Autonomous Programme Structure (Modified) of
F. Y. B. Tech. (Common to All Programmes)
A. Y.: 2019-2020

F. Y. B. Tech. Semester –I

Course Code	Course Title	Teaching Scheme Hours / Week			Examination Scheme			Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Practical / Oral		
BS 1101	Engg. Mathematics - I	3	1	0	50	50	0	100	4
BS 1102	Physics - I	2	1	0	50	50	0	100	3
BS 1103	Chemistry- I	2	1	0	50	50	0	100	3
ES 1101	Basic Electrical and Electronics Engg. - I	3	0	0	50	50	0	100	3
ES 1102	Fundamentals of Programming Language - I	1	0	0	25	0	0	25	1
ES 1103	Engg. Graphics	2	0	0	25	25	0	50	2
ES 1104	Environmental Studies	2	1	0	50	50	0	100	3
BS 1104	Physics and Chemistry Lab - I	0	0	2	25	0	0	25	1
ES 1105	Basic Electrical and Electronics Engg. Lab - I	0	0	2	0	0	25	25	1
ES 1106	Fundamentals of Programming Language - I	0	0	2	0	0	25	25	1
ES 1107	Engg. Graphics Lab	0	0	2	0	0	25	25	1
NC 1101	Value Education	1	0	0	0	0	0	0	0
	Total	**16**	**4**	**8**	**325**	**275**	**75**	**675**	**23**
	Grand Total	**28**			**675**			**675**	**23**

MKSSS's Cummins College of Engineering, Karvenagar, Pune-411052

DEAN ACADEMICS
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg For Women, Karvenagar, Pune-52.

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

BS1101 ENGINEERING MATHEMATICS - I

Teaching Scheme:	Examination Scheme:
Lectures: 3 Hrs/Week	In-Semester : 50 Marks
Tutorial: 1 Hr/Week	End-Semester: 50 Marks
Credits: 4	

Course Objectives:

Mathematics is a necessary path to scientific knowledge which opens new perspective of mental activity. Our aim is to provide sound knowledge of engineering mathematics to make the students think mathematically and strengthen their thinking power to analyze and solve engineering problems in their respective areas.

Course Outcomes:

1. Solve the system of Linear equations by using the matrix method and apply it to check Linear Dependence, Independence of the vectors.
2. Calculate eigen values, eigen vectors and apply it to diagonalize a matrix.
3. Analyze roots of algebraic equations by applying De Moivre's theorem and analyze the function of complex numbers .
4. Compute power series expansions by using higher order derivatives.
5. Calculate partial derivatives and use to analyze maxima, minima of a given function.

Unit – I: Matrices **(07)**

Matrices, Rank of the matrix, Echelon Form, Normal form, Inverse of the matrix,System of Linear Equations, Linear Dependence and Independence, Linear

Transformations, Rotation and Translation Matrices.

Unit – II: Applications of matrices **(06)**

Eigen Values, Eigen Vectors , Cayley Hamilton Theorem , Diagonalization and applications in finding powers of matrix.

Unit–III: Complex numbers and its applications **(08)**

Argand diagrams, De moivre's theorem and its applications, Hyperbolic Functions, Separation of real and imaginary parts of functions of complex numbers, Inverse Hyperbolic Functions, Logarithm of Complex Numbers.

Unit – IV: Differential calculus **(05)**

Successive Differentiation, Method of finding nth order derivative of functions, Leibnitz theorem, Taylor's series, Maclaurin's Series.

Unit – V: Partial Differentiation **(07)**

Partial Differentiation, chain rule, composite functions, Euler's theorem on homogeneous functions,Total derivatives .

Unit – VI: Jacobian and its applications **(08)**

Jacobian, Chain rule, Partial derivatives using Jacobian, Errors and Approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B.S. Grewal, **'Higher engineering Mathematics'**, *Khanna publishers, Delhi(*40th edition),(2008).
2. B. V. Ramana, **'Higher Engineering Mathematics ',** *Tata McGraw Hill Publications* (2007)
3. Erwin Kreyszig ,**'Advanced Engineering Mathematics'** *Wiley Eastern Ltd.*(8th Student Edition)(2004).

Reference Books:

1. C.R.Wylie, L.C. Barrette, **'Advanced Engineering Mathematics',** *McGraw Hill Publi-*

*cations, New Delhi.(*6th edition)(2003)
2. Peter V. O'neil,'**Advanced Engineering Mathematics'** ,Thomson Brooks / Cole, *Singapore (*5th edition) (2007).

BS1102 PHYSICS – I

Teaching Scheme

Lectures: 2 Hrs per week

Tutorial: 1 Hr per week

Credits: 3

Examination Scheme:

In-Semester : 50 Marks

End-Semester: 50 Marks

Course Objective:

1. To introduce undergraduate students Of engineering to the principles, notions, basic physical ideas, mathematical relations and applications of Classical Physics, specifically pertaining to the theories of Electromagnetic Radiation, Optics, Special Relativity
2. To point out some of the contexts in which Classical Physics fails to account for certain experimental observation thereby requiring Quantum Physics to take over

Course Outcomes:

By taking this course, the learner will be able to –

1: **Use** the laws of Electrostatics and Electromagnetic Radiation to determine the electric field dueto static and dynamic charge distributions.
2: Apply the laws of physical optics in situations involving interference, diffraction and polarization patterns.
3: Justify the use of the principles of special relativity in situations involving elementary particles.
4: Judge the relevance of quantum mechanical principles and methods in finding out interferometric behavior and allowed energy states of particles with arbitrary spins.

