques available.
- Understand the basic working of instruments used for measurement.
- Understand the errors in measurements and their rectification.

Section-A

Fundamentals **(8 Hours)**

Generalized instrumentation system, Advantages of instrumentation system, Objective of measurement, Standards of measurements, Classification of errors. Statistical analysis Static Characteristics- Accuracy, Precision, sensitivity, threshold, resolution, repeatability, drift. Dynamic Characteristics.

Measuring Instruments **(8 Hours)**

Resistance measurements using Wheatstone bridge, Kelvin Double Bridge, AC bridges: Maxwell bridge, Maxwell Wein Bridge, Hay's Bridge, Schering Bridge, and Anderson Bridge.

Section-B

Signal Analyzers **(6 Hours)**

Wave Analyzers: Frequency selective wave analyzer, heterodyne wave analyzer, Harmonic Distortion Analyzers, Total Harmonic Distortion, Intermodulation Distortion and Spectrum Analyzers.

Oscilloscope **(6 Hours)**

CRO, Block Diagram of CRO, CRT, Graticules, electrostatic deflection sensitivity, time base generator, Lissajous figures, types of CRO probes. Application of CRO, Dual Beam CRO, Dual Trace CRO, Sampling and storage CRO.

Section-C

Transducers (8 Hours)

Electrical Transducers , Classification of Transducers ,Characteristics and choice of Transducers, Strain gauge, LVDT, thermocouple, RTD, Thermistor, piezoelectric, crystal and photoelectric transducers and their applications.

Storage and Display Devices (8 Hours)

Necessity of recorders, recording requirements, graphic recorders, and strip chart recorders, X-Y Recorder, magnetic tape recorders. LED, LCD, Segmental Display, Dot Matrices, Segmental gas discharge display

Section-D

Data Transmission and Telemetry (8 Hours)

Introduction, method of data transmission, General telemetry system, Land line telemetry systems, RF Telemetry System and applications

Data Acquisition Systems (8 Hours)

Instrumentation system, types of instrumentation system, component of an analog data Acquisition Systems, digital data Acquisition Systems, uses of data Acquisition Systems

References:

1. Carr. *Element of Electronic Instrumentation & Measurment.* Pearson Education.
2. Kishore. *Electronic Measurments & Instrumentation*. Pearson Education.
3. Sawhney, A. K. *Electrical and Electronic Measurements and Instrumentation*.
4. Cooper, D. *Electronic Instrumentation and Measurement Techniques*
5. Electronic Instrumentation, by H.S. Kalsi, Tata McGraw Hill

Course Title: Analog Communication System

Course Code: ECE207A

L	T	P	Credits
4	0	0	4

Course Objective:

The course considers analog communication systems and techniques. In this course we will introduce some of the basic mathematical concepts that will allow us to think in the two "domains" of communications, the time domain and the frequency domain. We will cover the basic types of analog modulation (AM, FM, and PM) from both a mathematical description and from a block-diagram system approach.

Learning Outcomes:

The scope of this course is to provide the complete analysis of Analog communications. This knowledge helps them to acquire better application of these principles in Digital communications. The overall objective is to introduce the student to the basics of communication theory. This course emphasizes:

- Analog modulation and demodulation techniques.
- Acquiring mathematical understanding of Analog Communication Systems.
- Understanding the trade-offs (in terms of bandwidth, power, and complexity requirements)
- Performance evaluation of communication systems in the presence of noise.
- Design of practical communication system at the block diagram level under certain constraints and requirements.

Section-A

Base Band Signals and Systems (6 Hours)

Introduction, Elements of communication system, Noise Figure & noise factor, Noise equivalent temperature. Modulation & Demodulation, need of modulation, types of modulation systems, basic transmission signals.

Analog Modulation Techniques (7 Hours)

Introduction, theory of amplitude modulation; AM power calculations, AM current calculations, AM modulation with a complex wave, theory of frequency modulation;

mathematical analysis of FM, spectra of FM signals, narrow band of FM, Wide band FM, Theory of phase modulation, comparison of AM, FM & PM

Section-B

AM Transmission (5 Hours)

Introduction, generation of Amplitude Modulation, Low level and high level modulation, basic principle of AM generation; Methods of AM Generation.

AM Reception (7 Hours)

Receiver Parameters; Selectivity, Sensitivity, Fidelity, Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver; Basic elements of AM super heterodyne Receiver, AM detectors, Double hetro-dyne communication receiver.

Section-C

FM Transmission (6 Hours)

FM allocation standards, generation of FM by direct method, varactor diode Modulator, Cross by Direct FM Transmitter, Phase-Locked-Loop Direct FM Transmitter, Indirect generation of FM; Armstrong method, Frequency stabilized reactance FM transmitter.

FM Reception (8 Hours)

Frequency demodulators, Tuned circuit frequency discriminators; Slope Detector, Balance Slope Detector, Foster Seeley discriminator, Direct methods of FM detection.

Section-D

SSB Transmission (7 Hours)

Introduction, Single Side band systems, AM-SSB; Full carrier, Suppressed carrier , reduced carrier, Independent side band, Vestigial side band, Comparison of SSB Transmission to conventional AM, Generation of SSB.

SSB Reception (6 Hours)

SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Single Side band receivers; Single side band BFO Receivers, Coherent Single side band BFO Receivers, Single Side band Envelop detection receiver, Multi-Channel Pilot Carrier SSB Receiver.

Pulse Modulation Transmissions and Reception (5 Hours)

Introduction, Sampling Theorem Pulse Amplitude Modulation (PAM), Pulse modulation and demodulation methods

References:

1. Kennedy & Davis. *Electronic communication Systems.* Tata Mcgraw Hill.
2. Kumar, Manoj. & Manisha. *Analog Communication Systems.* New Delhi. Satya Prakashan.
3. Tomasi*. Electronic Communication System*. Pearson Education.
4. Roddy. *Electronic Communication*. Pearson Education.
5. Symon Hykens. *Analog Communication Systems*. John Wiley & Sons.
6. Taub & Schilling. *Principles of Communication System.* Tata Mc-Graw Hill.

DAV UNIVERSITY, JALANDHAR

Course Title: Electromagnetic Field Theory

Course Code: ECE210

L	T	P	Credits
4	0	0	4

Course Objective:

To enable the students understand the universal theoretical concepts in three dimensional real world and find solution to problems related to electro-magnetic wave propagation.

Learning Outcomes:

- To impart knowledge on the basic concepts of electric and magnetic fields.
- To educate scientifically about Maxwell's equations and Poynting theorem
- To interpret the Wave propagation in between parallel plates.
- To emphasize the significance of different types of waveguides.

Section-A

Introduction **(10 Hours)**

Review of Electrostatic and Magneto statics.

Time Varying Fields **(10 Hours)**

Maxwell's equations in differential and integral forms concept of displacement current. Boundary conditions.

Section-B

Electromagnetic Waves **(10 Hours)**

Wave equation and its solution in different media, plane wave, Sinusoidal time variation, polarization. Reflection of waves by perfect di electronics and by perfect insulators. Surface impedance, Poynting theorem and Poynting vector.

Guided Waves **(10 Hours)**

Waves between parallel planes. TE and TM waves and their characteristics. TEM waves, velocities of propagation, Attenuation in parallel plane guides, wave impedance.

Section-C

Transmission Lines **(10 Hours)**

Circuit representation of parallel plane transmission lines. Parallel plane transmission line with losses. Low loss RF and UHF transmission lines. Distortion less condition. Transmission line charts-impedance matching.

Section-D

Wave Guides **(10 Hours)**

Rectangular and circular wave guides. TE and TM waves in rectangular wave guides. Impossibility of TEM wave in wave guides. Wave impedance and characteristics impedances. Transmission line analogy for wave guides. Attenuation and factor of wave guides. Dielectric slab wave guides.

References:

1. Sadiku, Matthew N.O. *Elements of Electromagnetic*. Oxford Univ. Press.2009. , 4th ed.
2. Prasad, K.D. *Electromagnetic field and waves.*
3. Kraus, John D. *Electromagnetic*
4. Kaduskar. *Principles of Electromagnetic*
5. Jordan, Edward C. *Electromagnetic Waves and Radiating Systems*

DAV UNIVERSITY, JALANDHAR

Course Title: Analog Electronics

Course Code: ECE211

L	T	P	Credits
4	0	0	4

Course Objectives:

The purpose of this course is to introduce to the students the basics of feedback amplifiers, large signal amplifiers, tuned amplifiers, oscillators, operational amplifier circuits, and to design and analyze various electronic circuits and systems.

Learning Outcomes:

At the end of this course, the students will learn

- Working of power amplifiers and tuned amplifiers.
- Working of different types of feedback amplifiers & oscillators.
- Working of Differential and operational amplifiers.
- Basic working & design of operational amplifier circuits.

Section-A

Large Signal Amplifiers (10 Hours)

Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues. Push-Pull Amplifiers, operation of class- B push-pull amplifier, crossover distortion, transistor phase inverter, complementary- symmetry amplifier.

Section -B

Feedback Amplifiers (10 Hours)

Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier Concept of feedback, Positive and negative feedback, Voltage and current feedback, Series and shunt feedback, Effect of feedback on performance characteristics of an amplifier.

Oscillators (8 Hours)

Condition for sustained oscillation, Barkhausen criterion, R-C phase shift, Hartley, Colpitts, Crystal and Wien Bridge Oscillators, Frequency stability criterion.

Section -C

Differential and Cascade Amplifiers (10 Hours)

Introduction, Differential Amplifier, Differential Amplifier Circuit Configuration, Dual Input-Balanced output Differential Amplifier, Dual Input-Unbalanced output Differential Amplifier, Single Input-Balanced output Differential. Amplifier, Single Input-unbalanced output Differential Amplifier with their DC and AC analysis, Differential Amplifier with swamping resistors, Constant current bias, Current Mirror.

Section -D

Introduction to Operational Amplifiers (10 Hours)

Block diagram of a typical Op-Amp, Schematic symbol, integrated circuits and their types, IC package types, Pin Identification and temperature range, Interpretation of data sheets, Overview of typical set of data sheets, Characteristics and performance parameters of and Op- Amp, Ideal Op-Amp, Equivalent circuit of an Op-Amp, Ideal voltage transfer curve, Open loop configurations: Differential, Inverting & Non Inverting.

Applications of Op-Amp (10 Hours)

Peaking Amp, Summing, Scaling and Averaging Amp, Integrator, Differentiator. Active filters: Low pass, high pass, band pass and band stop, Basic comparator, Zero crossing detector, Schmitt trigger, IC555 Timer.

References:

1. Boylestad, Nashelsky. Electronic Devices and Circuit Theory. Pearson Education. 2009, 10th Ed.
2. Floyd. & Thomas L. Electronic Devices. Pearson Education Inc., Delhi. Latest Edition.
3. Sedra, Adel., S., & Smith, Kenneth C. Microelectronic Circuits. New York. Oxford University Press. 2013. Sixth Edition.
4. Jacob, Millman.& Halkias,Christos C. Integrated Electronics. Tata McGrawHill. New Delhi.
5. Streetman, Ben J. & Sanjay Banerjee. Solid State Electronic Devices. PHI. Latest Edition.
6. Gayakwad, Ramakant , Op Amps & Linear Integrated circuits, Pearson Education, Latest Edition
7. Paul R. Gray and Robert G.Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition

DAV UNIVERSITY, JALANDHAR

Course Title: Electronic Measurements and Instrumentation Laboratory

Course Code: ECE206

L	T	P	Credits
0	0	2	1

Course Objective:

To reinforce learning in the accompanying ECE203 course through hands-on experience with electronic measurement devices. This course is intended to understand the students to critically analyze the operation of various transducers for electronic measurement.

Learning Outcomes:

After completion of this course, the students will be capable of working with various electronic measurement tools. The student will be familiar with the working of various transducers.

List of Experiments

1. Measurement of Inductance by Maxwell's Bridge.
2. Measurement of small resistance by Kelvin's Bridge.
3. Measurement of Capacitance by Schering Bridge.
4. Measurement of Frequency by Wein Bridge.
5. Measurement of medium resistance by Wheat Stone's Bridge.
6. Determination of frequency & phase angle using C.R.O.
7. To determine output characteristic of a LVDT and determine its sensitivity.
8. Study characteristics of temperature transducer of Thermocouple
9. Study characteristics of temperature transducer of Thermistor
10. Study characteristics of temperature transducer of RTD
11. Study characteristics of Light transducer like Photovoltaic cell, Phototransistor and Pin Photodiode with implementation of small project using signal conditioning circuit.

Course Title: Analog Communication Systems Laboratory

Course Code: ECE212A

L	T	P	Credits
0	0	3	2

Course Objective:

The experiments in this laboratory enable the students to gather basic knowledge on communication systems. Different experiments are performed which forms the fundamental blocks of any communication system used now-a-days. Experiments are performed using electronic instrument, such as oscilloscopes, signal generators, spectrum analyzers, and network analyzers.

Learning Outcomes:

- To practice the basic theories of analog communication system.
- To provide hands-on experience to the students, so that they are able to apply theoretical concepts in practice.

List of Experiments

1. To generate & observe A.M. signal. Calculate modulation index for different values of modulating signal.
2. To generate DSB-SC AM signal using balanced modulator & detection of DSB –SC signal.
3. To generate SSB AM signal & detection of SSB signal.
4. To generate VSB AM signal & detection of VSB signal.
5. To generate a FM Signal using Varactor & reactance modulation.
6. Detection of FM Signal using PLL & foster seelay & resonant detector.
7. Sampling Theorem & Reconstruction of Signal from its samples using Natural Sampling, Flat Top Sampling & Sample & Hold Circuits & effect of duty cycle.
8. To generate & observe PAM signal & demodulate it.
9. To generate & observe PWM signal & demodulate it.
10. To generate & observe PPM signal & demodulate it.

DAV UNIVERSITY, JALANDHAR

Course Title: Signals and Systems Laboratory Using MATLAB

Course Code: ECE213

L	T	P	Credits
0	0	2	1

Course Objective:

To reinforce learning in the accompanying Course ECE209, this lab has been introduced. This course will help the students to simulate the various signal transforms through MATLAB/ Mentor DSP.

Learning Outcomes:

After completion of this course students will be able to understand experimentally the

- The Generation of elementary signal
- To perform various operations over signals
- To understand various concepts about signal that are helpful in understanding Digital Processing of the signal.

List of Experiments

1. Generation of continuous and Discrete Unit step signal.
2. Generation of exponential and Ramp Signal in Continuous and Discrete Domain.
3. To generate sine and cosine signals of various frequencies using MATLAB
4. To generate complex exponential signals using MATLAB
5. To study Continuous and discrete time Convolution.
6. Adding and subtracting two Given Signals (Continues as well as Discrete Signals)
7. To study the discrete Fourier transform of different elementary signals.
8. To study inverse discrete Fourier transform of different elementary signals.
9. To perform integration and differentiation on various elementary signals.
10. To develop program for finding response of the LTI system described by the difference equation.
11. To develop program for finding magnitude and phase response of LTI system described by system function H (z).
12. To study the applications of signal and systems in everyday life

Course Title: Analog Electronics Laboratory

Course Code: ECE214A

L	T	P	Credits
0	0	2	1

Course Objective: The purpose of this course is to introduce to the students the basics of biasing transistor circuits, feedback amplifiers, large signal amplifiers, tuned amplifiers, oscillators, wave shaping circuits, and to design and analyze various electronic circuits and systems

Learning Outcomes: At the end of this course, the students will learn

- Working of power amplifiers and tuned amplifiers.
- Working of different types of feedback amplifiers & oscillators.
- Frequency response and design of tuned amplifiers.
- Basic working & design of OP-AMP circuits

List of Experiments

1. Frequency response analysis of Tuned amplifiers.
2. To use OP-AMP as summing, scaling and averaging amplifier.
3. To use OP-AMP as Integrator and Differentiator.
4. To study the characteristics of a Class- A amplifier.
5. To study the characteristics of Class- B amplifier.
6. To study the characteristics of Class- B push-pull amplifier.
7. To study the characteristics of complementary symmetry amplifier.
8. To study the response of RC phase shift oscillator and determine frequency of oscillation.
9. To study the response of Hartley oscillator and determine frequency of oscillation.
10. To study the response of Colpitt's oscillator and determine frequency of oscillation.
11. To study the response of Wien Bridge oscillator and determine frequency of oscillation
12. Application of OP-AMP as Schmitt trigger.

DAV UNIVERSITY, JALANDHAR

Course Title: Microprocessor and Microcontroller

Course Code: ECE301

L	T	P	Credits
4	0	0	4

Course Objective: The purpose of this course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via a microprocessor/microcontroller implementation.

Learning Outcome: At the end of this course students will demonstrate the ability to

- Do assembly language programming
- Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.
- Develop systems using different microcontrollers
- Understand RSIC processors and design ARM microcontroller based systems

Section-A

Introduction (5 Hours)

Introduction to Microprocessors, classification, recent microprocessors.

Microprocessor Architecture (10 Hours)

8085 microprocessor Architecture. Bus structure, I/O, Memory &System buses, concept of address Bus, Data Bus & Control Bus, Synchronous & Asynchronous buses. Instruction execution sequence & Data Flow, Instruction cycle.

Section-B

Instruction set & Assembly Languages Programming (12 Hours)

Introduction, instruction & data formats, addressing modes, status flags, 8085 instructions, Data transfer operations, Arithmetic operations, Logical operations, Branch operations.

Section-C

Interfacing Devices (13 Hours)

Programmable Peripheral Interface (8255) - Programmable Interval Timer (8254) - Programmable Interrupt Controller (8259A) - Programmable DMA Controller (8257)

Programmable Communication Interface (8251A) – Programmable Keyboard and Display Controller (8279).

Section-D

Basic architecture of higher order microprocessor (10 Hours)

Concepts of virtual memory, Cache memory, Advanced coprocessor Architectures- 8086, 286, 486, Pentium

Microcontrollers (10 Hours)

Microcontrollers: 8051 systems, Introduction to RISC processors; ARM microcontrollers

References:

1. Gaonkar, Ramesh. *8085 Microprocessor*. PHI Publications.
2. Mazidi, Muhammad Ali. & Mazidi, Janice Gillispie. *The 8051 Microcontroller and Embedded systems.* Pearson Education. 2004. 7th Edition,.
3. Doughlas.V.Hall. *Microprocessor and Interfacing Programming and Hardware.* McGraw Hill. 1992. Revised 2nd edition.
4. Steve, Furbe., *ARM System on Chip Architecture.* Pearson Education. 2000. Second Edition,
5. D A Patterson and J H Hennessy, "*Computer Organization and Design The hardware and software interface"* Morgan Kaufman Publishers.
6. Kenneth J. Ayala, *The 8051 Microcontroller*, Penram International Publishing, 1996.

DAV UNIVERSITY, JALANDHAR

Course Title: Digital Communication System

Course Code: ECE302

L	T	P	Credits
4	0	0	4

Course Objective:

To provide a comprehensive coverage of digital communication systems. The key feature of digital communication systems is that it deals with discrete messages and to add organization and structure to this field

Learning Outcomes:

At the end of this course students will demonstrate the ability to

- Analyze and compare different analog modulation schemes for their efficiency and bandwidth
- Analyze the behavior of a communication system in presence of noise
- Investigate pulsed modulation system and analyze their system performance
- Analyze different digital modulation schemes and can compute the bit error performance

Section-A

Digital Transmission (15 Hours)

Introduction, Advantages of Digital Transmission, Pulse Code Modulation; PCM Sampling, Sampling Rate, Aliasing, quantization error, Uniform and Non uniform quantization, Dynamic Range, Coding efficiency, A law & μ law companding, Bandwidth of PCM, Block diagram of PCM system, Delta Modulation, Continuously variable Slope Delta Modulator (CVSDM) or Adaptive Delta Modulation, Differential Pulse Code Modulation,

Section-B

Elements of Detection Theory (15 Hours)

Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion. Line Coding & its properties.