Unit – I: Electromagnetic Radiation and Interference: (4)

Expression for the electric field beyond Coulomb's law; The dipole radiator; Physics of interference – Two dipole radiator

Unit – II: Diffraction and Polarization: (4)

The resultant amplitude due to *n* equal oscillators; Diffraction Grating; The electric vector of light; Birefringence; Polarisers

Unit – III: Capacitance and Dielectrics: (4)

Electrostatic energy; Capacitance of a Parallel-Plate Capacitor; The dielectric constant; The polarization vector

Unit – IV: Special Relativity: (4)

The Lorentz transformation; Slowing of clocks; Contraction of length; Relativistic energy

Unit – V: Quantum Behaviour – I: Particles and Waves: (4)

Experiments with bullets, waves and electrons; The uncertainty principle

Unit – VI: Quantum Behaviour – I: The Magnetism of Matter: (4)

The Precession of atomic magnets; Angular momentum in Quantum Mechanics; The magnetic energy of atoms; Quantized magnetic states

Text Book:

R. P. Feynman, R. B. Leighton and M. Sands, **'The Feynman Lectures on Physics'**, *Pearson Education* (2006)

Reference Books:

1. J. Walker, D. Halliday, R, Resnick, **'Principles of Physics'**, Wiley *Student Edition* (10th Edition)

2. H. Young and Roger Freedman, **'University Physics'**, Pearson Addison Wesley (12th Edition)

BS1103 CHEMISTRY- I

Teaching Scheme: **Examination Scheme:**

Lectures: 2 Hrs/Week In-Semester: **50** Marks

Tutorial: 1 Hr/Week End-Semester: **50** Marks

Credits: 3

Course Objectives:

The Chemistry course is designed such that the learners develop a sound background of fundamental concepts and principles relevant in the engineering context. The course facilitates undergraduates to learn bonding theories, methods of analysis and evaluate role of chemical substances. They analyze chemical processes related to engineering applications. Also the course inculcates basic problem solving skills involving chemistry principles.

Course Outcomes:

1. State laws, formulae, definitions and properties.
2. Comprehend synthesis procedures and analytical methods in qualitative and quantitative estimation.
3. Apply principles of fundamental chemistry for solving problems.
4. Analyze chemical processes for engineering applications based on chemical reactions and evaluate the role of chemical substances.
5. Critique the effect of different parameters on the properties of chemical substance.

Unit – I: Chemical Bonding **(05)**

Types of bonds - primary & secondary types with examples, hybridization based on valence bond theory, VSEPR theory, molecular orbital theory with respect to bonding in homo and hetero nuclear diatomic molecules.

Unit – II: Water Analysis and purification **(06)**

Chemical Analysis of water hardness, alkalinity and effect of hard water in boilers, Internal

treatment of boiler feed water, water softening techniques (Permutit and Ion exchange method) and membrane based processes.

Unit – III: Electro chemistry **(06)**

(a) Fundamentals of an electrochemical cell, EMF of cell, reference and indicator electrodes, conductance in solution and conductometric titration.

(b) Battery Technology

Primary & secondary cell, battery characteristics, Ni-Cd cell, Lithium-ion battery, rechargeable batteries, Fuel cell technology.

Unit – IV: Instrumental methods of Analysis-I **(04)**

Basic principles,instrumentation and applications of pHmetry, Potentiometry, Chromatography

Unit – V: Coordination Chemistry **(05)**

Introduction,Classification of ligands, naming coordination compounds, Werner and Sidgwick theory, VBT, CFT for Td and Oh complexes. Applications and comparison of VBT & CFT.

Unit – VI: Photochemistry **(04)**

Photochemical reactions, Laws of Photochemistry and quantum yield, energy transfer in photochemical reaction, applications.

Text Books:

1. Arun Bahl & G.D. Tuli,**Essentials of Physical Chemistry,***S.Chand Publications* (2014)
2. S.S. Dara **'Engineering Chemistry'** *S. Chand Publications (2010)*
3. Puri, Sharma, Kalia **'Principles of Inorganic Chemistry'**: *Milestone Publications* (2009)
4. B.S. Chauhan **'Engineering Chemistry'** :*Univ Sc Press.*(third edition)2009
5. Shashi Chawla **'A Text Book Of Engineering Chemistry'**: *Dhanpat Rai & Co.*(2015)

6. Jain and Jain '**A Text Book Of Engineering Chemistry**' *Dhanpat Rai & Co.*
7. Gurdeep Chatwal **'Instrumental methods of Chemical Analysis'** *Himalaya publ.house*

Reference Books:

1. Steven S. Zumdahl, **‘Chemistry concepts and applications’,** *Cengage learning publication* (2009)
2. Ram D. Gupta,**'Hydrogen fuel'***C.R.C.Publications*(2009)
3. Puri, Sharma, Pathania **'Principles of Physical Chemistry'** *: Vishal Publ. Co.*(2015)
4. Robert D. Braun*' **Instrumental methods of analysis'** Pharmamed press* (2010)

ES1101 Basic Electrical and Electronics Engineering - I

Teaching Scheme: **Examination Scheme:**

Lectures: 3 Hrs/Week In-Semester: 50 Marks

Credits: 3 End-Semester:50Marks

Course Objectives:

1. To make students familiar with the fundamental concepts of electric and magnetic circuits.
2. To educate the students about the realization of basic theoretical concepts & laws in real physical world.
3. To educate the students about the construction and applications of diode
4. To educate the students about the construction and applications of BJT

Course Outcomes:

After completion of course, students will be able to

1) Determine energy consumption for electro-thermal and electro-mechanical systems as well as analyze the temperature effect on resistance
2) Analyze given magnetic circuit and find circuit parameters
3) Analyze given DC circuit and calculate its parameters
4) Calculate average value and RMS value of sinusoidal and non-sinusoidal AC waveforms.
5) Analyze I-V characteristics of semiconductor diodes and transistors and design simple analog circuits using these devices

Unit – I: Introduction to electrical systems (05)

Review of basic electrical terms, Effect of temperature on resistance, Resistance temperature coefficient, insulation resistance, Work, Power and energy calculations for thermal, mechanical and electrical systems.

Unit – II: DC Networks (07)

Kirchoff's laws, Mesh and Nodal Analysis, Thevenin , Norton and Superposition Theorems, maximum power transfer therom, Network Simplifications using star-delta / delta-star transformations.

Unit – III: Electromagnetism and Magnetic Circuits (06)

Magnetic field due to electric current, Force on a current carring conductor, Electromagnetic induction, direction and magnitude of induced EMF, magnetomotive force and magnetic field strength, relative and absolute permeability, reluctance, series and parallel magnetic circuits, magnetic materials and B-H curve, self and mutual inductance, coupling coefficient,energy stored in magnetic circuits.

Unit – IV: Electrostatics and AC fundamentals (06)

A. Electrostatic field, electric flux density, electric field strength, permittivity. Capacitor and capacitance, dielectric strength and breakdown voltage, capacitors in series and parallel,composite capacitors, energy stored in capacitors, charging and discharging of capacitors and time constant

B. Generation of alternating emf, waveform terms and definitions, average value and rms values for sinusoidal and non sinusoidal currents and voltages, phasor representation of an alternating quantity

Unit – V: Diodes and rectifiers (06)

Overview of Semiconductor physics and p-n junction theory, Junction diode, construction and characteristic of p-n junction diode, zener diode, LED, photodiode, Half wave, full wave and bridge rectifiers, need of capacitor filter, rectifier operation with capacitor filter, zener diode as a voltage regulator, block diagram of Regulated power supply

Unit – VI: Junction Transistor Amplifiers (06)

Bipolar junction transistor, Construction of BJT, Types of biasing:-fixed bias and self bias circuit, BJT characteristics for-CE,CB,CC configurations, relationship between α and β, load line for a transistor, application of transistor as a switch and amplifier.

Text Books:

1. Hughes, **'Electrical and Electronic Technology'**, *pearson education*, (9^{th} edition), (2009)

Reference Books:

1. D. P. Kothari and I.J. Nagrath, '**Basic Electrical Engineering**', *McGraw-Hill*, (3^{rd} edition), (2010)
2. A. E. Fitzgerald, A.Grabiel,'**Basic Electrical engineering**',*McGraw-Hill*, (5^{th} edition), (2009)
3. Floyd, '**Electronic Devices and Circuits**', *pearson education, (*7^{th} edition),(2008)

ES 1102 Fundamentals of Programming Languages - I

Teaching Scheme:
Lectures: 1 Hr/Week
Credits: 1

Examination Scheme:
In-Semester: 25 Marks

Course Objectives:

1. Learn the fundamentals of building blocks of computer.
2. Understand how to formulate the programming language statements from description of a problem in English.
3. Understanding of decision and iteration interpretation in a programming language.
4. Understand basic building blocks of simple website.

Course Outcomes:

Students will be able to

1. Write algorithm based on given problem statement
2. Draw flow chart for a given problem statement
3. Write the code for simple problem statement
4. Debug the code snippets manually

Unit – I: Introduction to Programming (02)

Introduction to computer, Anatomy of a computer: Hardware and software, Operating system, Types of programming languages: Machine language, Assembly language, High level languages, Selection of language, Algorithm: As a program, As a flow-chart, Pseudo code

Unit – II: Writing First C Program (02)

Structure of a C program, Writing C program, Introduction to library functions in C, Files generated in C program, Comments, Indentation

Unit – III: Variables and Operations (03)

C language variables: Numeric, Character, Declaring and Initializing variables, Constants: Integer, Floating point, Character, String Operators: Arithmetic, Relational, Equality, Logical, Unary, Conditional, Bitwise, Assignment, Comma, sizeof, Operator precedence variable scope: Local and Global scope, Type casting and conversion

Unit – IV: Control flow in C Language (03)

Conditional branching statements: if statements, if-else Statement, Switch case, Iterative statements: while loop, do-while loop, for loop, Nested loops, break and continue statements

Unit – V: Arrays (02) Introduction to Arrays, Accessing Array elements, Internal representation of Arrays in C, Working with one-dimensional array, Introduction to two-dimensional arrays

Unit – VI: Introduction to Website Development (02)

Introduction to blogging and WordPress : Creating a simple website, Content creation, Pages and Blogs, Page linking, Comments, Adding contents like Multimedia, Presentations, Themes

Text Books:

1. Reema Thareja, **'Introduction to C programming',** *Oxford University Press* (2nd edition), (2015)
2. Pradeep Day, '**Computer Fundamentals and programming in C'**, *Oxford University Press*, (2nd edition) (2013)

Reference Books:

1. B Kernighan, D Ritchie, '**C programming Language'**, *Prentice Hall Software Series*, (2nd edition) (1988)

ES1103 Engineering Graphics

Teaching Scheme: **Examination Scheme:**

Lectures: 2 Hrs/Week In-Semester: 25 Marks

Credits: 2

End-Semester: 25Marks

Course Objectives:

a) To apply theory of projections and standard conventions in engineering drawing.

b) To understand the methods to draw various engineering curves.

c) To develop the visualization and interpretation skills, for the physical objects.

d) To develop free hand sketching skills.

Course Outcomes:

After completing the course students will be able to draw

a) Orthographic projections of an object.

b) Engineering curves by applying the given method.

c) Isometric views and development of surfaces of the given object.

4. Free hand sketches of simple machine elements.

Unit – I: Introduction to Engineering Drawing (02)

Layout and sizes of drawing sheets, drawing instruments, types of lines used in drawing practice, dimensioning systems, representation of tolerances, standard codes by B.I.S (SP-46).

Unit – II: Curves in Engineering Practice (05)

Construction of ellipse, parabola, hyperbola, involute, cycloid, archimedean spiral, helix on cone and cylinder.

Unit – III: Orthographic Projections (08)

Theory of projections, methods of obtaining orthographic views,sectional orthographic projections.

Unit – IV: Isometric Projections (08)

Isometric axes, Isometric scale, isometric projections and views, construction of isometric view from given orthographic views.

Unit – V: Development of lateral surfaces of solids (05)

Parallel line development, radial line development, methods to transfer points for development of prisms, pyramids, cylinder and cone.

Unit – VI: Free hand sketching (02)

Free hand sketching of front view and/or top view of standard machine elements –thread forms, hexagonal headed bolt and nut, screws, shaft and keys, spring, welded and riveted joint.