Section-C

Basic Digital Carrier Modulation & Demodulation Techniques (15 Hours)

Introduction, Information capacity, Shannon Limit for Information capacity, Bit Rate, Baud & M-ary Encoding, Amplitude Shift Keying (ASK), ASK Spectrum, ASK modulation and Demodulation, Frequency Shift Keying (FSK), FSK Bit Rate and Baud, Bandwidth and Frequency

Spectrum of FSK, FSK modulation and Demodulation Binary Phase Shift Keying, Binary PSK Spectrum, BPSK Transmitter, PSK Detection.

Section-D

Advanced Digital Carrier Modulation & Demodulation Techniques (15 Hours) Quadrature Phase Shift Keying (QPSK), QPSK Demodulator, Offset QPSK, π /4 QPSK, Comparison of conventional QPSK, Offset QPSK and π/4 QPSK, M-ary BPSK e.g. 8 PSK & 16 PSK, Quadrature Amplitude Modulation (QAM); 8 QAM & 16 QAM transmitters and receivers, Band Width efficiency, Carrier Recovery, Differential PSK, DBPSK transmitter and receiver, Constant Envelop Modulation; Minimum Shift Keying (MSK) & Gaussian Minimum Shift Keying (GMSK), Maximum likelihood sequence detection (Viterbi receiver). Equalization Techniques.

References:

1. Tomasi, Wayne. *Advanced Communication Systems*. Pearson. 5th edition
2. Proakis. *Digital Communication.* PHI
3. Lathi, B.P. *Modern Digital and Analog communication systems.* Oxford Publications.
4. Nguyen, Ha. *A first course in Digital Communication.* Cambridge Publications
5. Bernard, Sklar. *Digital Communications Fundamental and Applications.* PHI
6. Schling, Taub, *Principles of Communication Systems.* Mc Graw Hill

DAV UNIVERSITY, JALANDHAR

Course Tittle: Probability and Stochastic Processes
Course Code: ECE333

L	T	P	Credits
4	0	0	4

Course Objective: This subject equips the student with the significance of probability and random processes in context to signal processing and communication

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

- Understand representation of random signals
- Investigate characteristics of random processes
- Make use of theorems related to random signals
- To understand propagation of random signals in LTI systems.

Section A (15 Hours)

Sets and set operations; Probability space; Conditional probability and Bayes theorem; combinatorial probability and sampling models. Discrete random variables, probability mass function, probability distribution function, example random variables and distributions.

Section B (15 Hours)

Continuous random variables, probability density function, probability distribution function, example distributions; Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds.

Section C (15 Hours)

Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem.

Section D (15 Hours)

Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density.

Text/Reference Books:

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing,'' Third Edition, Pearson Education
2. A.Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes,'' Fourth Edition, McGraw Hill.
3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers,
5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Stochastic Processes, UBS Publishers
6. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press.

DAV UNIVERSITY, JALANDHAR

Course Title: Digital Signal Processing

Course Code: ECE311

L	T	P	Credits
4	0	0	4

Course Objective:

The purpose of this course is to introduce the concepts of Digital signal processing. The mathematical analysis of FIR and IIR filter design are dealt with in detail

Learning Outcomes: At the end of this course students will demonstrate the ability to

1. Represent signals mathematically in continuous and discrete time and frequency domain
2. Get the response of an LSI system to different signals
3. Design of different types of digital filters for various applications

Section-A

(15 Hours)

Signals, systems and signal processing –An overview, Sequences; representation of signals on orthogonal basis; Sampling and reconstruction of signals; Discrete systems attributes Recursive and non-recursive systems, Discrete systems described by constant coefficient difference equations,

Z-Transform and its application to the analysis of discrete systems, Analysis of LSI systems, frequency Analysis, Inverse Systems, Discrete Fourier Transform (DFT), Relationship of DFT to other transforms, Properties of DFT and circular convolution, Linear filtering methods based on the DFT.

Section B

(15 Hours)

Fast Fourier Transform (FFT) algorithms: Divide and conquer approach to computation of the DFT, Radix-2 FFT algorithms, Decimation in time (DIT) and decimation in frequency (DIF) algorithms, Implementation of FFT algorithms, Applications of FFT algorithms, Quantization errors in FFT algorithms.

Section C

(15 Hours)

Design of Digital Filters: General considerations, FIR Digital filter design: Window method, Frequency sampling method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic

Approximations; Lowpass, Bandpass, Bandstop and High pass filters. Effect of finite register length in FIR/IIR filter design.

Section D

(15 Hours)

Implementation of discrete time systems, Structures for FIR systems, Structures for IIR systems, Representation of numbers, Quantization of filter coefficients, Random variables and random processes. Parametric and non-parametric spectral estimation. Introduction to multirate signal processing. Application of DSP.

Text/Reference Books:

1. S.K. Mitra, Digital Signal Processing: A computer based approach. TMH
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, Latest Edition.
3. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall, Latest Edition.
4. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, Latest Edition.
5. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, Latest Edition.
6. D.J.DeFatta, J. G. Lucas andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, Latest Edition.

DAV UNIVERSITY, JALANDHAR

Course Title: Numerical Methods

Course Code: MTH256A

L	T	P	Credits
3	0	0	3

Course Objectives

The aim of this course is to teach the applications of various numerical techniques for a variety of problems occurring in daily life. At the end of the course, the students will be able to understand the basic concepts in Numerical Analysis of differential equations.

Section-A

Approximate numbers, Significant figures, rounding off numbers, Error Absolute, Relative and percentage

Non-Linear Equations: Bisection, Regula-Falsi, Secant, Newton-Raphson, General Iteration Method. Rate of convergence

Section-B

Systems of Simultaneous Linear Equations: Direct methods: Gauss elimination method, Gauss Jordon method, Matrix inversion method; Iterative methods: Jacobi method and Gauss-Seidel method, Power method for finding largest Eigen value.

Section-C

Operators: Forward, Backward and Shift (Definitions and some relations among them). Newton forward and backward, Gauss backward and forward interpolation, Stirling formula, Bessel formula, Lagrange's interpolation, Hermite Interpolation, Newton divided difference Interpolation. Numerical Differentiation, Maximum and Minimum values of a tabulated function.

Section-D

Numerical Integration: General Quadrature formula, Trapezoidal Rule, Simpson's 1/3-Rule, Simpson's 3/8-Rule, Boole's rule, Weddle's Rule.

Numerical solutions to first order ordinary differential equations: Taylor's Series method, Picard's Method, Euler's and modified Euler's methods, Runge-Kutta methods

References:

1. Jain, M.K. *Numerical Analysis for Scientists and Engineers*. New Delhi: S.B.W. Publishers, 1971.
2. Grewal B.S. *Numerical Methods in Engineering & Science With Programs In C& C++.* New Delhi: Khanna Publishers, 2012.
3. Golub G.H. and Ortega, J.M. *Scientific Computing and Differential Equations: An Introduction to Numerical Methods*. London: Academic Press, 1992.
4. John H. Mathews and Kurtis D. Fink, *Numerical Methods using Matlab*, 4th Ed., PHI Learning Private Limited, 2012.

DAV UNIVERSITY, JALANDHAR

Course Title: Microprocessor and Microcontroller Laboratory

Course Code: ECE306A

L	T	P	Credits
0	0	2	1

Course Objective:

This course is intended for physical understanding of Microprocessor and microcontroller.

Learning Outcomes:

The students will learn the programming in assembly language and will understand the architecture of Microprocessor and Microcontroller

List of Experiments

Section-A: General Purpose Programming Exercises

Minimum six experiments to be conducted.

1. Introduction of Microprocessor and Microcontroller Kit.
2. Addition, Subtraction, Multiplication and Division.
3. Finding the maximum value in an array.
4. Sorting of data.
5. Finding number of positive / negative elements in a block of data.
6. BCD-to-Hex conversion and Hex-to-BCD conversion.
7. Binary-to-ASCII and ASCII-to-Binary conversion.
8. Square Root of a given data.
9. LCM and GCD.

Section-B: Interfacing With Application Boards

Minimum six experiments to be conducted

1. 8255 PPI.
2. Transfer data serially between two kits (Study of 8253/8251).
3. 8279 Keyboard & display
4. Seven segment display
5. LCD Display
6. Traffic light.
7. 8259 programmable interrupt controller.
8. 8257/8237 DMA controller.

9. 8 bit ADC and 8 bit DAC.
10. Stepper motor control.
11. DC motor speed measurement and control module.
12. Real Time Clock.
13. Logic Controller.

DAV UNIVERSITY, JALANDHAR

Course Title: Digital Communication Systems Laboratory

Course Code: ECE307A

L	T	P	Credits
0	0	2	1

Course Objective:

This lab helps the students to understand the basic principles of digital communication systems by practical module systems. The experiments are designed in such a way that the theoretical concepts introduced in lectures are re- discussed and implemented practically.

Learning outcome:

The course will help the students:

- To demonstrate digital communication concepts using hands-on experience and using simulation environments such as Matlab/Simulink, or LabVIEW or ComSim
- To use commercial, modular systems which have some distinct advantages over bread boarding to examine more complex communication topics and to deliver a hands-on laboratory experience.

List of Experiments

1. Analysis of Time Division Multiplexing system.
2. Analysis of pulse code modulation and demodulation.
3. Analysis of delta modulation and demodulation and observe effect of slope overload.
4. Analysis pulse data coding techniques for various formats.
5. Data decoding techniques for various formats.
6. Analysis of amplitude shift keying modulator and demodulator.
7. Analysis of frequency shift keying modulator and demodulator.
8. Analysis of phase shift keying modulator and demodulator.
9. Error Detection & Correction using Hamming Code
10. Digital link simulation; error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ComSim.

Course Title: IC Applications Laboratory

Course Code: ECE317

L	T	P	Credits
0	0	2	1

Course Objective:

This lab helps the students to understand the basic operations & specifications of various IC's and their practical applications.

Learning outcome:

The course will help the students to design various electronics circuits using different IC's for numerous practical applications.

List of Experiments

1. Practical Applications of Following IC's
2. RB 156, Bridge Rectifier IC, Voltage regulators IC 7805,7905,7812 & 7912etc.
3. IC 741 (operational Amplifiers)
4. IC 555 Timer
5. IC 565 Phase Locked Loop
6. IC ULN 2003A NPN Darlington pair and Relay Driver & ICULN 2803A NPN Motor Driver
7. IC LM 386. Audio Amplifier
8. ULN2003 IC ; DTMF-based load control system.

DAV UNIVERSITY, JALANDHAR

Course Title: Digital Signal Processing Laboratory

Course Code: ECE314A

L	T	P	Credits
0	0	2	1

Course Objective:

To provide an introduction to DSP. The emphasis is on using MATLAB as a platform for understanding DSP techniques

Learning Outcomes:

The successful completion of this course will help the students to develop the programming skills in MATLAB. They will understand the physical significance of FIR and IIR filters. This course will also help them to understand the finite effect length errors.

List of Experiments

1. To study circular convolution with various methods.
2. To study auto correlation and cross correlation between signals.
3. To develop program for conversion of direct form realization to cascade form realization.
4. To develop program for cascade realization of IIR and FIR filters.
5. To develop program for designing FIR filter using rectangular window study its frequency response
6. To develop program for designing FIR filter using hanning window study its frequency response
7. To develop program for designing FIR filter using hamming window and study its frequency response
8. To develop program for designing IIR filter using butterworth approximations.
9. To develop program for designing IIR filter using chebyshev approximations.
10. To develop a program to explain finite length effects.

Course Title: Industrial Training-I

Course Code: ECE315A

L	T	P	Credits
0	0	0	2

Course Objective: To provide hands-on experience where electronics and communication engineering projects are carried out.

Learning Outcome: This will help students to implement the classroom learning in practical life

Students have to undergo two-week practical training in Electronics and Communication Engineering related project design of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

This course is mandatory and the student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations

DAV UNIVERSITY, JALANDHAR

Course Title: Microwave and Radar Engineering

Course Code: ECE309

L	T	P	Credits
4	0	0	4

Course Objective:

This course is designed to expose the basics of microwave devices and to introduce the students to radars and their applications

Learning Outcomes:

This course will lead the students to understand the fundamentals of microwave devices and circuits. This will help them to learn microwave measurements. The students will also learn the radars and their uses.

Section-A

Microwave Tubes (10 Hours)

Limitations of conventional tubes, construction, operation and properties of Klystron Amplifier, reflex Klystron, Magnetron, TWT, BWO, Crossed field amplifiers.

Microwave Solid State Devices (10 Hours)

Limitation of conventional solid state devices at MW, Transistors (Bipolar, FET), Diodes (Tunnel, Varactor, PIN), Transferred Electron Devices (Gunn diode), Avalanche transit time effect (IMPATT, TRAPATT, SBD)

Section-B

Microwave Components (10 Hours)

Analysis of MW components using s-parameters, Junctions (E, H, and Hybrid), Directional coupler, Bends and Corners, MW posts, S.S. tuners, Attenuators, Phase shifter, Ferrite devices (Isolator, Circulator, and Gyrator), Cavity resonator, and Matched termination.

Section-C

Microwave Measurements (8 Hours)

Power measurements using calorimeters and bolometers, Measurement of SWR, Frequency and wavelength, Microwave bridges.

Introduction to Radar Systems (7 Hours)

Basic Principle: Block diagram and operation of Radar, Radar range Equation, PRFs and Range Ambiguities, Applications of Radar.

Section-D

Doppler Radars **(8 Hours)**

Doppler determination of velocity, CW radar and its limitations, FMCW radar, Basic principle and operation of MTI radar, Delay line cancellers, Blind speeds and staggered PRFs.

Scanning and Tracking Techniques **(7 Hours)**

Various scanning techniques (Horizontal, vertical, spiral, palmer, raster, nodding), Angle tracking systems (Lobe switching, conical scan, monopulse), Range tracking systems, Doppler (velocity) tracking systems

References

1. Samuel, Liao. *Microwave devices and circuits.* PHI
2. Kulkarni, M. *Microwave devices and radar engg.* Umesh Publications
3. Merill, I. & Skolnik *Introduction to radar systems*
4. Collin, R.E. *Foundation of Microwave Engg.* McGraw Hill
5. Gupta, K.C. *Microwave Engg*

DAV UNIVERSITY, JALANDHAR

Course Tittle: Linear Control System

Course Code: ICE208

L	T	P	Credits
4	0	0	4

Course Objective:

- To teach the fundamental concepts of Control systems and mathematical modeling of the System
- To study the concept of time response and frequency response of the system
- To teach the basics of stability analysis of the system

Learning Objective:

- Formulation of equation of linear electrical, mechanical, thermal, pneumatic and hydraulic system, electrical, mechanical analogies
- Typical test – input signals
- Necessity of compensation
- Control components.

SECTION-A

Introductory Concepts: Plant, Systems, Servomechanism, regulating systems, disturbances, Open loop control system, closed loop control systems, linear and non-linear systems, time variant and invariant, continuous and sampled-data control systems, Block diagrams, some illustrative examples.

Modeling: Formulation of equation of linear electrical, mechanical, thermal, pneumatic and hydraulic system, electrical, mechanical analogies. Use of Laplace transforms, Transfer function, concepts of state variable modeling. Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

SECTION-B

Time Domain Analysis: Typical test – input signals, Transient response of the first and second order systems, Time domain specifications, Dominant closed loop poles of higher order systems, Steady state error and coefficients, pole-zero location and stability, Routh-Hurwitz Criterion.

Frequency Domain Analysis: Frequency response specifications, Closed loop frequency response, Relation between time and frequency response for second order systems, Log,

Magnitude versus Phase angle plot.

SECTION-C

Stability Analysis: Absolute and relative stability, Polar plots and Nyquist stability criterion, Bode plots-gain margin & phase margin, M and N loci.

Root Locus Technique: The extreme points of the root loci for positive gain, Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain and sketch of the root locus plot, criterion for stability.

SECTION-D

Compensation: Necessity of compensation, series and parallel compensation, compensating networks, applications of lag and lead-compensation.

Control Components: Error detectors – potentiometers and synchros, servo motors, a.c. and d.c. techno generators, Magnetic amplifiers.

References:

1. Ogata, K. *Modern Control Engineering*. Pearson
2. Nagrath & Gopal. *Control System Engineering*. New Age
3. Gopal ,M. *Control Systems- Principles & Design*. TMH .
4. Choudhury, Roy. *Modern Control Engineering*. PHI

DAV UNIVERSITY, JALANDHAR

L	T	P	Credits
3	0	0	3

Course Title: Programming with PYTHON

Course Code: CSE443A

Objectives: To impart knowledge of PYTHON programming methodologies and their significance.

Learning outcomes: - This course offers a good understanding of the concepts, methods and techniques of PYTHON.

SECTION-A

Introduction to Python Installation and Working with Python, Understanding Python variables, Python basic Operators, Understanding python blocks

Python Data Types Declaring and using Numeric data types: int, float, complex, using string data type and string operations, Defining list and list slicing, Use of Tuple data type

Python Program Flow Control Conditional blocks using if, else and elif**,** simple for loops in python, for loop using ranges, string, list and dictionaries Use of while loops in python, Loop manipulation using pass, continue, break and else Programming using Python conditional and loops block

SECTION-B

Python Functions, Modules and Packages Organizing python codes using functions**,** organizing python projects into modules, importing own module as well as external modules, Understanding Packages, Powerful Lambda function in python Programming using functions, modules and external packages

Python String, List and Dictionary Manipulations Building blocks of python programs**,** understanding string in build methods**,** List manipulation using in build methods**,** Dictionary manipulation**,** Programming using string, list and dictionary in build functions

Python File Operation Reading config files in python**,** Writing log files in python**,** Understanding read functions, read(), readline() and readlines()**,**Understanding write functions, write() and writelines()**,**Manipulating file pointer using seek**,** Programming using file operations

SECTION-C

Python Object Oriented Programming – Oops Concept of class, object and instances Constructor, class attributes and destructors, Real time use of class in live projects**,** Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Python Regular Expression Powerful pattern matching and searching Power of pattern searching using regex in python, Real time parsing of networking or system data using regex, Password, email, URL validation using regular expression, Pattern finding programs using regular expression

SECTION-D

Python Exception Handling Avoiding code break using exception handling, safe guarding file operation using exception handling, Handling and helping developer with error code, Programming using Exception

handling

Python Database Interaction SQL Database connection using python, creating and searching tables, Reading and storing config information on database, Programming using database connections

Python Multithreading Understanding threads**,** forking threads**,** synchronizing the threads

Programming using multithreading

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think like a Computer Scientist‟, 2ndedition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python –Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. John V Guttag, —Introduction to Computation and Programming Using Python‟, Revised and expanded Edition, MIT Press , 2013

DAV UNIVERSITY, JALANDHAR

Course Title: Programming with PYTHON Lab

Course Code: CSE445A

L	T	P	Credits
0	0	4	2

OBJECTIVES:

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, and dictionaries.
5. Read and write data from/to files in Python.

LIST OF PROGRAMS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

L	T	P	Credits
0	0	2	1

Course Title: Microwave and Radar Engineering Laboratory

Course Code: ECE312A

Course Objective:

Microwave communication deals with the study of operation and characteristics of microwave sources and microwave components. It also deals with the measurement of load impedance VSWR, antenna gain and radiation pattern.

Learning Outcomes:

This course will lead the students

To familiarize the students with microwave communication techniques/technologies.