Text Books:

1. N. D. Bhatt and V. M. Panchal,**'Engineering drawing, plane and solid geometry'**, *Charotor Publication House.*

a) R. K. Dhawan,**'A text book of Engineering Drawing'**, *Pearson Education Inc*.

b) P.S. Gill, **'Engineering Graphics'**, *Kataria and sons Publications.*

c) M.L.Dabhade, **'Engineering Graphics'**, *Vision Publications.*

Reference Books:

a) Warren J. Luzzader, **'Fundamentals of Engineering Drawing'**, *Prentice Hall of India, New Delhi.*

b) Fredderock E. Giesecke, Alva Mitchell, **'Principles of Engineering Graph-**

ics',*Maxwell McMillan Publishing.*

c) Dhananjay A. Jolhe, **'Engineering Drawing'**, *Tata McGrawHill Publishing Co. Ltd.*

ES 1104 Environmental Studies

Teaching Scheme:

Lectures: 2Hrs/Week

Tutorial: 1Hr/Week

Credits: 3

Examination Scheme:

In-Semester: 50 Marks

End-Semester: 50 Marks

Course Objectives:

1. It is an interdisciplinary approach to understand environment.
2. It enhances the ability to understand Environmental Problems.
3. Understand the relevance and importance of natural resources in the sustenance of life on earth and living standard.
4. To develop the ability and understand role of Individual in Environmental Protection

Course Outcomes:

A student should be able to obtain/develop:

1. Develop an understanding of environmental pollutions and hazards due to engineering/technological activities and general measures to control them.
2. Analyse the relationships between environmental laws across multiple sectors (local, state, national and international) Comprehend the importance of ecosystem and biodiversity.
3. Develop an understanding of different natural resources including renewable and non-renewable resources.

4. Identify suitable controlling measures for different types of solid wastes.

5. Improve fundamental knowledge of the inter-relationships between the built environment and natural environment.

6. Discuss an action plan for sustainable alternatives that integrate science, humanities and social perspective

Unit – I: Introduction (05)

Concept of environment and multidisciplinary nature of environmental studies:

a) Definition of Environment, multidisciplinary nature of Environmental Studies, scope, importance of Environment, Public awareness for Environment

b) Concept, Ecosystem characteristics:-Biotic abiotic, functional attributes

c) Energy flow in ecosystem: - Universal and single channel energy flow model, Nutrient Cycling:- Nitrogen cycle, carbon cycle, phosphorus cycle,

d) Concept of biodiversity

Unit – II: Integrated built environment (05)

d) Concept of integrated built environment – natural & man-made.

e) Eco-friendly materials in construction - Introduction, sources, Classification,properties and materials.

f) Principles of Building Planning: - Aspect, prospect, grouping, privacy, roominess, sanitation, orientation, circulation, elegance, economy.

g) Building bye laws (concept):- Building line, control line, set back distance, F.S.I., Built up area.

h) Concept of green building, advantages of green building, Introduction LEED rating system.

Unit – III: Renewable and Non- Renewable resources and it's Conservation (04)

f) Natural resources: Types of Renewable- Forest, water - causes of depletion, Conservation

g) Non-renewable resources, types, method of harnessing energy

Unit – IV: Environmental Pollution (05)

g) Introduction, Classification of pollution - Air and water - sources, causes, effects & remedial measures.

h) Solid waste generation, Collection of solid wastes, processing techniques, E- waste generation and methods of disposal.

i) Role of an individual in prevention of pollution.

Unit – V: Social Issues and Environment (05)

g) Unsustainable to sustainable development, urban problems related to energy, Climate change, global warming, acid rain, ozone layer depletion

h) Water conservation and Rain water harvesting

i) Introduction to Environmental Impact Assessment - Definition, introduction of methods with the help of a case study

j) Environment Protection Act, Forest Conservation Act, Public awareness.

Unit – VI: Smart City (03)

Concept and features of smart city, challenges of urbanization, selection process, strategy

Text books:

5. D.L. Manjunath, 'Environmental Studies', Pearson Education.

6. ErachBharucha, 'Text Book of Environmental Studies', UGC, Universities Press

Reference books:

5. D.K. asthana ,MeeraAsthana, ‘A Text Book Of Environmental Studies’,S.Chand.

6. Dr. J.P. Sharma, ‘Environmental Studies’,University Science Press.

7. Dr. Suresh K. Dhalmeja,‘Environmental Studies’,S.K.Kataria& Sons.

8. Anubha Kaushik, C.P.Kaushik, ‘Perspectives in Environmental Studies’,

New Age International Publishers.

9. Shah, Kale, Patki, ‘Building planning and Built environment’,

Tata McGraw Hill

10. Bukhootsow, ‘Energy policy and planning’,B- Prentice Hall of India New Delhi

BS1104 Physics and Chemistry Lab – I

Teaching Scheme	Examination Scheme
Practical: 2 Hrs/Week	In-Semester: 25
Credits: 1	

1: **Record** the observations as per the least counts of measuring instruments and carry out plotting and necessary calculations pertaining to the optical, electromagnetic and thermal systems.
2: Analyze the plotted data and experimental findings with the corresponding theoretical physical models pertaining to the optical, electromagnetic and thermal systems.
3: Analyze the sources of errors and arrive at conclusions pertaining to the behavior of optical, electromagnetic and thermal systems
4: Determine quality parameters of water such as hardness, alkalinity etc
5: Use of instrumental techniques in quantitative estimations like conductometry, pH metry, potentiometry.
6: Select appropriate quantitative analysis for estimation of different parameters of the substance.
7: Interpret the significance of a technique and specific role of reagent in qualitative and quantitative analysis.

List of Experiments:

Physics
1. Michelson Interferometer
2. Specific heat of substance
3. Hall Effect
4. Balmer Series and Emission Spectra
5. Zeeman Effect (Demo)

Chemistry
1. Qualitative & quantitative Analysis of alkali /alkaline earth metals using Flame Photometry.
2. Colorimetric verification of Beer-Lambert's law.
3. Determination of molecular weight of polymer using Ostwald Viscometer.
4. Proximate analysis of coal.

ES 1105 Basic Electrical and Electronics Engineering Lab-I

Teaching Scheme:	**Examination Scheme:**
Practical: 2 Hrs./Week	Practical Exam: 25 marks
Credits: 1	

Course Outcomes:

After completion of course, students will be able to

1. Perform basic domestic wiring
2. Apply circuit laws to find the parameters of given electrical network
3. Build a basic regulated DC power supply
4. Analyse the performance of Transistor in CE configuration
5. Write techinical report of conducted experiment

List of experiments:

1. Study of different electrical and electronics components and instruments.
2. To perform electrical wiring to control lamps using one way and two-way switches.
3. Determination of Temperature Rise of a Medium Resistance
4. Verification of kirchoff's laws & superposition theorems
5. Verification of Thevenin's theorem.
6. Performance analysis of half wave,full wave rectifier with center tap transformer and bridge rectifier with and without filter.
7. Performance analysis of three terminal IC voltage regulator
8. Determination of frequency responce of CE amplifier.

ES 1106 Fundamentals of Programming Languages Lab - I

Teaching Scheme:
Practical: 2 Hrs/Week
Credits: 1

Examination Scheme:
Practical: 25 Marks

Course Objectives:
Familiarize students with

1. Learn basics of C programming.
2. Learn to write C program for a given logical solution.
3. Learn to make validation checks at required places.
4. Learn to apply programming concepts to solve problems.

Course Outcomes:
Students will be able to

1) Write algorithm based on given problem statement
2) Apply appropriate programming constructs
3) Write program for simple problem statement
4) Test program for different inputs

Section 1 (any 08 assignments)

1. A) Write a C program to accept the length of three sides of a triangle and to test and print the type of triangle - equilateral, isosceles, right angled or none of these.

   B) Find out area, perimeter of a given trigonometric figure
2. Write a C Program to display the table of any given number
3. Write a C Program to reverse a given number
4. Write a C Program to find whether a given number is Armstrong number or not.
5. Write a C Program to calculate Simple Interest
6. Write a C Program to convert temperature from Celsius to Fahrenheit
7. Write a C program to display all the prime numbers between 1 to n
8. Write a C program to generate a series (like Fibonacci)
9. Write a C Program to display the numbers divisible by 7 in a given range(e.g. 11 to 90)
10. Write a C Program to accept a number and convert every digit into word and display it
11. Write a C Program for finding roots of Quadratic Equation
12. Write a C Program to find the greatest possible length which can be used to measure exactly the lengths 4m 95cm, 9m and 16m 65cm (Hint HCF)

Section 2 (any 02 assignments)

1. The traffic light at three different road crossings change after every 48, 72 and 108 sec, if they all change simultaneously at 8:20:00 hrs., then at what time will they again change simultaneously? (Hint : LCM)
2. The average of 25 results is 18. The average of first twelve of them is 14 and the average of last twelve of them is 17. Find the thirteenth result. (Hint Average).
3. The taxi fare is Rs. 14 for the first kilometer and Rs. 2 for each additional kilometer. What will be the

fare for 10 kilometers?(Hint: Arithmetic Progression)

4. Roma's mathematics test had 75 problems, i.e. 10 arithmetic, 30 algebra and 35 geometry problems. Although she answered 70% of the arithmetic, 40 %of algebra and 60% of geometry problems correctly she did not pass because she got less than 60% of the questions right. How many more questions she would have needed to solve to earn 60% of passing grade?(Hint Percentage.)
5. A radio is purchased for Rs. 490/- and sold for Rs.465.50. Find the loss percentage(Hint: Profit and Loss)
6. In how many ways can a cricket 11 be chosen out of a batch of 15 players?(Hint Permutation and Combination)
7. Write a C Program to accept a number and convert every digit into word and display it

Section 3 (study assignment)

Design and develop a small application using Wordpress

Text Books:

1. Reema Thareja, **'Introduction to C programming',** *Oxford University Press* (2nd edition), (2015)
2. Pradeep Day, '**Computer Fundamentals and programming in C'**, *Oxford University Press*, (2nd edition) (2013)

Reference Books:

1. B Kernighan, D Ritchie, '**C programming Language'**, *Prentice Hall Software Series*, (2nd edition) (1988)

ES1107 Engineering Graphics Lab

Teaching Scheme:

Practical: 2 Hrs/Week

Credit: 1

Examination Scheme:

Practical: 25 Marks

Course Objectives:

Students will be able to

1. Apply theory of projections and standard conventions in engineering drawing.
2. Understand the methods to draw various engineering curves.
3. Develop the visualization and interpretation skills for the physical objects.
4. Develop free hand sketching skills.

Course Outcomes:

After completing the course students will be able to

Identify applications of engineering curves and draw the curves.

Understand and draw orthographic projections and isometric views of an object.

Draw the development of lateral surfaces of solids.

Create free hand sketches of the machine elements.

I: Introduction to Engineering Drawing (01)

Drawing sheet layouts, drawing instruments, standard codes by B.I.S (SP-46)

II: Assignments and Drawing Sheets (12)

- Engineering Curves.
- Orthographic Projections
- Isometric Projections

- Development of surfaces of solids.
- Free hand sketching.

III: Introduction to computer aided drafting package (02)

Features and applications of computer aided drafting packages, basic operations, and various commands for drawing, dimensioning, editing, saving and plotting the drawings.

NC 1201 Value Education

Teaching Scheme: **Examination Scheme:**

Lectures: 1 Hr /Week In-Semester: Nil

Tutorial: Nil End-Semester: Nil

Credits: Nil

Course Objectives:

1. To make understand importance of values in human behavior.
2. To understand adjustments required in one self and others to uphold values in society.
3. To understand importance of values in Family Life.
4. To understand ethics required by professionals in work place.

Course Outcomes:

1. Students will appreciate importance of values in all walks of life.
2. To develop women professional with strong ethics and above all be a good human being.
3. To help students to develop their own value system and action plan based on it.
4. To understand the impact of the Moral role of students in nation building and being a responsible citizen.
5. Understand effects of Global issue like Terrorism, Environment, different cultures etc.

Unit – I: Values and Self Development (03)

Value Education – Definition - relevance to present day - Concept of Human Values - self introspection - Self esteem.

Unit – II: Family values (03)

Components, structure and responsibilities of family - Neutralization of anger - Adjustability- Threats of family life - Status of women in family and society - Caring for needy and el-

derly -

Time allotment for sharing ideas and concerns.