List of Experiments

1. Study of microwave components and instruments.
2. Measurement of crystal characteristics and proof of the square law characteristics of the diode.
3. Measurement of klystron characteristics.
4. Measurement of VSWR and standing wave ratio.
5. Measurement of Dielectric constants.
6. Measurement of Directivity and coupling coefficient of a directional coupler.
7. Measurement of Q of a cavity.
8. Calibration of the attenuation constant of an attenuator.
9. Determination of the radiation characteristics and gain of an antenna.
10. Determination of the phase-shift of a phase shifter.
11. Determination of the standing wave pattern on a transmission line and finding the length and position of the short circuited stub.

DAV UNIVERSITY, JALANDHAR

Course Title: Mini Project/Electronic Design workshop

Course Code: ECE316

L	T	P	Credits
0	0	3	2

Course Outcomes:

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

1. Conceive a problem statement either from rigorous literature survey or from the requirements raised from need analysis.
2. Design, implement and test the prototype/algorithm in order to solve the conceived problem.
3. Write comprehensive report on mini project work

Guidelines:

1. The mini-project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design.
2. The mini project may be a complete hardware or a combination of hardware and software.
3. The software part in mini project should be less than 50% of the total work.
4. Mini Project should cater to a small system required in laboratory or real life.
5. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
6. After interactions with course coordinator and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of mini-project.
7. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
8. The student is expected to exert on design, development and testing of the proposed work as per the schedule.
9. Art work and Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design.
10. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.

Course Name: Digital System Design

Course Code: ECE461

L	T	P	Credits
4	0	0	4

Course Objective

The Course intends to educate the student on the Front end design aspects of Very large Scale Integration Chip manufacturing Cycle. The Course teaches the Verilog Hardware Description language (HDL) that shall help in describing a circuit to the tools for simulation and further processing of the same towards manufacturing the chip. The course helps the student in understanding the tricks of developing good HDL descriptions.

Learning Outcomes:

- Acquired knowledge of combinational and sequential subcircuit design
- Acquired knowledge to build logic circuits based on PLDs, MUXes, ROMs
- Ability to learn and design Sequential Circuits
- Ability to learn and design Logic Circuits in Verilog Hardware Description Languages
- Ability to design ASM machines, Vending Machines etc.
- Learn about FPGAs, design and implementation using FPGAs.

Section-A

Combinational Logic: Review of adders, Subtractor, Multipliers, Multiplexers, ROM, PLA, PAL and PLD.

Synchronous Sequential Logic: Flip-flops, Triggering of flip-flops, Analysis of clocked sequential circuits, State reduction and assignment, Flip-flop excitation tables, Design procedure, Design of counters.

Section-B

Finite State Machines: Finite state model, Memory elements and their excitation functions, Synthesis of Synchronous sequential circuits, Capabilities and limitations of FSM, Design, Modeling and Simulation of Moore and Mealy machines.

Algorithmic State Machines: ASM chart, Timing considerations, Control implementation, Control Design with multiplexers, PLAs, etc.

Section-C

Verilog: Lexical conventions, data types, system tasks and compiler directives. Modules and ports. Hierarchical Modeling Concepts; Gate-Level, Dataflow and Behavioral Modeling, User defined primitives.

Design of networks for Arithmetic and logical operations: Representation of fixed-point and floating-point numbers and their operations, ALU, Serial adder, Binary multiplier, Binary divider.

Section-D

Designing with Programmable Logic Devices and Programmable Gate Arrays: Read only memories, Programmable logic arrays, Programmable array logic, designing with FPGAs, Xilinx series FPGAs.

References

1. Leach, Donald P. *Digital Principles and Applications.* TMH. Sixth Edition
2. Mano, M. M. *Digital Design*. PHI. 2002. 2nd Ed.
3. Palnitkar, S. *Verilog HDL A Guide to Digital Design and Synthesis.* PHI. 1996.

Course Name: Digital System Design Laboratory

Course Code: ECE462A

L	T	P	Credits
0	0	2	1

Course Objective

The Course intends to educate the student on the Front end design aspects of Very large Scale Integration Chip manufacturing Cycle with help of practical skills. The course helps the student in understanding the tricks of developing good HDL descriptions.

Learning Outcomes:

- Acquired knowledge of combinational and sequential subcircuit design
- Acquired knowledge to build logic circuits based on PLDs, MUXs, ROMs
- Ability to learn and design Sequential Circuits

List of Experiments

1. To verify the behavior of Basic Logic Gates using Truth Table
2. Implement the design of 1-bit half adder circuit in Verilog, then using half adder design a 1-bit Full Adder.
3. Implementation of 4:1 MUX using 2:1 MUX.
4. Implementation of 8 bit Binary Comparator using 4-bit Binary Comparators
5. Implementation of BCD to 7-segment decoder.
6. Implementation of 4-bit BCD Adder using 4-bit Binary Adders.
7. Implementing a Full Adder using (a) Decoder (b) Multiplexer.
8. Design i) Level Triggered ii) Edge-Triggered SR,D, JK Flip Flops.
9. Develop a behavioural module named UDCounter that takes inputs CLK, RESET, EN, U/D; and counts up/down.
10. Develop a model for Grey Code Converter and write the testbench for the same.
11. Design an ASM that detects a sequence 11001.
12. Design a State Machine that gives a synchronous Grey Code Sequence

DAV UNIVERSITY, JALANDHAR

Course Name: Sensors Laboratory

Course Code: ECE463

L	T	P	Credits
0	0	2	1

Course Objective

The Course intends to educate the student to learn various sensors and their operations in order to improve his practical skills.

Learning Outcomes:

Upon Completion of the course, the students will be able to understand various sensors and their application in industrial environment.

List of Experiments

1. To study the digital response a IR motion sensor and to determine its range.
2. To design a motion sensitive intruder alarming system using IR motion sensor.
3. To measure the distance of an object using SONAR principle by ultrasonic proximity sensor and
   determine the accuracy of the instrument.
4. To study the operation of digital humidity sensor & to calculate the accuracy of the device.
5. To study and measure Temperature using RTD.
6. To study and measure Temperature using Thermistor
7. To study and measure Temperature using Thermocouple
8. To measure level in tank using capacitive sensor
9. To characterize LVDT and measure displacement using LVDT
10. To characterize Strain Gauge and application as load cell.

Course Title: Industrial Training-II

Course Code: ECE400

L	T	P	Credits
0	0	0	2

Course Objective: To provide hands-on experience where electronics and communication engineering projects are carried out.

Learning Outcome: This will help students to implement the classroom learning in practical life

Students have to undergo two-week practical training in Electronics and Communication Engineering related project design of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

This course is mandatory and the student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

DAV UNIVERSITY, JALANDHAR

Course Title: Data Communication

Course Code: ECE411A

L	T	P	Credits
3	0	0	3

Course Objective:

The purpose of this course is to enable the students to understand the basics of Data communications concepts; network topologies; transmission media; network access control; communication protocols; network architecture; LANs, MANs, and WANs; internetworking.

Learning Outcomes

- Student can define and describe network architecture (layered approach and hierarchical approach).
- Student can describe analog and digital signals and their role in data transmission
- Student can describe the multiplexing of signals for data transmission and contention protocols.
- Student can describe data compression, data integrity, data security and their respective related techniques.
- Student can describe the features of flow control and related techniques

Section-A

Data Communication Concepts **(7 Hours)**

Networks and open system standards: the OSI reference model, Network topologies and the physical layer, Bus/Tree topology, ring topology, star topology. The future of data communications

Data Transmission **(8 Hours)**

Transmission modes, Simplex, half-duplex, full-duplex communications, Serial and parallel transmission, Synchronous transmission, Asynchronous transmission, Interface standards, Multiplexing of signals, Data compression

Section-B

Protocol Concepts - Media Access Control **(7 Hours)**

Protocol basics, MAC protocols (CSMA/CD and Token passing).

Data Security and Integrity **(8 Hours)**

Error detection and correction, Encryption and decryption, Viruses, worms, and hacking

Section-C

Local Area Networks **(7 Hours)**

LAN standards (IEEE standards 802 for LANs), Interconnecting LANs, LAN Hardware (server platforms, backup devices, LAN adapters, printers, etc.), LAN system software, LAN application software, LAN selection criteria.

MANs and WANs **(8 Hours)**

Network routing, Public data networks, Circuit-switched data network, Packet-switched data network, Internet protocol, ISDN, Electronic mail.

Section-D

Network Architecture **(8 Hours)**

Layered approach, Hierarchical approach.

Network Interconnections (Internetworking) **(7 Hours)**

LAN-to-LAN connections and LAN-to-Host connections o Repeaters, Bridges, Routers, and Gateways, Interconnection utilities

References:

1. Behrouz A. Forouzan *Data Communications and Networking 2/e,* SiE TMH 2000
2. Tanenbaum, A. S. *Computer Networks*. 4th ed. Upper Saddle River, NJ : Prentice Hall, 2003.

DAV UNIVERSITY, JALANDHAR

Course Name: Project

Course Code: ECE451

L	T	P	Credits
0	0	12 8	6

Course Objective:

The object of Project Work is to enable the student to extend further the investigative study taken up under ECE451, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned in the light of the Report prepared under ECE451;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar Presentation before a Departmental Committee.

Course Title: Antenna Engineering

Course Code: ECE305

L	T	P	Credits
4	0	0	4

Course Objective:

The purpose of this course is to enable the students to understand the basics of antennas and various types of antenna arrays and its radiation patterns. The main objective of this subject is to help students to identify the different latest antennas available for specific communication.

Learning Outcomes

- Study of various antennas, arrays and radiation patterns of antennas.
- To learn the basic working of antennas.
- To understand various techniques involved in various antenna parameter measurements.
- To understand the propagation of radio waves in the atmosphere.

Section-A

Introduction (8 Hours)

Physical concept of Radiation in single wire, two wire, and dipole, Current Distribution on a thin wire antenna.

Fundamental Parameters of Antenna (10 Hours)

Radiation Pattern, Radiation Power Density, Radiation intensity, Directivity, Gain, Antenna efficiency, Beam width, Bandwidth, Polarization, Antenna Input Impedance, Elementary idea about self and mutual impedance, Radiation efficiency, Effective aperture, Antenna Temperature.

Section-B

Linear Wire Antennas (10 Hours)

Retarded potential, Infinitesimal dipole, Current distribution of short dipole and half wave dipole, Far-field, Radiating near-field and reactive near-field region, Monopole and Half wave dipole.

Antenna Arrays (8 Hours)

Array of two point sources, Array factor, n-element linear array with uniform amplitude and spacing, Analysis of Broadside array, Ordinary end-fire array, Hansen-wood yard end fire array,

n-element linear array with non-uniform spacing, Analysis of Binomial and Dolph Tschebyscheff array, Scanning Array, Superdirective array.

Section-C

Aperture Antennas (8 Hours)

Field Equivalence principle, Rectangular and circular aperture antennas, Horn antenna, Babinet's Principle, Slot Antenna, Reflector antenna.

Ground wave Propagation (10 Hours)

Friis Free space equation, ,Reflection from earth's surface, Surface and Space wave propagation for vertical and horizontal dipole, Field strength of Space wave, Range of space wave propagation, Effective earth's radius, Effect of earth imperfections and atmosphere on space wave propagation, Modified refractive index, Duct propagation, Tropospheric propagation.

Section-D

Ionosphere Propagation (6 Hours)

Structure of ionosphere, propagation of radio waves through ionosphere, Refractive index of ionosphere, Reflection and refraction of waves by ionosphere, Critical frequency, Maximum usable frequency, Optimum working frequency, Lowest usable high frequency, virtual height, Skip Distance, Effect of earth's magnetic field

References:

1. Balanis C.A. & John. *Antenna Theory*. Wiley & Sons.
2. Jordan E.C. *Electromagnetics and radiating systems*. PHI.
3. Collins R.E. *Antenna and radio wave propagation.* McGraw Hill.
4. Krauss J.D., *Antenna Theory.* McGraw Hill.

Course Title: Satellite Communication

Course Code: ECE332

L	T	P	Credits
4	0	0	4

Course Objective:

To enable the student to become familiar with satellites and satellite services.

Learning Outcomes:

- Overview of satellite systems in relation to other terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.

Section-A

SATELLITE ORBITS: Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

Section-B

SPACE SEGMENT AND SATELLITE LINK DESIGN: Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

Section-C

SATELLITE ACCESS: Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption

EARTH SEGMENT: Earth Station Technology--Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain.

Section-D

SATELLITE APPLICATIONS: INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet

References:

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2006.
2. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Prentice Hall/Pearson, 2007.

Course Name: Bio-Medical Electronics

Course Code: ECE341

L	T	P	Credits
4	0	0	4

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

- Understand the application of the electronic systems in biological and medical applications.
- Understand the practical limitations on the electronic components while handling bio substances.
- Understand and analyse the biological processes like other electronic processes.

Section A **(15 Hours)**

Brief introduction to human physiology. Biomedical transducers: displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases.

Section B **(15 Hours)**

Bio-electrodes and bio potential amplifiers for ECG, EMG, EEG, etc. Measurement of blood temperature, pressure and flow.

Section C **(15 Hours)**

Impedance Plethysmography. Ultrasonic, X-ray and nuclear imaging.

Section D **(15 Hours)**

Prostheses and aids: pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped. Safety aspects.

Text/Reference Books:

1. W.F. Ganong, Review of Medical Physiology, 8th Asian Ed, Medical Publishers, 1977.
2. J.G. Websster, ed., Medical Instrumentation, Houghton Mifflin, 1978.
3. A.M. Cook and J.G. Webster, eds., Therapeutic Medical Devices, Prentice-Hall, 1982.

DAV UNIVERSITY, JALANDHAR

Course Name: Power Electronics

Course Code: ECE342

L	T	P	Credits
4	0	0	4

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

- Build and test circuits using power devices such as SCR
- Analyse and design controlled rectifier, DC to DC converters, DC to AC inverters,
- Learn how to analyse these inverters and some basic applications.
- Design SMPS.

Section A **(15 Hours)**

Characteristics of Semiconductor Power Devices: Thyristor, power MOSFET and IGBT Treatment should consist of structure, Characteristics, operation, ratings, protections and thermal considerations. Brief introduction to power devices viz. TRIAC, MOS controlled thyristor (MCT), Power Integrated Circuit (PIC) (Smart Power), Triggering/Driver, commutation and snubber circuits for thyristor, power MOSFETs and IGBTs (discrete and IC based).Concept of fast recovery and schottky diodes as freewheeling and feedback diode.

Section B **(15 Hours)**

Controlled Rectifiers: Single phase: Study of semi and full bridge converters for R, RL, RLE and level loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor, Effect of source impedance, Input current Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor.

Choppers: Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, Control techniques for choppers – TRC and CLC, Detailed analysis of Type A chopper. Step up chopper. Multiphase Chopper

Section C **(15 Hours)**

Single-phase inverters: Principle of operation of full bridge square wave, quasi-square wave, PWM inverters and comparison of their performance. Driver circuits for above inverters and mathematical analysis of output (Fourier series) voltage and harmonic control at output of inverter (Fourier analysis of output voltage). Filters at the output of inverters, Single phase current source inverter

Section D **(15 Hours)**

Switching Power Supplies: Analysis of fly back, forward converters for SMPS, Resonant converters - need, concept of soft switching, switching trajectory and SOAR, Load resonant converter - series loaded half bridge DC-DC converter. Applications: Power line disturbances, EMI/EMC, power conditioners. Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings, sizing of UPS. Separately excited DC motor drive. P M Stepper motor Drive.

Text /Reference Books:

1. Muhammad H. Rashid, “Power electronics” Prentice Hall of India.
2. Ned Mohan, Robbins, “Power electronics”, edition III, John Wiley and sons.
3. P.C. Sen., “Modern Power Electronics”, edition II, Chand& Co.
4. V.R.Moorthi, “Power Electronics”, Oxford University Press.
5. Cyril W., Lander,” Power Electronics”, edition III, McGraw Hill.
6. G K Dubey, S R Doradla,: Thyristorised Power Controllers”, New Age International Publishers. SCR manual from GE, USA.

DAV UNIVERSITY, JALANDHAR

Course Name: Adaptive signal processing

Course Code: ECE335

L	T	P	Credits
4	0	0	4

Course Objective: The study of adaptive signal processing involves development of various adaptation algorithms and assessing them in terms of convergence rate, computational complexity, robustness against noisy data, hardware complexity, numerical stability etc. This course will develop main classes of adaptive filter algorithms, namely the LMS. Towards this, it will develop all necessary mathematical tools, in particular, random variables, stochastic processes and correlation structure.

Learning Outcomes: The students will be able to learn:

- The difference between normal filter and adaptive filters
- Applications of adaptive filters in communication and medical signal processing
- Various adaptation algorithms used in adaptive filtering

Section A (12 H)

Introduction to Adaptive Filters: Adaptive filter structures, issues and examples, Applications of adaptive filters: Channel equalization, active noise control, Echo cancellation, beamforming

Discrete time stochastic processes Re-visiting probability and random variables, Discrete time random processes, Power spectral density – properties, Autocorrelation and covariance structures of discrete time random processes, Eigen-analysis of autocorrelation matrices.

Section B (12 H)

Optimum filtering: Wiener filter, search methods and the LMS algorithm: Wiener FIR filter, Steepest descent search and the LMS algorithm

Convergence and Stability Analyses: Convergence analysis of the LMS algorithm, Learning curve and mean square error behavior, Weight error correlation matrix, Dynamics of the steady state mean square error (mse), Misadjustment and stability of excess mse

Section C (12 H)

Variants of the LMS Algorithm: The sign-LMS and the normalized LMS algorithm, Block LMS, Review of circular convolution, Overlap and save method, circular correlation, FFT based implementation of the block LMS Algorithm.

The lattice filter and estimator: Forward and backward linear prediction, signal subspace decomposition using forward and backward predictions, Order updating the prediction errors and prediction error variances, basic lattice section, Reflection coefficients, properties, updating predictor coefficients, Lattice filter as a joint process estimator, AR modeling and lattice filters, Gradient adaptive lattice.

Section D (12 H)

RLS lattice filter: Least square (LS) estimation, pseudo-inverse of a data matrix, optimality of LS estimation, Vector space framework for LS estimation, Time and order updating of an orthogonal projection operator, Order updating prediction errors and prediction error power,

References:

1. H. Sayed, Adaptive Filters, John Wiley & Sons, NJ, 2008.
2. S. Haykin, Adaptive Filter Theory, Fourth Edition, Pearson Education LPE, 2007.
3. Alexander D. Poularikas, Zayed M. Ramadan, Adaptive filtering primer with MATLAB, CRC Press, 2006.
4. Widrow and S.D. Stearns, Adaptive Signal Processing, Prentice Hall, Englewood Cliffs, NJ, 1985.

DAV UNIVERSITY, JALANDHAR

Course Title: Digital Image Processing and Pattern Recognition

Course Code: ECE433

L	T	P	Credits
4	0	0	4

Course Objectives:

Introduce the student to analytical tools and methods which are currently used in digital image processing as applied to image information for human viewing. Then apply these tools in the laboratory in image restoration, enhancement and compression and pattern recognition.

Learning Outcomes:

This will help the student to

1. Develop an overview of the field of image processing.
2. Understand the fundamental algorithms and how to implement them.
3. Prepare to read the current image processing research literature.
4. Gain experience in applying image processing algorithms to real problem

Section-A

Introduction: Digital Image processing, Origins of DIP, Examples, Fundamental steps in DIP, Components of DIP

Fundamentals: Elements of visual perception, Light and the electromagnetic spectrum, Image Sensing and acquisition, Image sampling and quantization, basic relationships between pixels

Section-B

Image Enhancement Background, some basic gray level transformation, Histogram processing, enhancement using arithmetic/Logic operation, Basics of Spatial filtering, smoothing spatial filters, sharpening spatial filters, Introduction to the Fourier transform and the frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, homomorphic filters & implementation

Section-C

Image restoration: Noise models, restoration in the presence of noise only – spatial filtering, Periodic noise reduction by frequency domain filtering. Inverse filtering

Image compression: Fundamentals. Image compression models, error free compression, lossy compression

Section-D

Pattern Recognition: Introduction, Probability, Statistical decision making, nonparametric decision making, Clustering, Processing of waveforms, Image analysis.

References

1. Digital Image Processing, Woods & Gangzlez
2. Pattern Recognition, Pau & Gonzalez.

DAV UNIVERSITY, JALANDHAR

Course Name: Embedded Systems

Course Code: ECE310A

L	T	P	Credits
4	0	0	4

Course Objective

To provide sufficient Knowledge to understand the embedded systems design, embedded programming and their operating system.

Learning Outcomes

- To provide in-depth knowledge about embedded processor, its hardware and software.
- To explain programming concepts and embedded programming assembly language and C

Section-A

Introduction to Embedded systems design: The concept of embedded systems design, Embedded microcontroller cores, embedded memories. Examples of embedded systems**,** Use of software tools for development of an ES.

Section-B

8051 Microcontroller: Architecture, Instruction set: Data Move Operations, Logical Operations, Arithmetic Operations, Jump, Loop and Call Subroutine, Advanced Instructions.

8051 Addressing Modes: Immediate and register addressing mode, Accessing memory using different addressing modes, Bit addresses for I/O & RAM, Extra-128 byte on-chip RAM in 8052.

8051 Ports & Hardware Connections: I/O programing, I/O bit manipulation programming, Pin-description, explaining the Hex File.

Section-C

8051 Timers & Counters: Timer programing, Counter Programing, programming in C of timers and counters.

8051 Serial Programming: Basics of serial programming, serial communication; RS232 connections, Serial Port programming in Assembly & C.

Section-D

8051 Interrupts: 8051 interrupts, Timer interrupts, external hardware interrupts, serial communication interrupts, Interrupt priority, Interrupt programming in C.

8051 Interfacing and Applications: Interfacing External Memory, Keyboard and Display Devices: LED, 7-segment LED display, LCD.

References:

1. Ayala, K. *The 8051 Microcontroller.* Thomson Delmar Learning. 2007. 3rd Ed.
2. Mazidi, M.A. *The 8051 Microcontroller & Embedded Systems using Assembly & C.* Pearson Ed, 2009. 2nd Edition,
3. Ghoshal, S. *8051 Microcontroller*. Pearson Education. 2010.
4. Uma Rao, K. & Pallavi, A. *The 8051 Microcontrollers*. Pearson Ed. 2009.

DAV UNIVERSITY, JALANDHAR

Course Title: Digital Memory Systems

Course Code: ECE334

L	T	P	Credits
4	0	0	4

Course Objective:

To learn and understand digital memory systems, organization, applications in computers and digital systems.

Learning Outcome:

- Understand the classifications of memories- ROM, RAM, Volatile and Non-volatile memories.
- Understand the basic memory organization.
- Enable the students to know computer memory systems- memory hierarchy and cache configurations.
- Overall coverage of semiconductor, magnetic and optical memories.

SECTION-A

Introduction

Memory Classification based on size, timing, access pattern, I/O architecture, and Application. Memory Architectures and building blocks.

SECTION–B

Non-volatile semiconductor memories

Read only memories: ROM cells, programming the ROM, NAND ROM, NOR ROM.

Non-volatile Read-Write Memories: Floating gate transistor, EPROM, EEPROM (E^2PROM), Flash EEPROM (Flash)

SECTION –C

Volatile semiconductor memories in computers

SRAM – SRAM cell, Operation, Read and Write mechanism, advantages. Computer memory hierarchy – Need, Cache memory (SRAM), different cache configurations, hit rate, access times, direct mapped and set-associative cache configurations.

SECTION–D

DRAM – DRAM cell, Operation, Read-Write mechanisms, charge leakage and refreshing mechanism.

Magnetic Memories: Floppy Disk Drives (FDD), Hard Disk Drives (HDD), their working principle, data encoding, read-write heads, physical organization of disks.

Optical Memories: CD, DVD, Blue-Ray technology: Read/Write mechanisms, R/W speed, data capacity, data organization on tracks and sectors.

References:

1. John L. Hennessy, David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan-Kaufman, Fifth edition, 2012.
2. Bruce Jacob, Spencer W.Ng., "Memory Systems- Cache, DRAM, Disk", Elsevier, 2008.
3. J. Rabaey, A. Chandrakasan, B. Nikolic, "Digital Integrated Circuits – A Design Perspective", 2nd Edition, PHI, 2013.

DAV UNIVERSITY, JALANDHAR

Course Title: Information Theory and Coding

Course Code: ECE422

L	T	P	Credits
4	0	0	4

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

- Understand the concept of information and entropy
- Understand Shannon's theorem for coding
- Calculation of channel capacity
- Apply coding techniques

Section-A

Basics of information theory, entropy for discrete ensembles; Shannon's noiseless.

Section-B

Coding theorem; encoding of discrete sources, Fixed and Variable length source codes, optimized coding

Section-C

Markov sources; Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels.

Section-D

Techniques of coding and decoding; Huffman codes and uniquely detectable codes; Cyclic codes, convolutional arithmetic codes.

Text/Reference Books:

1. N. Abramson, Information and Coding, McGraw Hill, Latest Edition
2. M. Mansurpur, Introduction to Information Theory, McGraw Hill, Latest Edition
3. R.B. Ash, Information Theory, Prentice Hall, Latest Edition
4. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, Latest Edition

Course Title: Optical Fibre Communication

Course Code: ECE432

L	T	P	Credits
4	0	0	4

Course Objective:

To expose the basics of optical devices and components. To expose various optical fibre modes configurations and various signal degradation factors associated with optical fibre and to the design simple optical communication system.

Learning Outcomes:

This course will help the students

- To understand all Optical devices and components.
- To understand the principles of fibre-optic communications and the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
- To design the optical communication system.

Section-A

Introduction **(10 hours)**

Need of Fibre Optic Communications, Evolution of Light wave Systems, Basic Concepts; Analog & Digital Signals, Optical Fibres as a Communication Channel, Optical Transmitters, Optical Receivers.

Optical Fibres **(8 hours)**

Geometrical-Optics Description; Step-Index Fibres, Graded Index Fibres, Single-Mode-Fibres, Fibre Losses; Attenuation Coefficient, Material Absorption, Rayleigh scattering, wave guide Imperfections, Fibre Manufacturing; Design Issues, Fabrication Methods, Cables and Connectors

Section-B

Optical Transmitters **(12 hours)**

Basic Concepts; Emission and Absorption Rates, p-n Junctions, Non radiative Recombination, Semiconductor Materials, Light Emitting Diodes; Power-current Characteristics, LED spectrum, Modulation Response, LED Structures, Semi-Conductor Lasers

Section-C

Optical Receivers **(14 hours)**

Basic concepts, p-n Photo Diodes, p-i-n Photo Diodes, Avalanche Photo Diode, MSM Photo detector, Receiver Design, Receiver Noise; Noise mechanism, Receiver sensitivity; Bit error rate, Minimum Receiver Power, Sensitivity Degradation, Receiver Performance.

Section-D

Light Wave Systems **(10 hours)**

System Architecture, Loss limited Light wave systems, Dispersion limited Light wave systems, Power Budget, Long Haul systems, Sources of Power Penalty; Model Noise,

Multi-channel Systems **(6 hours)**

WDM Light wave systems, Optical TDM Systems, Subscriber Multiplexing, and Code Division Multiplexing.

References

1. Maenbaev & Scheiner. *Fiber optic Communications Technology.* Pearson Publications
2. Senior J. *Optical Fiber Communications Principles & Practice*. PHI.
3. Keiser, G. *Optical Fiber Communication*. McGraw Hill.

Course Title: Virtual Instrumentation

Course Code: ECE331

L	T	P	Credits
4	0	0	4

Course Objective

To enable the students to understand basics, programming techniques, data acquisition and interfacing techniques of virtual instrumentation and to use VI for different applications.

Learning Outcomes

- The students will be able to familiarize the basics and need of VI.
- The students will be able to learn LabVIEW software basics.
- To get better understanding of data acquisition techniques.
- The students can have an exposure to different interfacing techniques.
- The students can able to design some real time application using LabVIEW software.

Section-A

Virtual Instrumentation (12 hours)

Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

VI Programming Techniques (12 hours)

VIS and sub-VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, local and global variable, string & file input.

Section-B

Data acquisition basics (12 hours)

Introduction to data acquisition on PC, Sampling fundamentals, Input/output techniques and buses. ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation, Simple applications using NI MyDAQ and NI ELVIS.

Section-C

LabVIEW in signal processing (12 hours)

Waveform Generation, Sampling, Quantization, Aliasing, Signal Reconstruction. Fourier transforms, Power spectrum, Correlation methods, windowing & flittering. Digital Filter Design, IIR/FIR Filtering system Design, Adaptive Filter design.

Section-D

Frequency domain processing (12 hours)

Discrete Fourier Transform and Fast Fourier Transform, STFT, Wavelet Transform, Signal Processing applications.

References

1. Sumathi & P.Surekha. *LabVIEW based Advanced Instrumentation.* Springer, 2007.
2. Jerome, Jovitha. *Virtual Instrumentation Using LabVIEW*. PHI Learning Pvt. Ltd, 2010.
3. Cory L.Clark. Labview *Digital Signal Processing and Digital Communication*.
4. Herbert. A. J. *The structure of Technical English.* Orient Longman, 1995

DAV UNIVERSITY, JALANDHAR

Course Title: MEMS Fundamentals

Course Code: ECE431

L	T	P	Credits
4	0	0	4

Course Objective:

This course is offered to students to gain basic knowledge on MEMS (Micro Electro Mechanical System) and various fabrication techniques. This enables them to design, analyze, fabricate and test the MEMS based components.

Learning Outcomes:

This course will lead the students to learn

- MEMS and micro fabrication.
- Essential electrical and mechanical concepts of MEMS.
- Various sensing and actuating technique.
- The polymer and optical MEMS.

Section-A

Introduction to MEMS and Micro Fabrication (12 hours)

History of MEMS Development, Characteristics of MEMS, Miniaturization, Microelectronics integration, Mass fabrication with precision, Sensors and Actuators, Energy domain, Micro fabrication, microelectronics fabrication process, Silicon based MEMS processes, New material and fabrication processing, Points of consideration for processing. Anisotropic wet etching, Isotropic wet etching, Dry etching of silicon, deep reactive ion etching (DRIE), and Surface micromachining process, structural and sacrificial material.

Electrical and Mechanical concepts of MEMS (12 hours)

Conductivity of semiconductors, crystal plane and orientation, stress and strain , definition , Relationship between tensile stress and strain, mechanical properties of Silicon and thin films, Flexural beam bending analysis under single loading condition, Types of beam, longitudinal strain under pure bending , deflection of beam, Spring constant, torsional deflection, intrinsic stress, resonance and quality factor.

Section-B

Electrostatic and thermal principle sensing and actuation (12 hours)

Electrostatic sensing and actuation, Parallel plate capacitor , Application, Inertial, pressure and tactile sensor parallel plate actuator, comb drive, Thermal sensing and Actuations, Thermal sensors, Actuators, Applications Inertial, flow and infrared sensors.

Section-C

Piezoresistive, piezoelectric and magnetic principle sensors and actuator (12 hours)

Piezoresistive sensors, Piezoresistive sensor material, stress in flexural cantilever and membrane, Application, Inertial, pressure, flow and tactile sensor, Piezoelectric sensing and actuation, piezoelectric material properties, quartz, PZT, PVDF, ZnO, Application, Inertial, Acoustic, tactile, flow, surface elastic waves Magnetic actuation, Micro magnetic actuation principle, Deposition of magnetic materials, Design and fabrication of magnetic coil.

Section-D

Polymer and Optical MEMS (12 hours)

Polymers in MEMS, polymide, SU, 8 Liquid crystal polymer(LCP), PDMS, PMMA, Parylene , Flurocorbon, Application, Acceleration, pressure, flow and tactile sensors, Optical MEMS, passive MEMS optical components, lenses, mirrors, Actuation for active optical MEMS.

References

1. Chang Liu. *Foundations of MEMS.* Pearson Indian Print. 2012 1st Edition.
2. Rebiz, Gaberiel M. *RF MEMS Theory,Design and Technology.* John Wiley & Sons, 2003.
3. Charles P. Poole and Frank J. Owens. *Introduction to Nanotechnology.* John Wiley & Sons, 2003.
4. Gardner, Julian W and Vijay K Varadhan. *Microsensors, MEMS and Smart Devices.* John Wiley & sons, 2001.

DAV UNIVERSITY, JALANDHAR

Course Name: Biomedical Signal Processing

Course Code: ECE435

L	T	P	Credits
4	0	0	4

Course Objectives:

This course presents the fundamentals of digital signal processing with particular emphasis on problems in biomedical research and clinical medicine. It covers principles and algorithms for processing both deterministic and random signals. Topics include data acquisition, filtering, coding, feature extraction, and modelling. This course provides practical experience in processing physiological data, with examples from cardiology and neurology.

Learning Outcomes: After completion of the course, students will be able to learn:

- Recording of 12 lead ECG used in clinical practice
- Interpretation of ECG printed on graph paper
- EEG data recording using 10-20 electrode system
- Physiological data acquisition and interpretation
- Filtering for removal of undesired artifacts in bio-electrical signals

Section A (12 H)

Introduction to biomedical Signals: The nature of biomedical signals, examples of biomedical signals, objectives of biomedical signal analysis, difficulties in biomedical signal analysis, computer-aided diagnosis.

Cardio logical Signal Processing: Basic electrocardiography; ECG data acquisition; ECG lead system; ECG parameters and their estimation; Use of multi-scale analysis for parameters estimation of ECG waveforms

Section B (12 H)

Filtering for removal of artifacts in ECG: Time-domain Filters, Frequency domain filters, Adaptive Noise Cancelling: Adaptive noise canceller; Cancellation of 60 Hz interference in electrocardiography, cancelling donor heart interference in heart –transplant electrocardiography, cancellation of the electrocardiography signal from the electrical activity of the chest muscles, cancelling method to enhance Fetal ECG monitoring, ECG Recording and Analysis: Long term continuous ECG recording; The wavelet approximation- discrete wavelet series; Discrete wavelet transform (DWT); Multi-resolution analysis; Pyramid algorithm.

Section C (12 H)

Neurological Signal Processing: The Brain and its potentials; The Electrophysiology origin of brain waves; the EEG Signal and its characteristics; EEG analysis; Linear prediction theory; The autoregressive (AR) method; Transient detection and elimination-the case of epileptic patients. Adaptive Filter and Algorithm: A Review of the Wiener filtering problem; Principle of an adaptive filter; Steepest – descent algorithm; Windrow-hoff least –mean-square adaptive algorithm.

Event Detection: The P, QRS, and T waves in the ECG, The first and second heart sounds, The dichotic notch in the carotid pulse, EEG rhythms, waves, and transients, Derivative-based methods for QRS detection, Integer filters, The Pan-Tompkins algorithm for QRS detection, Detection of the dichotic notch.

Section D (12 H)

Frequency-domain Characterization: The Fourier Spectrum, Estimation of the Power Spectral Density Function, The periodogram, The use of windows: Spectral resolution and leakage, Estimation of the autocorrelation function, Autoregressive modeling based power spectrum estimation.

HRV and Arrhythmia analysis: Heart rate variability-definition; comparison of short-term and long term HRV analysis; Time domain and spectral domain parameters of short term recording.

References:

1. Rangaraj M Rangayyan**. "**Biomedical signal analysis: a case-study approach". ; Wiley-Interscience. 2002
2. Reddy D C. "Modern Biomedical Signal Processing – Principles and Techniques", TMH, New Delhi, 2005
3. Akay M. "Biomedical Signal Processing", Academic press, California, 1994.
4. Tompkins W J "Biomedical Signal Processing", Prentice hall of India, New Delhi, 1999.
5. Bronzino J D "The Biomedical Engineering handbook", CRC and Free press, Florida, 1995.

DAV UNIVERSITY, JALANDHAR

Course Name: Audio and speech processing

Course Code: ECE436

L	T	P	Credits
4	0	0	4

Course Objective: To provide students with the knowledge of basic characteristics of speech signal in relation to production and hearing of speech by humans. To describe basic algorithms of speech analysis common to many applications. To give an overview of applications (recognition, synthesis, coding) and to inform about practical aspects of speech algorithms implementation.

Learning Outcomes:

- The students will get familiar with basic characteristics of speech signal in relation to production and hearing of speech by humans.
- They will understand basic algorithms of speech analysis common to many applications.
- They will be given an overview of applications (recognition, synthesis, coding) and be informed about practical aspects of speech algorithms implementation.

Section A (12 H)

Digital Models for the Speech Signal: Process of speech production, Acoustic theory of speech production, Lossless tube models, and Digital models for speech signals

Time Domain Models For Speech Processing: Time dependent processing of speech, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using energy & zero crossings, Pitch period estimation, Short time autocorrelation function, Short time average magnitude difference function, Pitch period estimation using autocorrelation function, Median smoothing

Section B (12 H)

Digital Representations of the Speech Waveform: Sampling speech signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation, Differential PCM, Comparison of systems, direct digital code conversion.

Short Time Fourier analysis: Linear Filtering interpretation, Filter bank summation method, Overlap addition method, Design of digital filter banks, Implementation using FFT, Spectrographic displays, Pitch detection, Analysis by synthesis, Analysis synthesis systems

Section C **(12 H)**

Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters, Applications. Speech Enhancement: Spectral subtraction & filtering, Harmonic filtering, parametric re-synthesis, Adaptive noise cancellation

Section D **(12 H)**

Speech Synthesis: Principles of speech synthesis, Synthesizer methods, Synthesis of intonation, Speech synthesis for different speakers, Speech synthesis in other languages, Evaluation, Practical speech synthesis. Automatic Speech Recognition: Introduction, Speech recognition vs. Speaker recognition, Signal processing and analysis methods, Pattern comparison techniques, Hidden Markov Models, Artificial Neural Networks.

References:

1. L. R. Rabiner and R. W. Schafer, "Digital Processing of Speech Signals", Pearson Education (Asia) Pte. Ltd., Latest Edition.
2. D. O'Shaughnessy, "Speech Communications: Human and Machine", University Press, Latest Edition.
3. L. R. Rabiner and B. Juang, "Fundamentals of Speech Recognition", Pearson Education (Asia) Pte. Ltd., Latest Edition.
4. Ben gold and Nelson Morgan, "Speech and audio signal processing", processing and perception of speech and music, Wiley- India Edition, 2006 Edition

DAV UNIVERSITY, JALANDHAR

Course Title: CMOS Circuit Design

Course Code: ECE434

L	T	P	Credits
4	0	0	4

Course Objective:

Learn, Understand and acquire ability to design CMOS Logic Circuits.

Learning Outcome:

- Understand the Physics of MOS device.
- Understand the CMOS process technology.
- Ability to design layout of CMOS circuits.
- Understand the characteristics of CMOS circuits.
- Ability to understand the basic difference between static and dynamic CMOS logic circuits.
- Understand CMOS transmission gates, latches and registers.

Section-A

Introduction

Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy. MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication.

Section-B

MOS Transistor

MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET Current/ Voltage Characteristics, Scaling and Small geometry effects and capacitances.

MOS Inverters

Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter. Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.