Unit – III: Ethical values (03)

Professional ethics - Mass media ethics- Advertising ethics -Influence of ethics on family life -
psychology of children and youth – Leadership qualities - Personality development.

Unit – IV: Social values (03)

Faith, service and secularism - Social sense and commitment -Students and Politics -Social awareness, Consumer awareness, Consumer rights and responsibilities - Redressal mechanisms

Unit – V: Effect of international affairs on values of life/ Issue of Globalization (03)

Modern warfare -Terrorism. Environmental issues - mutual respect of different cultures, religions
and their beliefs.

Text Books:

1. Chakraborty, S.K., **'Values and Ethics for Organizations Theory and Practice'**, *Oxford
University Press, New Delhi*, (2001)

Reference Books:

1. T. Anchukandam and J. Kuttainimathathil (Ed) 'Grow Free Live Free', ***Krisitu Jyoti***

F. Y. B. Tech. Semester –II									
Course Code	Course Title	Teaching Scheme Hours / Week			Examination Scheme			Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Practical / Oral		
BS 1201	Engg. Mathematics - II	3	1	0	50	50	0	100	4
BS 1202	Physics - II	2	1	0	50	50	0	100	3
BS 1203	Chemistry - II	2	1	0	50	50	0	100	3
ES 1201	Basic Electrical and Electronics Engg. - II	3	0	0	50	50	0	100	3
ES 1202	Fundamentals of Programming Language - II	1	0	0	25	0	0	25	1
ES 1203	Basic Mechanical Engg.	3	0	0	50	50	0	100	3
ES 1204	Engg. Mechanics	2	1	0	50	50	0	100	3
BS 1204	Physics and Chemistry Lab - II	0	0	2	25	0	0	25	1
ES 1205	Basic Electrical and Electronics Engg. Lab - II	0	0	2	0	0	25	25	1
ES 1206	Fundamentals of Programming Language - II	0	0	2	0	0	25	25	1
ES 1207	Engg. Mechanics Lab	0	0	2	0	0	25	25	1
ES 1208	Workshop Practice – I	0	0	2	0	0	25	25	1
	Total	**16**	**4**	**10**	**350**	**300**	**100**	**750**	**25**
	Grand Total	**30**			**750**			**750**	**25**

MKSSS's Cummins College of Engineering Karvenagar, Pune-411052

DEAN ACADEMICS
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg. For Women, Karvenagar, Pune-52

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

BS1201 Engineering Mathematics-II

Teaching Scheme: **Examination Scheme:**

Lectures: 3 Hrs/Week In-Semester: 50 Marks

Tutorial: 1 Hr /Week End-Semester: 50 Marks

Credits: 4

Course Objectives:
Mathematics is a necessary path to scientific knowledge which opens new perspective of mental activity. Our aim is to provide sound knowledge of engineering mathematics to make the students think mathematically and strengthen their thinking power to analyse and solve engineering problems in their respective areas.

Course Outcomes: Students will be able to
1. Solve first order first degree DE, apply it to model and solve simple engineering problems like R-C circuit, conduction of heat etc.
2. Apply Beta, Gamma, Error function and Leibnitz's rule of DUIS to solve integration of univariate function
3. Identify the characteristics of the given function and trace the curve.
4. Integrate multivariate functions over the given region and apply the knowledge to find area, volume, mass, density etc.
5. Obtain Fourier series of given periodic function; Find nth harmonics for given data.

Course Contents:

Unit – I: First order first degree Differential Equation (07)

Definition, Order and degree of Differential Equation, Formation of differential equation, solutions of differential equation, Exact differential equation, Linear differential equation and equations reducible to these types.

Unit – II: Applications of Differential Equations (05)

Applications of differential equations to engineering problems: simple electrical circuits, applications of chemical engineering, applications of mechanical engineering and applications of physics.

Unit – III: Integral Calculus (07)

Special Functions:-Gamma Function, Beta Function, Error function. Differentiation Under integral sign (Leibnitz's rule). Curve tracing of Cartesian form, polar form.

Unit – IV: Multiple Integrals (08)
Transformation of Co-Ordinate systems Spherical, Polar and Cylindrical, Double and Triple integrals with limits, Double and Triple integrals without limits. Dirichlet's theorem.

Unit – V: Applications of Multiple Integrals (06)

Area of cartesian curves, Area of polar curves, Volume of solid, Mass of plane lamina, Mass of solid.

Unit – VI: Fourier Series and Harmonic Analysis (09)

Definition of Fourier series, Dirichlet's conditions, full range Fourier series, half range Fourier Sine series, half range Fourier Cosine Series, Practical Harmonic analysis and applications to problems in Engineering.

Text Books:

1. B.S. Grewal, 'Higher engineering Mathematics', Khanna publishers, Delhi (40th edition), 2008 .

2. B. V. Ramana, 'Higher Engineering Mathematics ',Tata McGraw Hill Publications, (2007)

Reference Books:

1. C.R.Wylie, L.C. Barrette, 'Advanced Engineering Mathematics', McGraw Hill Publications, New Delhi.(6th edition),(2003)

2. Peter V. O'neil, 'Advanced Engineering Mathematics', Thomson Brooks / Cole, Singapore (5th edition), (2007).

3. Erwin Kreyszig, 'Advanced Engineering Mathematics' ,Wiley Eastern Ltd.(8th Student Edition), (2004).

BS 1202 PHYSICS– II

Teaching Scheme:

Lectures: 2Hrs/Week

Tutorial: 1Hr/Week

Credits: 3

Examination Scheme:

In-Semester: 50 Marks

End-Semester: 50 Marks

Course Objective:

The objective of this course is to provide an 'algorithmic' introduction of the basic principles of Quantum Physics to the first year students of engineering. Throughout the course, the applications of Quantum Physics will be discussed by emphasizing the laws of combining 'probability amplitudes'. This will be done through several case studies and experimental situations.

Course Outcomes:

By taking this course, the learner will be able to –

1: **Apply** the laws of combining probability amplitudes for obtaining intensity distributions of ensembles of identical microscopic systems.
2: Differentiate between domain – specific nature of probability amplitudes in elementary quantum mechanical situations.
3: Justify the use of the laws of combining probability amplitudes in situations involving photons and two – state and multi – state quantum systems.