Section-C

Combinational MOS Logic Circuits

Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates).

Sequential MOS Logic Circuits

Introduction, behavior Bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.

Section-D

Dynamic logic circuits

Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic.

Low – Power CMOS Logic Circuits

Introduction, Overview of Power Consumption

References:

1. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.
2. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed.
3. W. Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

DAV UNIVERSITY, JALANDHAR

Course Title: Nano Electronics

Course Code: ECE437

L	T	P	Credits
4	0	0	4

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

- Understand various aspects of nano-technology and the processes involved in making nano components and material.
- Leverage advantages of the nano-materials and appropriate use in solving practical problems.
- Understand various aspects of nano-technology and the processes involved in making nano components and material.
- Leverage advantages of the nano-materials and appropriate use in solving practical problems.

Section-A

Introduction to nanotechnology, meso structures, Basics of Quantum Mechanics: Schrodinger equation, Density of States. Particle in a box Concepts, Degeneracy. Band Theory of Solids.

Section-B

Kronig-Penny Model. Brillouin Zones. Shrink-down approaches: Introduction, CMOS Scaling, The nano-scale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.),

Section-C

Resonant Tunnelling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics.

Section-D

Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation

Text/ Reference Books:

1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, 2009.
2. W. Ranier, Nanoelectronics and Information Technology (Advanced Electronic Material and Novel Devices), Wiley-VCH, 2003.
3. K.E. Drexler, Nanosystems, Wiley, 1992.
4. J.H. Davies, The Physics of Low-Dimensional Semiconductors, Cambridge University Press, 1998.
5. C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley, 2003

Course Title: Wireless Communication

Course Code: ECE442

L	T	P	Credits
4	0	0	4

Course Objective:

To introduce students to the concepts of wireless systems and mobile systems.

Learning Outcomes:

To understand and gain complete knowledge about

- Basic wireless, cellular concepts.
- Radio wave propagation and Mobile Channel models.
- Various performance analysis of mobile communication system
- Standards 1G, 2G Basic system available.

Section-A

Introduction (10 hours)

Mobile Radio Systems around the world, Examples of Wireless Communication Systems; Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems, Comparison of common Wireless Communication systems

Digital Communication through fading multipath channels (10 hours)

Fading channel and their characteristics- Channel modelling, Digital signaling over a frequency non selective slowly fading channel- frequency selective slowly fading channel- Calculation of error probabilities- Tapped Delay line model- The RAKE demodulator- performance-Concept of diversity branches and signal paths- Combining methods- Selective diversity combining-pre-detection and post-detection combining- Switched combining- maximal ratio combining- Equal gain combining.

Section-B

Multiple Access Techniques for Wireless Communications (7 hours)

Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access, Packet Radio Protocols; Pure ALOHA, Slotted ALOHA, Capacity of Cellular Systems

Wireless Networking (10 hours)

Introduction, Difference between Wireless & Fixed Telephone Networks, Development of Wireless Networks, Traffic Routing in Wireless Networks, Wireless Data Services, Common Channel signaling,

broad band ISDN & ATM, Signaling System No. 7(SS-7), Personal Communication Services/ Networks, Protocols for Network Access, Network Databases.

Section-C

Wireless Systems & Standards (10 hours)

AMPS and ETACS, United States digital cellular (IS- 54 & IS 136), Global system for Mobile (GSM); Services, Features, System Architecture, and Channel Types, Frame Structure for GSM, Speech Processing in GSM, CDMA Digital standard (IS 95); Frequency and Channel specifications, Forward CDMA Channel, Reverse CDMA Channel, CT2 Standard for Cordless Telephones, Personal Access Communication System, Pacific Digital Cellular, Personal Handyphone Systems, PCS and ISM Bands, Wireless Cable Television.

Section-D

Wireless Local Area Networks (WLAN) (10 hours)

Components and working of WLAN, transmission media for WLAN, Modulation techniques for WLAN (DSSS, FHSS), IEEE802.11 standards and protocols for WLAN (MACA, MACAW). Mobile Network and Transport layer: Mobile IP, Mobile TCP, traffic routing in wireless networks, wireless ATM. Wireless Local Loop (WLL), WLL Architecture, WLL Technologies and frequency spectrum.

Future trends (3 hours)

Blue Tooth technology, 4G mobile techniques, Wi-Fi Technology.

References:

1. Rappaport, Theodore S. *Wireless communications: Principles and practice*. Pearson Education
2. Pandya, Raj. *Mobile and Personal Communication systems and services.* Prentice Hall of India

Course Title: Telecommunication Switching and Networks

Course Code: ECE472

L	T	P	Credits
4	0	0	4

Course Objective:

To introduce fundamentals functions of a telecom switching office, namely, digital multiplexing, digital switching and digital subscriber access.

Learning Outcomes

- Student will understand the concepts of Frequency and Time division multiplexing.
- Student will understand digital multiplexing and digital hierarchy namely SONET / SDH

Section-A

Multiplexing: Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Biphase, Differential Encoding, Time Division Multiplexing, Time Division Multiplex Loops and Rings, SONET/SDH: SONET Multiplexing Overview, SONET Frame Formats, SONET Operations, Administration and Maintenance, Payload Framing and Frequency Justification, Virtual Tributaries, DS3 Payload Mapping, E4 Payload Mapping, SONET Optical Standards, SONET Networks. SONET Rings: Unidirectional Path-Switched Ring, Bidirectional Line-Switched Ring.

Section-B

Digital Switching: Switching Functions, Space Division Switching, Time Division Switching, two-dimensional Switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SS7 signaling.

Network Synchronization Control and Management: Timing: Timing Recovery: Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S. Network Synchronization, Network Control, Network Management.

Section-C

Digital Subscriber Access: ISDN Basic Rate Access Architecture, ISDN U Interface, ISDN D Channel Protocol. High-Data-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line, VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop, Hybrid Fiber Coax Systems, Voice band Modems: PCM Modems, Local Microwave Distribution Service, Digital Satellite Services.

Section-D

Traffic Analysis: Traffic Characterization: Arrival Distributions, Holding Time Distributions, Loss Systems, Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow Traffic, Delay Systems: Exponential service Times, Constant Service Times, Finite Queues

References

1. J. Bellamy, "Digital Telephony", John Wiley, 2003, 3rd Edition.
2. JE Flood, "Telecommunications Switching, Traffic and Networks", Pearson

Course Title: Electronic Sensors and Transducers

Course Code: ECE441

L	T	P	Credits
4	0	0	4

Course Objective:

To impart knowledge on various types of sensors and transducers, for the automation in science, engineering and medicine.

Learning outcomes:

The study of this course will lead to

- Understanding the basic concepts of various sensors and transducers.
- Develop knowledge in selection of suitable sensor based on requirement and application.

Section-A

Introduction **(12 hours)**

Definition, classification, static and dynamic parameters, Characterization , Electrical, mechanical, thermal, optical, biological and chemical, Classification of errors , Error analysis, Static and dynamic characteristics of transducers, Performance measures of sensors.

Mechanical and electromechanical sensors **(12 hours)**

Resistive potentiometer, strain gauge, Inductive sensors and transducer, capacitive sensors, ultrasonic sensors.

Section-B

Thermal and radiation sensor **(12 hours)**

Thermal Sensors: Gas thermometric sensors, acoustic temperature sensors, magnetic thermometer, resistance change -type thermometric sensors, thermo emf sensors, junction semiconductor types, Thermal radiation sensors, spectroscopic thermometry, Radiation Sensors: Photo detectors, photovoltaic and photo junction cells, photo sensitive cell, photo FETs and other devices.

Section-C

Magnetic and electro-analytical sensor **(12 hours)**

Magnetic Sensors: Force and displacement measurement, magneto resistive sensors, Hall Effect sensor, Inductance and eddy current sensors, Angular/rotary movement transducer, Electromagnetic flow meter, squid sensor. Electro-analytical Sensors: Electro chemical cell, cell potential, sensor electrodes, electro ceramics in gas media, chemFET.

Section-D

Sensors and their applications **(12 hours)**

Automobile sensor, Home appliance sensor, Aerospace sensors, sensors for manufacturing, medical diagnostic sensors and environmental monitoring.

References

1. Patranabis, D. *Sensor and Actuators.* Prentice Hall of India (Pvt) Ltd., 2006.
2. Ian Sinclair. Sensor and Transducers. Elsevier India Pvt Ltd, 2011, 3rd Edtion.
3. Sawhney.A.K, Puneeth sawhney. *A Course in Electrical and Electronic Measurements and Instrumentation.* Dhanpat Rai Publications, 2012.
4. Ernest O. Doeblin. *Measurement System, Application and Design*. Tata McGraw Hill Publishing Company Ltd., 2008, 5th Edition.

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Course Title: Remote Sensing

Course Code: ECE471

L	T	P	Credits
4	0	0	4

Course Objective:

- To provide exposure to students in gaining knowledge on concepts and applications leading to modelling of earth resources management using Remote Sensing
- To acquire skills in storing, managing digital data for planning and development.

Learning Outcomes:

- Fully equipped with concepts, methodologies and applications of Remote Sensing Technology.
- Acquire skills in handling instruments, tools, techniques and modeling while using Remote Sensing Technology
- It empowers the candidate with confidence and leadership qualities.

Section-A

Remote Sensing : Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra-Red (IR), Near IR, Middle IR, Thermal IR and Microwave – Black Body Radiation - Planck's law – Stefan-Boltzman law.

Section-B

EMR interaction with atmosphere and earth materials: Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy. Reflectance – Specular and Diffuse Reflection Surfaces- Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface: Imaging spectrometry and spectral characteristics.

Section-C

Optical and Microwave Remote Sensing: Satellites - Classification – Based on Orbits and Purpose – Satellite Sensors - Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners– Description of Sensors in Landsat, SPOT, IRS series – Current Satellites - Radar – Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics; Sonar remote sensing systems.

Section-D

Geographic Information System: GIS – Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection - Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters

Miscellaneous Topics: Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications- Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems. Global positioning system – an introduction.

References:

1. M.G. Srinivas(Edited by), Remote Sensing Applications, Narosa Publishing House, 2001. (Units 1 & 2).
2. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications 2001 (Units 3, 4 & 5).

Course Title: Multirate Systems and Filter Banks

Course Code: ECE443

L	T	P	Credits
4	0	0	4

Course Objective:

The aim of this course is to introduce the idea of filter banks and wavelets and to describe the manner in which technical developments related to wavelets have led to numerous applications

Learning Outcomes:

After completing this course the student will be able to understand

- The design of various digital filters and multirate filters
- Design of perfect reconstruction filter banks for various applications
- Discrete Wavelet transform and its filter banks implementation
- Filter banks for Bio-signal analysis and audio and speech processing

Section-A

Introduction: Review of discrete time systems, review of digital filters, filter design specifications, FIR filter design and IIR filter design.

Fundamentals of Multirate systems: Basic multirate operations, Interconnection of Building blocks, the polyphase representation, multistage implementations, applications of multirate systems.

Section-B

Maximally Decimated Filter Banks: QMF filter banks, Errors created in QMF filter bank, A simple Alias free QMF system, Power symmetric QMF filter banks, M-channel filter banks, polyphase representation, perfect reconstruction systems

Section-C

Para-unitary Perfect Reconstruction filter banks: Lossless transfer matrices, Filter bank properties introduced by para-unitariness, Two channel FIR Para-unitary QMF filter banks

Cosine Modulated filter bank: The pseudo QMF filter bank, Design of pseudo QMF bank, Cosine modulated perfect reconstruction systems

Section-D

The wavelet transform and its relation to filter banks: The short time Fourier transform, the wavelet transform, discrete time orthogonal wavelets, continuous time orthonormal wavelet basis.

References

1. P. P. Vaidyanathan, Multirate Systems and Filter Banks• , Pearson Education, Low Price Edition

2. K. P. Soman, K. I. Ramachandran, "Insight Into Wavelets - From Theory to Practice", Prentice Hall of India, Eastern Economy Edition, Prentice Hall of India Private Limited, M-97, Connaught Circus, New Delhi - 110 001, Copyright 2004, ISBN Number 81-203-2650-4.

Course Title: Wavelet Theory and Applications

Course Code: ECE473

L	T	P	Credits
4	0	0	4

Course Objectives: The objective of this course is to establish the theory necessary to understand and use wavelets and related constructions. A particular emphasis will be put on constructions that are amenable to efficient algorithms, since ultimately these are the ones that are likely to have an impact.

Learning Outcomes:

- To gain ability to analyse CWT and DWT.
- To gain ability to understand the applications of wavelet theory

Section-A

Continuous Wavelet Transform Introduction, Continuous-time wavelets, Definition of the CWT, the VWT as a Correlation, Constant-Factor Filtering Interpretation and Time-Frequency Resolution, the VWT as an Operator, Inverse CWT, Problems.

Section-B

Introduction to Discrete Wavelet Transform and Orthogonal Wavelet Decomposition: Introduction, Approximation of Vectors in Nested Linear Vector Subspaces, Examples of an MRA, Problems.

Section-C

MRA, Orthonormal Wavelets, And Their Relationship To Filter Banks: Introduction, Formal Definition of an MRA, Construction of General Orthonormal MRA, a wavelet Basic for the MRA, Digital Filtering Interpretation, Examples of Orthogonal Basic Generating Wavelets, Interpreting Orthonormal MRAs for Discrete-Time signals, Miscellaneous Issues Related to PRQME Filter Banks, generating Scaling Functions and wavelets from Filter Coefficient, Problems.

Section-D

Wavelet Transform And Data Compression: Introduction, Transform Coding, DTWT for Image Compression, Audio Compression, And Video Coding Using Multi-resolution Techniques: a Brief Introduction.

References:

1. James S. Walker, “A Primer on Wavelets and their Scientific Applications”, CRC Press, (1999).

2. Rao, “Wavelet Transforms”, Pearson Education, Asia.
3. C. Sidney Burrus, Ramesh A. Gopinath, “Introduction to Wavelets and Wavelets Transforms”, Prentice Hall, (1997).

Course Title: Digital Computer Design

Course Code: ECE444

L	T	P	Credits
4	0	0	4

Course Objective:

To study the basic structure of a digital computer and to discuss in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

Learning Outcome:

- Understanding of the basic structure and operation of a digital computer.
- Details of the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication &division.
- Details of the different types of control and the concept of pipelining.
- Hierarchical memory system including cache memories and virtual memory.

UNIT A

INTRODUCTION (9 hours)

Evolution of Computers, VLSI Era, System Design- Register Level, Processor Level, CPU Organization, Data Representation, Fixed – Point Numbers, Floating Point Numbers, Instruction Formats, Instruction Types, Addressing modes.

DATA PATH DESIGN (9 hours)

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson Algorithm, Booth's algorithm, non-restoring division algorithm, Floating Point Arithmetic, Pipeline Processing, Modified booth's Algorithm

UNIT B

CONTROL DESIGN (9 hours)

Hardwired Control, Micro programmed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control, Instruction Pipelines, Pipeline Performance, and Superscalar Processing

UNIT C

MEMORY ORGANIZATION (9 hours)

Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical

Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

UNIT D

SYSTEM ORGANIZATION(9 HRS)

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, IO and system control, IO

interface circuits, Handshaking, DMA and interrupts

References:

1. John P.Hayes, "Computer architecture and Organisation", Tata McGraw-Hill, Third edition, 2012.
2. Carl.V. Hamacher, Zvonko Varanesic.G. and Safat G.Zaky, "Computer Organisation", V Edition,

   Reprint 2012,Tata McGraw-Hill Inc.
3. Morris Mano, "Computer System Architecture", Third Edition,Prentice-Hall of India, 2000.
4. Paraami, "Computer Architecture", Eighth impression, 2011, Oxford Press.
5. Pal Chaudhuri. P, "Computer organization and design", 2nd Edition, Prentice Hall of India, 2007

Course Title: Advanced Communication System

Course Code: ECE501

L	T	P	Credits
4	0	0	4

Course Objective: The course considers advanced communication systems and techniques. In this course we will introduce some of the basic mathematical concepts that will allow us to think in the two "domains" of communications, the time domain and the frequency domain. We will cover the types of analog to analog modulation, analog to digital modulation, digital to analog modulation, digital to digital modulation from both a mathematical description and from a block-diagram system approach.

Learning Outcomes: The scope of this course is to provide the complete analysis of Analog, pulse & digital communication over analog as well as digital channels. This knowledge helps them to acquire better application of these principles in higher end communication systems. The overall objective is to introduce the student to the basics of communication. This course emphasizes:

- Analog to analog modulation and demodulation techniques.
- Acquiring mathematical understanding of Communication Systems.
- Understanding the trade-offs (in terms of bandwidth, power, and complexity requirements)
- Performance evaluation of communication systems in the presence of noise.
- Design of practical communication system at the block diagram level under certain constraints and requirements.

Section A

Generalized Communication Systems (10 Hrs)

Introduction, generalized block diagram of communication system, Superhetrodyne & Tuned Radio Frequency Receiver, review of analog communication system: Amplitude modulation, DSB-SC, SSB-SC, SSB-PC/RC, VSB, ISB, Frequency modulation, amplitude, frequency spectrum, power calculations, band width calculations etc. electromagnetic frequency spectrum, bandwidth, information capacity and noise.

Digital Transmission Part 1 (10 Hrs)

Introduction, Pulse modulation, Sampling, PAM: Natural and Flat top, PAM Transmitter & Receiver, PWM: Transmitter and Receiver, PPM: Transmitter and Receiver, Difference in PAM, PWM, and PPM.

Section B

Digital Transmission Part 2 (10 Hrs)

PCM, PCM Sampling, Signal to Quantization noise ratio, Linear & non-linear, PCM codes, coding methods, Companding: A-Law, μ- law, Digital companding, Delta modulation, Adaptive delta modulation, differential PCM, inter symbol interference, eye patterns.

Digital Modulation (10 Hrs)

Introduction, information capacity bits, bit rate, baud & M-ary encoding, ASK, FSK, PSK, BPSK, QPSK, 8PSK, 16 PSK, QAM, 8 QAM, 16 QAM, Bandwidth efficiency, DPSK, Trellis code modulation, Probability of error, error performance

Section C

Digital Baseband Transmission (10 Hrs)

Introduction, introduction to discrete PAM signals, Line coding and its properties. Various PAM formats for line codes, RZ, NRZ and Manchester coding. HDB, B8ZS (unipolar and Bipolar)

Section D

Data Communications (10 Hrs)

Introduction, data communication codes, error control, error detection, error correction, character synchronization, ISDN, ATM

References:

1. Tomasi, Wayne. *Electronic Communication Systems*. Pearson, 2013
2. Proakis. *Digital Communication.* PHI, 2012.
3. Lathi, BP. *Modern Digital and Analog Communications systems*. Oxford, 2013
4. Haykin, Simon. *Communication Systems*. John wiley & Sons, 2011
5. Related IEEE/IEE publications.

Course Title: Advanced Optical Communication

Course Code: ECE502

L	T	P	Credits
4	0	0	4

Course Objective: To expose basics of Optical devices and components. To expose various optical fibre modes configurations and various signal degradation factors associated with optical fiber and to the design simple optical communication system.

Learning Outcomes: This course will help the students

- To understand all Optical devices and components.
- To understand the principles of fiber-optic communications and the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
- To design the optical communication system.

Section A

Introduction (8 Hrs)

Evolution of optical communication systems, elements of optical fiber transmission link, Comparison of optical communication systems with other contemporary communication systems.

Optical Fibers & Signal Degradation (8 Hrs)

Basics of optical fibers, Attenuation and dispersion effects in single mode and multimode optical fibers.

Section B

Optical Fibers & Signal Degradation (8 Hrs)

Control of dispersion in single mode & multimode fibers

Transmitter Receivers & Modulators (7 Hrs)

Light emitting diodes, laser diodes, their structures, efficiency of laser diodes, functional block diagram & typical circuits of transmitter. PIN & APD photodiodes noise sources in photo detectors, SNR and noise equivalent power, sensitivity & quantum limit of receivers

Section C

Transmitter Receivers & Modulators (7 Hrs)

Functional block diagram and typical circuits of a receiver, decision circuit design, Electro-optic, electro-absorption & acousto-optic external modulators.

Digital Transmission Systems (8 Hrs)

Point to Point link, system considerations, link power, budget & rise time budget analysis, Line coding techniques, NRZ, RZ, Manchester etc., eye pattern analysis.

Section D

WDM Base Optical Communication System (7 Hrs)

Introduction to wavelength division multiple access, Receiver & transmitter requirements in WDM networks, Repeaters & amplifiers, Erbium doped fiber amplifier (EDFA).

Passive Components for WDM Based Systems (7 Hrs)

Couplers & splitters, FBT couplers, WDM multiplexer & de-multiplexers fixed & tunable filters, isolators, circulators & attenuators, Optical switches & wavelength converters

References:

1. Keiser, G. *Optical Fiber Communications*. McGraw Hill, 2009.
2. Myanbaev, D.K. & Lowell L. Scheiner. *Fiber Optic Communication Technolog.* Pearson Education Asia, 2008.
3. Agrawal, G.P. *Nonlinear Fiber Optics.* Academic Press, 2009.
4. Senior, J.M. *Optical Fiber Communications*. Prentice Hall India, 2008.

Course Title: Advanced Digital Signal Processing
Course Code: ECE506

L	T	P	Credits
4	0	0	4

Course Objective:
To introduce the student to advanced digital signal processing techniques.

Learning Outcomes:

- To study the parametric methods for power spectrum estimation.
- To study adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- To study multi-rate signal processing fundamentals.
- To study the spectral estimation of various signals.
- To introduce the student to applications of Signal Processing

Section A

Review of Signal Processing
Overview of DSP, Characterization in time and frequency, FFT Algorithms, Digital filter design and structures: Basic FIR/IIR filter design &structures, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, FIR/IIR Cascaded lattice structures, and Parallel all pass realization of IIR.

Section B

Multi Rate Signal Processing
Multi rate DSP, Decimators and Interpolators, Sampling rate conversion, multistage decimator & interpolator, poly phase filters, QMF, digital filter banks, Applications in subband coding.

Autoregressive modelling
Linear prediction & optimum linear filters, stationary random process, forward-backward linear prediction filters, solution of normal equations, AR Lattice and ARMA Lattice-Ladder Filters, Wiener Filters for Filtering and Prediction.

Section C

Adaptive Signal Processing
Adaptive Filters, Applications, Gradient Adaptive Lattice, Minimum mean square criterion, LMS algorithm, Recursive Least Square algorithm

Spectral Estimation

Estimation of Spectra from Finite-Duration Observations of Signals. Nonparametric Methods for Power Spectrum Estimation, Parametric Methods for Power Spectrum Estimation, Minimum Variance Spectral Estimation, Eigen analysis Algorithms for Spectrum Estimation.

Applications of DSP

Section D

Applications of Signal Processing

Application of DSP & Multi rate DSP, Application to Radar, introduction to wavelets, application to image processing, design of phase shifters, DSP in speech processing & other applications

References:

1. John Proakis, G. & Dimitris G. Manobakis, *Digital Signal Processing Principles, Algorithms and Applications*, PHI. 4th edition 2007.
2. N. J. Fliege, "*Multirate Digital Signal Processing: Multirate Systems -Filter Banks – Wavelets*", 1st Edition, John Wiley and Sons Ltd, 1999.
3. Bruce W. Suter, "*Multirate and Wavelet Signal Processing*", 1st Edition, Academic Press, 1997.
4. M. H. Hayes, "*Statistical Digital Signal Processing and Modeling*", John Wiley & Sons Inc., 2002.
5. S.Haykin, "*Adaptive Filter Theory*", 4th Edition, Prentice Hall, 2001.
6. D.G.Manolakis, V.K. Ingle and S.M.Kogon, "*Statistical and Adaptive Signal Processing*", McGraw Hill, 2000.

Course Title: Logic Synthesis Using HDL

Course Code: VLS502

L	T	P	Credits
4	0	0	4

Course Objective:

HDL programming is fundamental for VLSI design and hence this course is given.

Learning Outcome:

- Acquired know ledge about combinational & sequential circuits.
- Foster ability to identify and code the module using different modeling styles.
- Foster ability to code using subprograms.
- Foster ability to w rite test benches in Verilog.
- Acquired know ledge about FSM and how to code a FSM.
- Ability to synthesize the Verilog code.

Section A

Review of digital design **(6 Hrs)**

MUX based digital design, Design using ROM, Programmable Logic Arrays (PLA) and Programmable Array Logic (PAL), Sequential circuit design - design of Moore and Mealy circuits, Design of a pattern sequence detector using MUX, ROM and PAL.

Introduction to Verilog **(6 Hrs)**

Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools, Test Benches.

Language Constructs and Conventions **(6 Hrs)**

Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Memory, Operators, System Tasks.

Section B

Gate Level Modeling **(6 Hrs)**

Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Additional Examples, Design of Flip-flops with Gate Primitives, Delays, Design of Basic Circuits.

Behavioral Modeling **(6 Hrs)**

Introduction, Operations and Assignments, Functional

Bifurcation, Initial Construct, Always Construct, Examples, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-blocking Assignments, The case statement, Simulation Flow. If and if-else constructs, assign-deassign construct, repeat construct, for loop, the disable construct, while loop, forever loop, parallel blocks, force-release construct, Event.

Modeling at Dataflow Level (6 Hrs)

Introduction, Continuous Assignment Structures, Delays and Continuous Assignments, Assignment to Vectors, Operators.

Section C

Design using Algorithmic State Machine Charts (6 Hrs)

Derivation of ASM charts Design examples such as game, etc. using ASM Design using Algorithmic State Machine Charts dice Implementation of ASM charts using microprogramming, and Verilog design of bus arbitrator.

Test Benches (6 Hrs)

Test benches, verifying responses, clocks and resets, printing response values, reading data files, reading standard types, error handling.

Section D

Simulation, Synthesis, Place and Route, and Back Annotation (6 Hrs)

Design flow, Simulation using Modelsim, Synthesis using Synplify, Place and Route, and Back Annotation using Xilinx.

Design of memories (5 Hrs)

Verilog realization of Read Only Memory (ROM), Verilog realization of Random Access Memory (RAM), and Verilog coding of controller for accessing external memory.

Introduction to Hardware Implementation (1 Hrs)

References:

1. Verilog HDL: A Guide to Digital Design and Synthesis; S.Palnitkar; PH/Pearson, 1996.
2. Verilog HDL Synthesis; J.Bhaskar; BS publications, 2001.
3. Digital Principles and Applications; Donald P Leach, A P Malvino; Tata McGraw-Hill Edition 2006.

Course Title: Research Methodology

Course Code: ECE510

L	T	P	Credits
4	-	-	4

Course Objective:
The course is designed to introduce the students to research methodology and application of research techniques and procedures. The primary goal of this course is to develop a sound understanding of research methods.

Learning Outcomes: The students will be able to apply the various research methods by using computerized data analysis software's to solve the real life problems.

Section – A

Introduction to Research: Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Process, Criteria of Good Research, Problems Encountered by Researchers in India.
Defining the Research Problem: What is a Research Problem?, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem
Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, factors affecting RDs, Relation among RDs, Developing a Research Plan.

Section – B

Sampling design and Procedures: Sample or Census, The Sampling Design Process, A Classification of Sampling Techniques, Choosing Nonprobability Versus Probability Sampling, Uses of Non probability Versus Probability Sampling.
Measurement and Scaling: Non-comparative Scaling Techniques, Continuous Rating Scale, Itemized Rating Scale, Non-comparative Itemized Rating Scale Decisions, Multi-item Scales, Scale Evaluation, Choosing a Scaling Technique.
Methods of Data Collection: Collection of Primary Data, Observation Method, Interview Method, Collection of Data through Questionnaires, Collection of Data through Schedules, Some Other Methods of Data Collection, Collection of Secondary Data, Selection of Appropriate Method for Data Collection.

Questionnaire & form design: questionnaire & observation forms, questionnaire design process.

Section – C

Data preparation: editing, coding, transcribing
Data analysis: tests of significance based on t, f and z distribution and chi-square test; cross

tabulation

Multiple Regression: Overview of Multiple Regression, Statistics Associated with Multiple Regression, Conducting Multiple Regression, Stepwise Regression, Multicollinearity

Discriminant Analysis: Discriminant Analysis Model, Statistics Associated with Discriminant Analysis, Conducting Discriminant Analysis

Conjoint Analysis: Basic Concepts in Conjoint Analysis, Statistics Associated with Conjoint Analysis, Conducting Conjoint Analysis, Assumptions & Limitations of Conjoint Analysis, Hybrid Conjoint Analysis

Section – D

Multi-Dimensional Scaling: Basic Concepts in Multidimensional Scaling (MDS), Statistics Associated with MDS, Conducting Multidimensional Scaling, Selecting an MDS Procedure, Deciding on the Number of Dimensions, Labelling the Dimensions & Interpreting the Configuration, Assessing Reliability and Validity, Assumptions & Limitations of MDS, Scaling Preference Data

Correspondence Analysis: Relationship between MDS, FA, & DA

Factor Analysis: Factor Analysis Model, Statistics Associated with Factor Analysis, Conducting Factor Analysis, Applications of Common Factor Analysis

Cluster Analysis: Statistics Associated with Cluster Analysis, Conducting Cluster Analysis, Applications of Non-hierarchical Clustering, Clustering Variables.

Research Report Writing: Contents of Report, Executive Summary, Bibliography format. Presentation of Report.

References:

1. Bajpai Naval, Business Research Methods, Pearson Publications.
2. Malhotra, Naresh K. Marketing Research: An Applied Orientation, 5th Edition. Pearson/Prentice-Hall, 2007.
3. Proctor Tony, Essentials of Marketing Research, Prentice Hall, 4th Edition.
4. Beri, G. C. Marketing research, McGraw-Hill, 4th Edition
5. Kothari, C.R. Research Methodology, New Age Publishers.

Course Title: Advanced Communication System Laboratory

Course Code: ECE504

L	T	P	Credits
0	0	3	2

Course Objectives: This lab helps the students to understand the basic principles of digital communication systems by practical module systems. The experiments are designed in such a way that the theoretical concepts introduced in lectures are re-discussed and implemented practically.

Learning Outcomes:

To demonstrate digital communication concepts using hands-on experience and using simulation environments such as PSPICE / Multisim, or Matlab/Simulink, or LabVIEW.

List of Experiments

1. **Analog Modulation based Communication:** To generate various Analog modulation techniques like Amplitude Modulation, Frequency Modulation and Phase Modulation used in RF Communication using MATLAB.
2. **Digital Modulation based Communication:** To implement various Digital Modulation techniques like ASK, FSK, BPSK, QPSK, 8PSK, QAM using MATLAB.
3. **Waveform Coding:** Implementation of PCM, DPCM and its analysis, Implementation of A-Law, μ-Law and its analysis.
4. **Channel Modeling:** Implementation of AWGN, BSC, DMS, Rayleigh and Rician fading Channels.
5. **Channel coding techniques:** Implementation of various channel coding techniques and their analysis using MATLAB.
6. **Bit error Rate:** To design a complete digital communication system and study the Bit error rate on various levels of signal to noise ratio.
7. **Free Space Communication:** To build a free space communication model and to analyze the free space loss and power received using MATLAB.
8. **RF link Budget:** To calculate the RF link budget for satellite communication using MATLAB Program.

9. **CDMA transmitter and Receiver:** To simulate the basic CDMA transmitter and receiver using MATLAB.
10. **OFDM:** To simulate the basic OFDM communication model using MATLAB.
11. **Antenna:** In this the experiments will demonstrate the following
    i. Antenna radiation patterns
    ii. Antenna beam-width
    iii. Effective radiative powers
    iv. Antenna array
    v. Antenna gain
    vi. Effective aperture
    vii. Antenna directivity,
    viii. Main to side lobe ratio.

The above experiments will be performed on various antennas such as Dipole antenna, Parabolic antenna, Micro-strip antenna, Horn antenna, Yagi-uda antenna etc.

Course Title: Signal Processing Laboratory

Course Code: ECE509

L	T	P	Credits
0	0	3	2

Course Objective:

To introduce the student to advanced digital signal processing techniques with help of MATLAB

Learning Outcomes: This will help the students to

- Study of the parametric methods for power spectrum estimation.
- Study of adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- Study of multi-rate signal processing fundamentals.
- Study of the analysis of signals.

List of Experiments

1. Experiment to demonstrate the sample rate reduction, interpolation and decimation using MATLAB.
2. Experiment to demonstrate the Line enhancer using MATLAB
3. Experiment to demonstrate the adaptive filtering using MATLAB
4. Experiment to demonstrate Hilbert transform using MATLAB
5. Experiment to demonstrate DCT using MATLAB
6. Experiment to demonstrate STFT using MATLAB
7. Experiment to demonstrate DWT using MATLAB
8. Experiment to demonstrate IDWT using MATLAB
9. Experiment to compare the various transform using MATLAB

DAV UNIVERSITY, JALANDHAR

Course Title: Embedded Systems

Course Code: VLS523

L	T	P	Credits
4	0	0	4

Course Objective:

Course introduces system hardware and firmware design for embedded applications. It also teaches all aspects of design and development of an embedded system.

Learning Outcome:

- Acquire the knowledge of the basic ARM Microcontroller, and based embedded designs.
- Acquire the knowledge about embedded system design, firmware including programming languages.
- Ability to learn and understand the RTOS concepts, including RTOS timers, interrupts, system clock.
- Ability to learn and design 32-Bit ARM programming and hardware implementation

Section – A

Introduction To Embedded System And Arm Architect (12 Hrs)

Challenges of Embedded Systems – Embedded system design process. Embedded processors – ARM processor – Architecture, ARM and Thumb Instruction sets.

Section – B

Embedded C Programming (12 Hrs)

C-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues.

Optimizing Assembly Code (12 Hrs)

Profiling and cycle counting – instruction scheduling – Register allocation – conditional

execution – looping constructs – bit manipulation – efficient switches– optimized primitives.

Section – C

RTOS Principle (12 Hrs)

Operating systems and its internals - Multitasking and Real time Operating Systems – Task Swapping Methods – Scheduler Algorithms – Priority Inversion – Task , Thread and Process – Choosing Operating System – Commercial Operating Systems – Linux.

Section – D

Embedded Software Development Process (12 Hrs)

Meeting real time constraints – Multi-state systems and function sequences. Embedded software development tools – Emulators and debuggers. Design methodologies – Case studies – Complete design of example embedded systems.

References

1. Mckenzie, Scott, The 8051 Microcontroller, PHIs, (1995) 5th ed.
2. Simon, David E., An Embedded System Primer, Pearson Education, (2005) 4th ed.
3. K.V.K.K.Prasad, Embedded/Real-time Systems: Concepts, Design and Programming – Dreamtech press.
4. Proramming for Embedded Systems – Dreamtech Software team, Willey – Dreamtech
5. Andrew N Sloss, D. Symes and C. Wright, "*ARM system developers guide",* Morgan Kauffman/ Elsevier, 2006.

DAV UNIVERSITY, JALANDHAR

Course Title: Information and Communication Theory
Course Code: ECE508

L	T	P	Credits
4	0	0	4

Course Objective:

This course is intended to make students understand the concepts of information theory. This will also help them to learn the physical significance of various source and channel coding algorithms

Learning Outcomes:

At the end of the course students should be able to

- Calculate the information content of a random variable from its probability distribution
- Relate the joint, conditional, and marginal entropies of variables in terms of their coupled probabilities
- Define channel capacities and properties using Shannon's Theorems
- Construct efficient codes for data on imperfect communication channels
- Generalize the discrete concepts to continuous signals on continuous channels

Section A

Foundations of Information theory **(10 Hrs)**

Probability, uncertainty, information, concepts of randomness, redundancy, compressibility, noise, bandwidth, ensembles, random variables, marginal and conditional probabilities.

Section B

Entropy **(8 Hrs)**

Marginal entropy, joint entropy, conditional entropy

Source Coding **(8 Hrs)**

Source coding theorem, Huffman coding, Channel coding theorem, channel capacity theorem, Channels, Shenonfano theorem

Sampling Process **(8 Hrs)**

Base band and band pass sampling theorems reconstruction from samples, Practical aspects of sampling and signal recovery TDM.

Section C

Channel Coding Part 1 **(10 Hrs)**

Waveform Coding and Structured Sequences, Types of Error Control, Structured Sequences, Linear Block Codes, Error-Detecting and Correcting Capability, Cyclic Codes.

Channel Coding Part 2 **(8 Hrs)**

Convolutional Encoding, Convolutional Encoder Representation, Convolutional Decoding & Problems, Properties of Convolutional Code.

Section D

Channel Coding Part 3 **(8 Hrs)**

Reed-Solomon Codes, Interleaving and Concatenated Codes, Coding and Interleaving Applied to the Compact Disc.

References:

1. Cover, T.M. & J.A. Thomas. *Elements of information theory*. New York. Wiley.
2. Sklar, Bernard. *Digital Communications, Fundamentals and Applications.* Prentice Hall. Second Edition
3. Gallanger, Robert G. *Information Theory and Reliable Communication*. Mc Graw Hill.
4. Related IEEE/IEE publications.

DAV UNIVERSITY, JALANDHAR

Course Title: Mini Project
Course Code: ECE550

L	T	P	Credits
0	0	4	2

Course Objective: To train the students in preparing and presenting technical topics

Learning Outcomes: This will help the student to identify their topics of interest related to the program of study and prepare and make presentation before an enlightened audience

The students are expected to give at least two presentations on their topics of interest which will be assessed by a committee constituted for this purpose. This course is mandatory and a student has to pass the course to become eligible for the award of degree. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations

Course Title: Dissertation Part-1, Part-2 & Part-3

Course Code	L	T	P
ECE610	0	0	8
ECE611	0	0	8
ECE612			24

Course Code:ECE610, ECE611 & ECE612

Course Objective: To undertake research in an area related to the program of study. This will help the students to be capable of identifying a problem related to the program of study and carry out wholesome research on it leading to findings which will facilitate development of a new/improved product, process for the benefit of the society.

Learning Outcome: This will help the students to identify their potential areas of research and to contribute their skills towards the field of Electronics and Communication engineering.

M.Tech Dissertation should be socially relevant and research oriented ones. Each student is expected to do an individual research. The research work is carried out in two phases – Phase I in III semester and Phase II in IV semester. Phase II of the thesis work shall be in continuation of Phase I only. At the completion of dissertation, the student will submit a research report, which will be evaluated (end semester assessment) by duly appointed examiner(s). This evaluation will be based on the Research report and a viva voce examination on the same. The detailed assessment and evaluation procedure of dissertation will be implemented according to the guidelines & policies notified by the University.

DAV UNIVERSITY, JALANDHAR

Course Title: Microelectronics

L	T	P	Credits
4	0	0	4

Course Code: ECE503

Course Objective:

The course considers helps the students to understand Microelectronics

Learning Outcomes:

Students will learn the practical aspects of Microelectronics and their uses

Section A

A Review of microelectronics and introduction to MOS technology

(8Hrs)

Introduction to IC technology, metal oxide semiconductor and related VLSI technology , Basic MOS transistors, enhancement and depletion model transistors, N-MOS and CMOS fabrication process, thermal aspects of processing, and production of E beam masks.