Unit – I: Probability Amplitudes: (4)

The laws for combining amplitudes; The two-slit interference patter; Scattering from a crystal

Unit – II: Identical Particles: (4)

Bose particles and Fermi particles; Case studies involving use of the exclusion principle

Unit – III: The Dependence of Amplitudes on Time: (4)

Stationary states; Potential energy and energy conservation; The precession of a spin-half particle

Unit – IV: The Hamiltonian Matrix: (4)

Resolving state vectors; How state changes with time; Hamiltonian Matrix

Unit – V: Two-state Systems and Single Qubit Logic Gates: (4)

Experiments with bullets, waves and electrons; The uncertainty principle

Unit – VI: Band Theory of Solids and Semiconductor Physics: (4)

States for an electron in a lattice; Electrons and holes in semiconductors; The Hall effect; Rectification at a semiconductor junction; The transistor

Text Book:

R. P. Feynman, R. B. Leighton and M. Sands, **'The Feynman Lectures on Physics'**, *Pearson Education* (2006)

Reference Books:

1. J. Walker, D. Halliday, R, Resnick, **'Principles of Physics'**, Wiley *Student Edition* (10^{th} Edition)
2. H. Young and Roger Freedman, **'University Physics'**, Pearson Addison Wesley (12^{th} Edition)

BS-1203 Chemistry II

Teaching Scheme:

Lectures: 2 Hrs/Week

Tutorial: 1 Hr/Week

Examination Scheme:

In-Semester: 50 Marks

End-Semester: 50 Marks

Credits: 3

Course Objectives:

The Chemistry course is designed for the learners to develop a sound background of fundamental concepts and principles relevant in the engineering context. The course facilitates undergraduates to evaluate the role of chemical substances in different methods of preparation and analysis.They analyze chemical processes related to engineering applications. Also the course inculcates basic problem solving skills involving chemistry principles.

Course Outcomes:

By taking this course, the students will be able to

CO1: Apply spectral and analytical techniques for chemical analysis.

CO2: State laws, definitions and identify physical parameters affecting composition of systems.

CO3:Elucidate on structure and synthesis of materials.

CO4: Evaluate types, factors, mechanisms related to corrosion and its preventive methods.

CO5: Analyze materials for their properties and applications such as fuel or speciality materials.

Unit – I: Instrumental methods of Analysis II (04)

Basic principles, theory, instrumentation and applications of Uv-Vis Spectrophotometry; Flamephotometry.

Unit – II: Polymer Chemistry (07)

Basic terms, molecular weight determination, types of polymerization and its mechanism (free radical and ionic), compounding of plastics, Speciality polymers, Recycling of polymers

Unit – III: Chemistry of fuels (09)

Calorific value, Bomb & Boys' calorimeter, Proximate and Ultimate analysis of coal, Crude

oil: refining, knocking, alternate fuels, rocket propellants, Combustion: calculation of air required for combustion.

Unit – IV: Corrosion **(04)**

Dry and wet corrosion mechanism, types, factors affecting corrosion, Protection against corrosion: Cathodic and anodic protection, powder coating and metallic coatings.

Unit – V: Phase Rule **(03)**

Gibbs Phase Rule, one Component system- Water system, Sulphur system, Two component system- (Pb-silver alloy). Applications and limitations of phase rule.

Unit – VI: Nanomaterials **(03)**

Introduction to nanomaterials, synthesis by top down and bottom up methods, properties and typical applications of nanomaterials.

Text Books:

1. Arun Bahl and G.D. Tuli, **'Essentials of Physical Chemistry'**, (2014/2016)
2. S.S. Dara **'Engineering Chemistry'** *S.Chand Publications* (2010)
3. Puri, Sharma, Kalia **'Principles of Physical Chemistry'** *Milestone Publication* (2009)
4. B.S. Chauhan **'Engineering Chemistry'** *Univ Sc Press.*(2015)
5. Shashi Chawla **'A Text Book Of Engineering Chemistry'** *Dhanpat Rai & Co.* (2015)
6. S.K. Kulkarni **'Nanotechnology: principles and practices'** (2014)
7. Gurdeep Chatwal **'Instrumental methods of Chemical Analysis'** *Himalaya publishing house* (1996)

Reference Books:

1. Ram D. Gupta,**'Hydrogen as a fuel'** *C.R.C.Publication* (2009)
2. Puri,Sharma,Pathania **'Principles of Physical Chemistry'** *Vishal Publishing Co.* (2015-16)
3. **Robert D. Braun 'Instrumental methods of analysis'** ***Pharmamed press*** **(2010)**

ES 1201 Basic Electrical and Electronics Engineering – II

Teaching Scheme:
Lectures: 3 Hrs/Week
Credits: 3

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks

Pre-requisite : Semiconductor physics

Course Objectives:

1. To make students familiar with the fundamental concepts of AC circuits
2. To familiarize the students with three phase supply
3. To develop a clear understanding of operation and application of transformer
4. To make students familiar with Digital Circuits
5. To introduce Basics operational amplifier (IC 741) and its applications

Course Outcome:

Having successfully completed this course, the student will be able to:

1. Analyze and determine parameters of single phase AC circuit.
2. Quantify parameters of single phase transformer related to its operation and use .
3. Develop applications of logic gates for building combinational and sequential circuits.
4. Build simple linear and non-linear circuits using operational amplifier.
5. Analyze characteristics of different power devices and transducers.

Unit I: **AC Circuits** **(08)**

Behavior of pure R,L,C in ac circuits,Series and parallel RL, RC and RLC circuits, concept of Impedance and admittance, power triangle and power factor.Resonance in series and parallel RLC circuit, Three phase voltage generationand waveform, star and delta balanced systems. Relationship between phase and line quantities, phaser diagram, power in a three phase circuit.

Unit II : Single phase Transformers **(07)**

1 Φ transformer: concept, types, working, ideal transformer, practical transformer, equivalent circuit, phasor diagram, efficiency and regulation calculations. Introduction to three phase transformer.