Electrical properties of MOS circuit

(8Hrs)

Parameters of MOS transistors, drain to source current, threshold voltage, trans-conductance output conductance and figure of merit, pass transistor, N-MOS inverter, pull-up to pull down ratio for an N-MOS inverter, alternative forms of pull up

Section B

CMOS and BiCMOS Circuit (7Hrs)

C-MOS inverters, MOS transistor circuit model, comparative aspects of key parameters of CMOS and bipolar transistor BiCMOS inverters, latch up in CMOS circuits, BiCMOS latch up susceptibility

Design processes **(7Hrs)**

MOS layers, stick diagram, design rules and layout, double metal single poly silicon C-MOS process.

Section C

Basic circuit concepts **(8Hrs)**

Sheets resistance, area capacitance, delay unit, inverter delay, super buffers, and propagation delays.

Scaling of MOS circuits **(7Hrs)**

Scaling factor, limitations, scaling of wires and inter connections

Section D

Subsystem design & layout **(7Hrs)**

Architectural issues, switch logic, gate logic, clocked sequential circuits, and other system consideration.

Ultra-fast VLSI circuits and systems **(8Hrs)**

Ultra-fast systems, GaAs crystal structure, GaAs devices, fabrication, device modeling and performance estimation.

References:

1. DA. & K, Eshrachian *Basic VLSI design systems & circuits*. Prentice Hall India, 1988.
2. Geigar B.R., Strader M.E. & P.E. Allen. *VLSI design techniques for analog & digital circuit*y. McGraw Hill, 1990.
3. Related IEEE/IEE publications

DAV UNIVERSITY, JALANDHAR

Course Title: Detection and Estimation Theory

Course Code: ECE553

L	T	P	Credits
4	0	0	4

Course Objective:

The course considers helps the students to understand principles of detection and estimation theory

Learning Outcomes:

Students will learn the details of

1. Vector Spaces
2. Stochastic Processes
3. Detections and estimation theory

Section A

Vector and Matrices spaces

Review of Vector Spaces, Vectors and matrices: notation and properties, orthogonality and linear independence, bases, distance properties, matrix operations, Eigen values and eigenvectors.

Symmetric Matrices

Properties of Symmetric Matrices, Diagonalisation of symmetric matrices, symmetric positive definite and semi definite matrices, principal component analysis (PCA), singular value decomposition.

Section B

Stochastic Processes:

Time average and moments, ergodicity, power spectral density, covariance matrices, response of LTI system to random process, cyclo-stationary process, and spectral factorization.

Detection Theory

Detection in white Gaussian noise, correlator and matched filter interpretation, Bayes' criterion of signal detection, MAP, LMS, entropy detectors, detection in colored Gaussian noise, Karhunen-Loeve expansions and whitening filters.

Section C

Estimation Theory

Minimum variance estimators, Cramer-Rao lower bound, examples of linear models, system identification, Markov classification, clustering algorithms.

Section D

Kalman and Weiner Filtering

Discrete time Wiener-Hopf equation, error variance computation, causal discrete time Wiener filter, discrete Kalman filter, extended Kalman filter, examples. Specialized Topics in Estimation: Spectral estimation methods like MUSIC, ESPIRIT, DOA Estimation.

References:

1. Steven M. Kay, "Fundamentals of Statistical Signal Processing, Volume I: Estimation Theory",
2. Prentice Hall, 1993
3. Steven M. Kay, "Fundamentals of Statistical Signal Processing, Volume II: Detection Theory", 1st Edition, Prentice Hall, 1998
4. Thomas Kailath, Babak Hassibi, Ali H. Sayed, "Linear Estimation", Prentice Hall, 2000.
5. H. Vincent Poor, "An Introduction to Signal Detection and Estimation", 2nd Edition, Springer, 1998.

DAV UNIVERSITY, JALANDHAR

Course Title: Mobile Ad Hoc Networks

L	T	P	Credits
4	0	0	4

Course Code: ECE507

Course Objectives: To understand the fundamentals and architectures of wireless communication standards and Mobile Adhoc networks.

Learning Outcomes:

- To study the introduction of wireless communication systems.
- To study the specifications and functionalities of wireless protocols / standards.
- To study the fundamentals of mobile Adhoc networks.

Section A

Introduction to Wireless Network (8 Hrs)

Evolution of Mobile Cellular Network, Global System for Mobile Communications (GSM), General Packet Radio Service (GPRS), Personal Communications Services (PCSs), Wireless LANs (WLANS), Universal Mobile Telecommunications System (UMTS, IMT2000, IS-95, cdma-One and cdma2000 Evolution.

Origins of Ad Hoc (8 Hrs)

Packet Radio Networks: Introduction, Technical Challenges, Architecture of PRNETs, Components of Packet Radios, Routing in PRNETs, Route Calculation, Pacing Techniques, Media Access in PRNETs, Flow Acknowledgments in PRNETs

Section B

Ad Hoc Wireless Networks (10 Hrs)

Ad Hoc Network, Heterogeneity in Mobile Devices, Wireless Sensor Networks, Traffic Profiles, Types of Ad Hoc Mobile Communications, Types of Mobile Host Movements, Challenges Facing Ad Hoc Mobile Networks .

Ad Hoc Wireless Media Access Protocols (8 Hrs)

Introduction, Problems in Ad Hoc Channel Access, Receiver-Initiated MAC Protocols, Sender-Initiated MAC Protocols, Existing Ad Hoc MAC Protocols, MARCH: Media Access with Reduced Handshake

Section C

Overview of Ad Hoc Routing Protocols (10 Hrs)

Table-Driven Approaches, Destination Sequenced Distance Vector (DSDV), Wireless Routing Protocol (WRP), Cluster Switch Gateway Routing (CSGR), Source-Initiated On-Demand Approaches, Ad Hoc On-Demand Distance Vector Routing (AODV), Dynamic Source Routing (DSR), Temporally Ordered Routing Algorithm (TORA), Signal Stability Routing (SSR), Location-Aided Routing (LAR), Power-Aware Routing (PAR), Zone Routing Protocol (ZRP), Source Tree Adaptive Routing (STAR), Relative Distance, Micro-diversity Routing (RDMAR).

Section D

Communication Performance of Ad Hoc Networks (8 Hrs)

Introduction, Performance Parameters of Interest, Route Discovery (RD) Time, End-to-End Delay (EED) Performance, Communication Throughput Performance, Packet Loss Performance, Route Reconfiguration/Repair Time, TCP/IP-Based Applications

Ad Hoc Nomadic Mobile Applications (8 Hrs)

In the Office, While Traveling, Arriving Home, In the Car, Shopping Malls, The Modern Battlefield, Car-to-Car Mobile Communications, Mobile Collaborative Applications

References:

1. Toh, C.K. *Ad Hoc Mobile Wireless Networks: Protocols and Systems*. PHI
2. Basagni, Stefano. *Mobile Ad Hoc Networking.* Wiley Publications

DAV UNIVERSITY, JALANDHAR

Course Title: Opto-electronic Devices

Course Code: ECE552

L	T	P	Credits
4	0	0	4

Course Objectives:

This course provides a complete overview of the wide variety of different semiconductor. Optoelectronic devices employed in light wave systems and networks. Topics include variety of different subjects including a detailed discussion of the design and operation of optical LEDs, the basic physics and operation of lasers and photo detectors, details of the basic physics and operation of solar cells, the operation of quantum well electro-absorption modulators and electro-optic modulators, and the design and operation of optoelectronic integrated circuits. Emphasis is on the underlying device physics behind the operation and design of optoelectronic devices.

Learning Outcomes:

- Explain key concepts in quantum and statistical mechanics relevant to physical, electrical and optoelectronic properties of materials and their applications to optoelectronic devices and photonic integrated circuits that emit, modulate, switch, and detect photon
- Describe fundamental and applied aspects of optoelectronic device physics and its applications to the design and operation of laser diodes, light-emitting diodes, and photo detector
- Analyze optoelectronic device characteristics in detail using concepts from quantum mechanics and solid state physics

Section A

Basics of Optics: (10 Hrs)

Wave nature of light, Light sources-blackbody radiation, review of some quantum mechanical concepts, Energy bands in solids, Electrical conductivity, semiconductors, carrier concentration, Work function, Excess carriers in semiconductors, junctions, and quantum well, Elliptical polarization, Birefringence, optical activity, Electro-optic effect, Kerr modulators, Scanning and switching, Magneto optic devices, Acousto-optic effect, Quantum well modulators, nonlinear optics.

Section B

Optical Sources 1: **(10 Hrs)**

Difference between optical display devices and electrical display devices such as Photoluminescence, Cathodoluminescence, Cathode ray tube, Electro luminescence, Injection luminescence and light emitting diodes, Plasma displays, Display brightness, LCD, Numeric displays

Section C

Optical Sources 2: **(10 Hrs)**

Lasers: Emission and absorption of radiation, Einstein relations, Absorption of radiation, Population inversion, Optical feedback, Threshold conditions-laser losses, Line shape function, population inversion and pumping threshold conditions, Laser modes, Classes of Laser, Single mode operation, Frequency stabilization, Mode locking, Q switching, Laser applications, Measurement of distance, Holography, High energy applications of lasers.

Section D

Photo diodes: **(10 Hrs)**

PN, PIN and Avalanche photodiode, Detector performance parameters, Thermal detectors, Photon devices.

Optical Waveguides: **(10 Hrs)**

Total internal reflection, planar dielectric waveguide, Optical fiber waveguide, Losses in fibers, Optical fiber connectors, Measurement of fiber characteristics, Fiber material and manufacture, Fiber cables.

Optical Communication Systems: **(8 Hrs)**

Modulation schemes, free space communication, Fiber optical communication systems, integrated optics.

Non-Communications Applications of fibers: **(2 Hrs)**

Optical fiber sensors, Light guiding fibers.

References

1. Wilson, John and Hawkes, John, Optoelectronics: An Introduction, Prentice Hall (2003) 2nd ed.
2. Kasap, S.O., Optoelectronics and Photonics: Principles and Practices, Prentice Hall (2001).
3. Keiser, G, Optical Fiber Communication, Tata McGraw Hill (2007).
4. Senior, John M., Optical Fiber Communication, Dorling Kindersley (2008) 2nd ed.

Course Title: Biomedical Signal Processing

Course Code: ECE561

L	T	P	Credits
4	0	0	4

Course Objectives:

To introduce the fundamentals of Biomedical Signal Processing.

Learning Outcomes:

When passed, the student should be able to:

- Describe the origin, properties and suitable models of important biological signals such as ECG, EEG and EMG.
- Determine and successfully apply suitable algorithms for analysis of biomedical signals. Specifically, the student should be able to implement and apply algorithms for parametric and non-parametric estimation of a signal's power spectrum density

Section A

Introduction (15 Hrs)

Genesis and significance of bioelectric potentials, ECG, EOG, EMG and their monitoring and measurement, Spectral analysis, digital and analog filtering, correlation and estimation techniques, AR / ARMA models, Adaptive Filters.

Section B

ECG (15 Hrs)

Pre-processing, Measurements of amplitude and time intervals, Classification, QRS detection, ST segment analysis, Baseline wander removal, wave form recognition, morphological studies and rhythm analysis, automated diagnosis based on decision theory ECT compression, Evoked potential estimation.

Section C

EEG (15 Hrs)

evoked responses, Epilepsy detection, Spike detection, Hjorth parameters, averaging techniques, removal of Artifacts by averaging and adaptive algorithms, pattern recognition of alpha, beta, theta and delta waves in EEG waves, sleep stages,

Section D

EMG (15 Hrs)

Wave pattern studies, biofeedback, Zero crossings, Integrated EMG. Time frequency methods and Wavelets in Biomedical Signal Processing

References:

1. Willis J Tompkins, ED, "Biomedical Digital Signal Processing", Prentice-Hall of India, 1996.
2. R E Chellis and R I Kitney, "Biomedical Signal Processing", in IV parts, Medical and Biological Engg. And current computing, 1990-91.
3. Special issue on "Biological Signal Processing", Proc. IEEE 1972
4. Arnon Kohen, "Biomedical Signal Processing", Volumes I & II, CRC Press.
5. Metin Aray, "Time frequency and Wavelets in Biomedical Signal Processing", IEEE Press, 1999.Current Published literature

Course Title: ECE562

Course Code: Wireless Sensor Networks

L	T	P	CR
4	0	0	4

Course Objective:

This course is intended to make students understand the concepts of wireless sensor networks. This will also help them to learn the various protocols and management of wireless sensor networks.

Learning Outcome:

At the end of the course students should be able to:

- Understand the sensor technology and data transmission over sensor networks
- Various medium access and routing protocols used in sensor network
- Management of wireless sensor networks

Section A

Introduction and Applications of Wireless sensor networks (7 Hrs)

Overview of Wireless Sensor Networks, Applications of wireless sensor networks; Category 2 WSN applications, Category 1 WSN applications.

Basic Wireless Sensor Technology (7 Hrs)

Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends.

Wireless Transmission Technology and Systems (7 Hrs)

Radio Technology Primer, Available Wireless Technologies.

Section B

Medium Access Control Protocols for Wireless Sensor Networks (7 Hrs)

Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study, IEEE 802.15.4 LR-WPANs Standard Case Study.

Routing Protocols for Wireless Sensor Networks (6 Hrs)

Routing Challenges and Design Issues in Wireless Sensor Networks, Routing Strategies in Wireless Sensor Networks.

Section C

Transport Control Protocols for Wireless Sensor Networks (6 Hrs)

Traditional Transport Control Protocols, Transport Protocol Design Issues, Performance of Transport Control Protocols, CODA, ESRT, RMST, PSFQ, GARUDA.

Middleware for Wireless Sensor Networks (7 Hrs)

WSN Middleware Principles, Middleware Architecture, MiLAN, IrisNet, AMF, DSWare, CLMF and MSM.

Section D

Network Management for Wireless Sensor Networks (7 Hrs)

Requirements, Traditional Network Management Models, Network Management Design Issues, MANNA Architecture.

Operating Systems for Wireless Sensor Networks (6 Hrs)

Operating System Design Issues, Examples; TinyOS, mate, MagnetOS, MANTIS, OSPM and EYES OS.

References:

1. K Sohraby, D Minoli, T Znati**,** Wireless Sensor Networks; Technology, Protocols and Applications, Wiley Interscience.
2. Related IEEE publications

Course Title: Optical Networks

Course Code: ECE563

L	T	P	Credits
4	0	0	4

Course Objectives:

The course will give the student in-depth understanding of the functionality of optical networks and how they may be implemented. How an optical network can work together with an IP-based network infrastructure for ensuring both high reliability and performance in access, metro and transport networks, is paid special attention.

Learning Outcomes:

- To be able to design optical networks, taking both physical transmission properties and optical networking constraints into account
- To be able to evaluate performance of optical packet switched nodes using discrete event simulation methods

Section A

Optical Networks (8 Hrs)

Principles and Challenges: Wavelength-Division Multiplexing (WDM): Networking Evolution, WDM Network Constructions, WDM Economics.

Next Generation Networks (9 Hrs)

Multiplexing Level, WDM – Passive Optical Network, Wavelength Allocation Strategies, Dynamic Network Reconfiguration Using Flexible WDM, Static WDM PONs, Wavelength Routed PON, Reconfigurable WDM PONs, Wavelength Broadcast-and-Select Access Network, Wavelength Routing Access Network, Geographical, Optical and Virtual Topologies: Star, Tree, Bus, Ring and Combined, Compatibility with Radio Applications UWB, UMTS, Wi-Fi, Radio-Over-Fibre, Next Generation G/E-PON Standards Development Process.

Section B

Network Protection **(9 Hrs)**

Protection Schemes, Reliability Performance Evaluation.

Traffic Studies **(9 Hrs)**

Dynamic Bandwidth Allocation, QoS and Priorization in TDMA PONs, WDMA/TDMA Medium Access Control, Access Protocols for WDM Rings with QoS Support, Efficient Support for Multicast and Peer-to-Peer Traffic, Single-Hop Networks, Multihop Networks, Channel-Sharing and Multicasting

Section C

Virtual Topology Design **(9 Hrs)**

Introduction, System Architecture, Formulation of the Optimization Problem, Algorithms, Experimental Results -Physical Topology as Virtual Topology (No WDM), Multiple Point-to-Point Links (No WRS), Arbitrary Virtual Topology (Full WDM), Comparisons, Effect of Nodal Degree and Wavelength, Network Design: Resource Budgeting and Cost Model, Virtual Topology Reconfiguration.

Section D

Ring Networks **(8 Hrs)**

Introduction, System Architecture and Assumptions (Model), Illustrative Examples, Optimization Criteria, Flow-Based Algorithms, delay-Based Algorithms, Illustrative Examples-Network Description, Delay vs. N Characteristics, Delay vs. Throughput Characteristics, Two or Greater Partitions.

All-Optical Cycle Elimination **(9 Hrs)**

Introduction, Wavelength Cross-connect Switches, Network Assumptions, Overview of Solution and Algorithms, Details of Algorithms, Illustrative Examples-Dynamic Analysis, Static Analysis.

References

1. Murthy, C. Siva Ram, Mohan Gurusamy, WDM Optical Networks: Concepts, Design, and Algorithms, Prentice Hall of India (2001).
2. Maier, Marti, Optical Switching Networks, Cambridge University Press (2008).
3. Sivalingam, Krishna M., Subramaniam, Suresh, Emerging Optical Networks Technologies: Architectures, Protocols, and Performance, Springer (2004).
4. Mukherjee, Biswanath, Optical WDM Networks, Springer (2006).

DAV UNIVERSITY, JALANDHAR

Course Title: VLSI Architectures

L	T	P	Credits
3	0	0	3

Course Code: VLS507A

Course Objectives:

The course aims to convey the knowledge of advanced concepts of microcomputer architectures and memory hierarchy design.

Learning Outcomes:

- Acquire the knowledge of CISC processors, their architecture and examples
- Acquire the knowledge of RISC processors, their organization, RISC concepts, difference between RISC and CISC.
- Ability to understand and implement the concept of Pipelining in processor architecture and issues
- To reinforce the need of memory hierarchy design and multi-core architectures
- Ability to learn and design arithmetic system design and issues

Section – A

Complex Instruction Set Computers (CISC) (13 Hrs)

Instruction Set, Characteristics and Functions, Addressing Modes, Instruction Formats, Architectural Overview, Processor Organization, Register Organization, Instruction Cycle, Instruction Pipelining, Pentium Processor, PowerPC Processor.

Section – B

Reduced Instruction Set Computers (RISC) (14 Hrs)

Instruction execution Characteristics, Register Organization, Reduced Instruction Set, Addressing Modes, Instruction Formats, Architectural Overview, RISC Pipelining, Motorola 88510, MIPS R4650, RISC Vs. CISC.

Pipeline Processing (14 Hrs)

Basic Concepts, Classification of Pipeline Processors, Instruction and Arithmetic Pipelining: Design of Pipelined Instruction Units, Pipelining Hazards and Scheduling,

Principles of Designing Pipelined Processors.

Section – C

Memory Architectures (14 Hrs)

Memory hierarchy design, Multiprocessors, thread level parallelism and multi-core architectures, I/O buses. Arithmetic: Fixed point, Floating point and residue arithmetic, Multiply and Divide Algorithms.

Issues in arithmetic system design, Issues in the applications (optimizing the hardware – software interface), ASIP, reconfigurable computing, Future microprocessor architectures.

Section – D

Superscaler Processors (5 Hrs)

Overview, Design Issues, PowerPC, Pentium.

References

1. Patterson, D.A. and Hennessy, J., Computer Architecture: A Quantitative Approach, Morgan Kaufmann (2003)3rd ed.
2. Stallings, W., Computer Organization and Architecture: Designing for Performance, Prentice Hall (2003) 7th ed.
3. Patterson, D.A. and Hennessy, J., Computer Organization and Design, Elsevier(2004) 3rd ed.

DAV UNIVERSITY, JALANDHAR

Course Title: Audio and Speech Processing

Course Code: ECE571

L	T	P	Credits
4	0	0	4

Course Objective:

The aim of this module is to describe techniques used in, and architectures for, the design of state-of-the-art speech technology systems. These methods are starting to appear in many types of information processing and computer systems. The course focusses on three main areas: speech recognition; spoken dialogue systems and text-to-speech speech synthesis.

Learning Outcomes:

- The students will get familiar with basic characteristics of speech signal in relation to production and hearing of speech by humans.
- They will understand basic algorithms of speech analysis common to many applications.
- They will be given an overview of applications (recognition, synthesis, coding) and be informed about practical aspects of speech algorithms implementation.

Section A

Digital Models for the Speech Signal (7 Hrs)

Process of speech production, Acoustic theory of speech production, Lossless tube models, and Digital models for speech signals.

Time Domain Models For Speech Processing (8 Hrs)

Time dependent processing of speech, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using energy & zero crossings, Pitch period estimation, Short time autocorrelation function, Short time average

magnitude difference function, Pitch period estimation using autocorrelation function, Median smoothing.

Section B

Digital Representations of the Speech Waveform (7 Hrs)

Sampling speech signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation, Differential PCM, Comparison of systems, direct digital code conversion.

Short Time Fourier Analysis (8 Hrs)

Linear Filtering interpretation, Filter bank summation method, Overlap addition method, Design of digital filter banks, Implementation using FFT, Spectrographic displays, Pitch detection, Analysis by synthesis, Analysis synthesis systems.

Section C

Homomorphic Speech Processing (7 Hrs)

Homomorphic systems for convolution, Complex cepstrum, Pitch detection, Formant estimation, Homomorphic vocoder.

Linear Predictive Coding of Speech (8 Hrs)

Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters, Applications.

Section D

Speech Enhancement (7 Hrs)

Spectral subtraction & filtering, Harmonic filtering, parametric re-synthesis, Adaptive noise cancellation.

Speech Synthesis (8 Hrs)

Principles of speech synthesis, Synthesizer methods, Synthesis of intonation, Speech synthesis for different speakers, Speech synthesis in other languages, Evaluation, Practical

speech synthesis. Automatic Speech Recognition: Introduction, Speech recognition vs. Speaker recognition, Signal processing and analysis methods, Pattern comparison techniques, Hidden Markov Models, Artificial Neural Networks.

References:

1. L. R. Rabiner and R. W. Schafer, "Digital Processing of Speech Signals", Pearson Education (Asia) Pte. Ltd., 2004.
2. D. O'Shaughnessy, "Speech Communications: Human and Machine", Universities Press, 2001.
3. L. R. Rabiner and B. Juang, "Fundamentals of Speech Recognition", Pearson Education (Asia) Pte. Ltd., 2004.
4. Z. Li and M.S. Drew, "Fundamentals of Multimedia", Pearson Education (Asia) Pte. Ltd., 2004

Course Title: Wireless and Mobile Communication

Course Code: ECE572

L	T	P	Credits
4	0	0	4

Course Objective:

To introduce the students to the concepts of wireless systems, mobile systems

Learning Outcomes:

After **completion** of this course students will be able to understand

- Basic wireless, cellular concepts.
- 2G, 3G and 4G networks
- Various performance analysis of mobile communication system

Section A

Cellular Concepts (8 Hrs)

System Design Fundamentals: Cellular concept-channel reuse- handoff strategies-dynamic resource allocation-interference and system capacity-improving capacity and coverage of cellular systems.

Second and third generation network standards (8 Hrs)

GSM standardization-architecture and function partitioning-GSM radio aspects-security aspects-protocol model-call flow sequences evolution to2.5G mobile radio networks. IS-95 service and radio aspects, key features of IS-95 CDMA systems- ECWDMA-UMTS physical layer-UMTS network architecture-CDMA 2000 physical layer

Section B

Wireless Local Area Networks (WLAN) (10 Hrs)

Components and working of WLAN, transmission media for WLAN, Modulation techniques for WLAN (DSSS, FHSS), IEEE802.11 standards and protocols for WLAN (MACA, MACAW). Mobile Network and Transport layer: Mobile IP, Mobile TCP, traffic routing in wireless networks, wireless ATM. Wireless Local Loop (WLL), WLL Architecture, WLL Technologies and frequency spectrum. 4G mobile techniques, Wi-Fi Technology.

Section C

Capacity of Wireless Channels (9 Hrs)

Capacity of Flat Fading Channel- Channel Distribution Information known – Channel Side Information at Receiver – Channel Side Information at Transmitter and Receiver – Capacity with Receiver diversity – Capacity comparisons – Capacity of Frequency Selective Fading channels.

Diversity

Realization of Independent Fading Paths – Receiver Diversity – Selection Combining – Threshold Combining – Maximal-Ratio Combining – Equal - Gain Combining – Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme-basic concepts of RAKE receivers

Section D

Multiple Access Techniques (8 Hrs)

Frequency division multiple access-time division multiple access-spread spectrum multiples access space division multiple access- packet radio.

MIMO and multicarrier modulation (9 Hrs)

Narrowband MIMO model-parallel decomposition of MIMO channel-MIMO channel capacity-MIMO diversity gain –data transmission using multiple carriers multicarrier modulation with overlapping sub-channels-mitigation of subcarrier fading-basic concepts of OFDM

References:

1. Andrea Goldsmith, "Wireless Communications," Cambridge University Press, 2005
2. T.S. Rappaport, "Wireless Communications," Pearson Education, 2003
3. Pandya, Raj. Mobile and Personal Communication systems and services. Prentice Hall of India

Course Title: Optical Switching and Wavelength Routing

Course Code: ECE573

L	T	P	Credits
4	0	0	4

Course Objectives:

This is a research-oriented course dealing with the principles and issues arising in the design of optical networks with WDM technology. We will study the architecture of WDM networks and related protocols, as they are today and as they are likely to evolve in the future. Emphasis will be placed on performance, internetworking, and transition strategies from today's technology to a future all-optical infrastructure..

Learning Outcomes:

- This will help the student to understand the details of several particular protocols, as example implementations of fundamental principles, and digest descriptions of specific protocols, extracting the salient concepts; implement or simulate complex protocols for optical networks; identify and employ appropriate tools for evaluating optical network performance

Section A

Routing and Wavelength Assignment (12 Hrs)

Introduction, Problem Formulation, Illustrative Examples - Static Lightpath Establishment (SLE), Dynamic Lightpath Establishment (DLE), Introduction, Basics of Wavelength Conversion, Network Design, Control, and Management Issues, Benefit Analysis, Benefits of Sparse Conversion, Circuit-Switched Approaches, Packet-Switched Approaches, Reconfiguration in WDM Networks, WDM Network Control and Management, Amplification-Related Issues, Systems Design Considerations.

Section B

Electro-optic and Wavelength Conversion (9 Hrs)

Enabling Technologies, Wavelength-Converter Design, Wavelength-Convertible Switch Design, Network Design, Control, and Management Issues, Network Design, Network Control, Network Management.

Terabit Switching and Routing Network Elements (9 Hrs)

Transparent Terabit Switching and Routing, Opaque Terabit Switching and Routing, Modular Structure and Greater Granularity, Scalability, Multiple Protocol Interfaces, Architectures and Functionalities, Buffering Scheme, Switching Fabric, IP-Based IPI and OPI, IP-Based Electronic Controller, Multiprotocol Label Switching.

Section C

Protocol Design Concepts (12 Hrs)

Capacity, Interface Speeds, and Protocols, TCP/IP, and the Network Layer, Protocols and Layering , Internet Protocol Design: The End-to-End Principle, Transport Layer and TCP, Service Models at the Transport Layer, UDP and Connectionless Transport, TCP and Connection-Oriented Transport, Network Layer, Network Service Models, Internet Protocol and Fragmentation/Reassembly, Routing in the Internet, Asynchronous Transfer Mode, IP over ATM , IP Switching, QoS, Integrated Services, and Differentiated Services, Integrated Services and RSVP, Differentiated Services, Multiprotocol Label Switching, Labels, Route Selection.

Section D

Optical Network Engineering (9 Hrs)

Optical Network Architecture, Optical Network and Traffic Engineering, Routing and Wavelength Assignment, Optical Network Design and Capacity Planning, Physical Topology Design, Virtual Topology Design, Design of Survivable Optical Networks, Dynamic Light path Provisioning and Restoration, Route Computation, Wavelength Assignment, Performance of Dynamic RWA Algorithms, Control Plane Issues and Standardization Activities, Traffic Management for IP-over-WDM Networks, IP- and Wavelength-Routing Networks.

Internetworking Optical Internet and Optical Burst Switching (9 Hrs)

Overview of Optical Burst Switching, QoS Provisioning with OBS, Survivability Issue in OBS Network, IP-over-WDM Control and Signaling, Network Control, Engineering Control Plane, MPlS/GMPLS Control Plane for Optical Networks, Signaling Protocol.

References

1. Liu, Kelvin H., IP Over WDM, Wiley (2002).
2. Dixit, Sudhir, IP over WDM: Building the Next Generation Optical Internet, Wiley Interscience (2003).
3. Serrat, Joan and Galis, Alex, Deploying and Managing IP over WDM networks, Artech House (2003).

Course Title: Adaptive Signal Processing

Course Code: ECE651

L	T	P	Credits
4	0	0	4

Course Objective:

The study of adaptive signal processing involves development of various adaptation algorithms and assessing them in terms of convergence rate, computational complexity, robustness against noisy data, hardware complexity, numerical stability etc.

Learning Outcomes:

- This course will develop main classes of adaptive filter algorithms, namely the LMS. Towards this, it will develop all necessary mathematical tools, in particular, random variables, stochastic processes and correlation structure. The filtering problem is developed in the form of computing orthogonal projection on a signal subspace

Section A

Adaptive systems (12 Hrs)

definitions and characteristics, Open and Closed loop adaptation, Adaptive linear combiner, Performance function, Gradient and minimum mean square error, performance function, Gradient and minimum mean square error, Alternate expressions of gradient

Section B

Theory of adaptation with stationary signals (12 Hrs)

Input correlation matrix, Eigen values and Eigen vectors of the i/p correlation matrix

Searching the performance surface (12 Hrs)

Basic ideas of gradient search, Stability and rate of convergence, Learning curve, Newton's method, steepest descent method, Comparison

Section C

Important adaptive algorithms (12 Hrs)

LMS Algorithm, Derivation, Convergence of the weight vector, learning curve, noise vector in weight vector solution, mis adjustment, performance, Z Transforms in Adaptive signal processing, other adaptive algorithms- LMS Newton , Sequential regression, Recursive least squares, adaptive recursive filters, random search algorithms, Adaptive Lattice predictor, Adaptive filters with orthogonal signals.

Section D

Applications of Adaptive signal processing (12 Hrs)

Adaptive modeling of a multi-path communication channel, adaptive model in geophysical exploration, Inverse modeling, Adaptive interference canceling: applications in Bio-signal processing

References:

1. Adaptive signal processing: Widrow and Stearns, Pearson 2.Statistical and Adaptive signal processing- Manalokis, Ingle and Kogon, Artech House INC., 2005.
2. Adaptive filter theory- 4 th edition, Simon Haykin, Prentice Hall 2.Adaptive filters- A H Sayed, John Wiley
3. Adaptive filtering primer with MATLAB – A Poularikas, Z M Ramadan, Taylor and Francis Publications
4. Digital Signal and Image processing- Tamal Bose, John Wiley publications.

Course Title: Modern Radar Systems

Course Code: ECE652

L	T	P	Credits
4	0	0	4

Course Objective: This course aims at providing the necessary basic concepts in Surveillance Radar. Knowledge of fundamentals and applications of Tracking RADAR. Understanding of concepts of RADAR waveform design and RADAR applications such as stealth technology etc.

Learning Outcomes: At the end of the course, the students would

- Have a fundamental knowledge of the basic RADAR concepts.
- Have a well-founded knowledge of Tracking RADAR & steps involve in RADAR waveform design.
- Be able to understand the basic concept behind various applications such as stealth technology & ECC measures etc. the

Section A

Fundamentals of Surveillance Radar and Design (15 Hrs)

Bandwidth considerations, prf, Unambiguous range and velocity, Pulse length and Sampling, Radar Cross-section and Clutter.

Section B

Tracking Radar (15 Hrs)

Tracking and Search Radars, Antenna beam shapes required, Radar guidance, Frequency agility, Importance of Monopulse Radar.

Section C

Radar waveform design (15 Hrs)

Bandwidth and pulse duration requirements, Range and Doppler accuracy uncertainty relation, pulse compression and phase coding.

Section D

Principles of Secondary Surveillance Radar (15 Hrs)

Radar studies of the atmosphere, OHR and Radar jamming, EC, ECC measures and stealth applications.

References:

1. "Microwave and Radar Engineering" by Gottapu Sasi Bhushana Rao, ISBN – 978813179944 Pearson Education 2013.
2. “Understanding of Radar Systems”, Simon Kingsley and Shaun Quegan,McGraw Hill
3. Radar Handbook by Skolnik.

Course Title: Photonics

Course Code: ECE653

L	T	P	Credits
4	0	0	4

Course Objectives:

The aim of this course is to train students in methods of analysis, design, and dimensioning performance evaluation of optical fibre based communications systems. First, we consider the parameters of interest for systems planning using different photonic technologies as well as advanced optical signal processing models. Then, using this knowledge, we will study the design and evaluation of modern optical fibre based communication systems.

Learning Outcomes:

- Ability to dimension and design WDM high bit-rate fibre optic communication systems.
- Ability to analyze, model and implement advanced optical communication systems.
- Ability to use optical communications simulation tools to assess the results obtained from theoretical studies

Section A

High-Speed Low-Chirp Semiconductor Lasers (9 Hrs)

Introduction, Fundamental Dc Properties of Long-Wavelength QW Lasers, High-Speed Direct Modulation Of Strained Qw Lasers, Quantum Dot Lasers, Long-Wavelength Vcsels, Wavelength Integration And Control, Plasmonic Vcsels, Optical Signal Processing Based On Vcsel Technologies, And Vcsel-Based Slow Light Devices.

Telecom Optical Amplifiers (8 Hrs)

Power Photonics, single-mode fiber 980-NM pumps, Materials for 980-nm Pump Diodes, Optical Beam Narrow Stripe Technology, Output Power Scaling, Spectral Stability, Packaging, Failure Rate.

Section B

High-Speed Optical Modulators (9 Hrs)

Introduction, principles and mechanisms of external optical modulation, modulators based on phase changes and interference, intensity modulators based on absorption

changes, traveling wave electroabsorption modulators (EAMS), high-efficiency modulators.

Advances in Photodetectors (7 Hrs)

Waveguide Photodiodes, Balanced Receivers, High-Power Photodetectors, Avalanche Photodiodes.

Section C

Planar Light wave Circuits (9 Hrs)

Introduction, Basic Waveguide Theory And Materials, Passive Optical Filtering, Demodulating, And De-multiplexing Devices, Inter-Signal Control Devices, Intra-Signal Control Devices.

Silicon Photonics (9 Hrs)

Introduction, Soi Wafer Technology, High-Index-Contrast Waveguide Types And Performance On Soi, Input–Output Coupling, Passive Waveguide Devices And Resonators, Active Modulation Silicon Photonics, Germanium Photodetectors And Photoreceivers For Integrated Silicon Photonics, Cmos Integration and Integated Silicon Photonics, Nonlinear Effects, Applications.

Section D

Microelectromechanical Systems (9 Hrs)

For Light wave Communication: Introduction, Optical Switches and Cross-connects, Wavelength-Selective MEMS Components, Transform Spectrometers, Diffractive Spectrometers and Spectral Synthesis, Tunable Lasers, Other Optical MEMS Devices, Emerging MEMS Technologies and Applications.

References

1. Kaminow, Ivan P., Li, Tingye, Willner, Alan E., Optical Fiber Telecommunications V.A., Components and Subsystems, Elsevier (2008).
2. Kaminow, Ivan P., Li, Tingye and Willner, Alan E., Optical Fiber Telecommunications V.B., Systems and Networks, Academic Press (2008) 5th ed.
3. Goleniewski, Lillian, Jarrett Kitty Wilson, Telecommunications Essentials: The Complete Global Source, 2nd Edition, Addison Wesley Professional (2006).
4. Lee, Chi H., Thompson and Brian J., Optical Science and Engineering, CRC (2007).

Course Title: Digital Image and Video Processing

Course Code: ECE551

L	T	P	Credits
4	0	0	4

Course Objective:

The objective of this course is to introduce the students to the fundamental techniques and algorithms used for acquiring, processing and extracting useful information from digital images. Particular emphasis will be placed on covering methods used for image sampling and quantization, image transforms, image enhancement and restoration, image encoding, image analysis and pattern recognition. In addition, the students will learn how to apply the methods to solve real-world problems in several areas including medical, remote sensing and surveillance and develop the insight necessary to use the tools of digital image processing (DIP) to solve any new problem. The study is extended to the video processing as well.

Learning Outcomes:

- To study fundamentals of digital imaging.
- To study various image and video enhancement techniques.
- To study image segmentation techniques
- To study image processing of color images.
- To introduce the student to feature extraction of images

Section A

Digital Image and Video Fundamentals

Digital image and video fundamentals and formats, 2-D and 3-D sampling and aliasing, 2-D/3-D filtering, image decimation/interpolation, video sampling and interpolation, Basic image processing operations, Image Transforms Need for image transforms, DFT, DCT, Walsh, Hadamard transform, Haar transform, Wavelet transform

Section B

Image, Video Enhancement and Restoration

Image, Video Enhancement and Restoration Histogram, Point processing, filtering, image restoration, algorithms for 2-D motion estimation, change detection, motion-compensated filtering, frame rate conversion, de-interlacing, video resolution enhancement, Image and Video restoration (recovery).

Image and Video Segmentation

Image and Video Segmentation Discontinuity based segmentation- Line detection, edge detection, thresholding, Region based segmentation, Scene Change Detection, Spatiotemporal Change Detection, Motion Segmentation, Simultaneous Motion Estimation and Segmentation Semantic Video Object Segmentation, Morphological image processing.

Section C

Colour image Processing

Colour fundamentals, Colour models, Conversion of colour models, Pseudo colour image processing, Full colour processing

Image and Video Compression

Lossless image compression including entropy coding, lossy image compression, video compression techniques, and international standards for image and video compression (JPEG, JPEG 2000, MPEG-2/4, H.264, SVC), Video Quality Assessment

Section D

Feature Extraction

Object recognition Image Feature representation and description-boundary representation, boundary descriptors, regional descriptors, feature selection techniques, introduction to classification, supervised and unsupervised learning, Template matching, Bayes classifier

References:

1. Ed. Al Bovik ,"*Handbook of Image and Video Processing*", 2nd Edition, Academic Press, 2000.

2. J. W. Woods, "*Multidimensional Signal, Image and Video Processing and Coding*", 2nd Edition, Academic Press, 2011.
3. Rafael C. Gonzalez and Richard E. Woods," *Digital Image Processing*", 3rd Edition, Prentice Hall, 2008.

1.3.1. M. Tekalp, "*Digital Video Processing*", 2nd Edition, Prentice Hall, 2015.

4. S. Shridhar, "*Digital Image Processing*", 2nd Edition, Oxford University Press, 2016.