Unit III: Digital Electronics **(07)**

Binary number systems and binary arithmetic, basic gates, implementation of basic gates using universal gates, Boolean algebra, standard representation of logic functions (SOP and POS forms), Introduction of Combinational logic circuits like multiplexer ,demultiplexer ,half adder and full adder, Introduction of Sequential logic circuits like flip- flops (SR, D), counters and shift registers.

Unit IV: OPAMP **(07)**

Introduction to operational amplifiers, opamp configurations, modes and parameters, Negative feedback concept and applications like comparators, summing amplifiers, integrators and differentiators.

Unit V: POWER DEVICES **(07)**

Construction, characteristics and turn on mechanism of SCR, two transistor analogy of SCR, concept of line and forced commutation. Introduction to phase control concept. Construction, characteristics of IGBT and MOSFET.

Unit VI: Transducers **(06)**

Introduction to Transducers, selection of transducers, classification of transducers. Types of transducers such as LVDT, RTD, Thermistor and strain gauge.

Text Books:-

Hughes,"Electrical & Electronic Technology", *Pearson Education, 9th Edition*

Reference Books:-

1. AP Malvino & Donald Leach,"Digital Principles and Applications", *McGraw Hill Education, 4th edition*

2. Floyd ,"Electronic Devices and Circuits", *Pearson Education India, 8th edition*

3. H.S. Kalsi "Electronic Instrumentation",*TMH publication,2nd edition*

4. Jacob Millman & C C Halkais, Chetan parikh,"Integrated Electronics", *TMH, 2nd edition*

5. D.P. Kothari and I.J. Nagrath, "Basic Electrical Engineering", *Tata McGraw- Hill, 3rd Edition.*

ES 1202 Fundamentals of Programming Languages - II

Teaching Scheme:
Lectures: 1 Hr/Week
Credits: 1

Examination Scheme:
In-Semester: 25 Marks

Course Objectives:
Familiarize students with

1. Understand role of functions and it's utility in programming.
2. Understand the use of pointers in memory management.
3. Understand the utility of need and utility of user defined data types.
4. Learn and explore mobile application development environment.

Course Outcomes:
Students will be able to

1. Write program using functions
2. Write code for effective memory management
3. Write code using appropriate user defined data types for various applications
4. Write code with user defined functions similar to inbuilt functions

Unit – I: Functions in C **(03)**
Concept of Function, Function declaration, Function definition, Function Call, Return statement, Passing parameters: Call by value, Recursion

Unit – II: Strings **(02)**
Introduction, Reading Strings, Writing Strings, Strings Operations: Counting characters in String, Converting into upper case and lower case, Concatenation, Appending, Comparing, Reverse

Unit – III: Introduction to Pointers in C **(02)**
Understanding Computer memory, Introduction to Pointers, Declaring pointer variable, Function Call by reference, Pointer and Arrays, Role of Pointers in Passing an Array to a Function, Pointers and Strings

Unit – IV: Structures **(02)**
Introduction to Structures: Declaring Structure and Structure Variables, Initializing Structure, Accessing members of Structure

Unit – V: Unions, Enumeration Data types **(02)**
Declaring Union and its members, Accessing members of Union, Enumeration Types

Unit – VI: Mobile application Development **(02)**
Introduction, Web apps vs. Native apps, Introduction to mobile operating System like Android / IOS / Windows, Features and architecture of Mobile Operating System, Generating GUI and views, Layouts and Application Components, Creating simple mobile application.

Text Books:

1. Reema Thareja, **'Introduction to C programming',** *Oxford University Press* (2nd edition), (2015)
2. Pradeep Day, '**Computer Fundamentals and programming in C'**, *Oxford University Press*, (2nd edition) (2013)

Reference Books:

1. B Kernighan, D Ritchie, '**C programming Language'**, *Prentice Hall Software Series*, (2nd edition) (1988)

ES1203 Basic Mechanical Engineering

Teaching Scheme:

Lectures: 3Hrs/Week

Credits: 3

ExaminatioScheme:

In-Semester: 50 Marks

End-Semester: 50 Marks

Course Objectives:

a) To provide an overview of mechanical engineering systems (Power plant, Manufacturing plant, Maintenance systems, transmission systems).

b) To enable students to understand terminology used in Mechanical engineering with its significance.

c) To make student understand concept of Mechatronics System.

Course Outcomes:

a) The student will be able to differentiate between major areas like Design, Manufacturing and Thermal in mechanical industries while addressing a problem.

b) The student will be able to select an appropriate sector while finding solution to a problem.

c) The student will be aware of avenues available while choosing career opportunities in mechanical engineering Industry.

d) Understand the underlying principle of energy conversion systems and power plants, power producing and Power absorbing devices.

e) Students will be able to identify Mechatronics System and its components.

Unit – I: Introduction to basic mechanical engineering (06)

Industry overview-Comparison between process, product and service industry. Work environment for Mechanical industries, role of a mechanical engineer, ethics, professional hazards and safety concerns in mechanical industry. Typical manufacturing method of a product.

Unit – II: Introduction to thermal engineering (08)

Thermodynamic system, properties, states, process, cycle, first law of thermodynamics, application of first law to open and closed systems,second law of thermodynamics, conceptual difference between heat engine, heat pump and refrigerator, significance of efficiency and co-efficient of performance. Numerical on appropriate topics.

Unit – III: Power producing devices and power absorbing devices (08)

Power producing devices-Internal combustion engines and turbines, power plants.

Power absorbing devices-Centrifugal pumps, reciprocating units, vapour compression refrigeration, air conditioning systems.

Energy management system-fluctuations in demand-supply of energy,need of power grid, concept of energy audit.

Unit – IV: Introduction to design engineering

Introduction to engineering materials, elements and principles of engineering design, basic procedure, Basic requirement, standards in design, aesthetic and ergonomic considerations in design.

Basic machine elements, shaft, key, coupling, bearing, clutch and brake.

Mechanical drives, belt, chain and gear.

Unit – V: Introduction to manufacturing (08)

Operation on different machine tools, lathe, Milling, Drilling.

Joining of metals, welding-gas and arc, TIG, MIG, Soldering, brazing.

Hot and cold working-Forging, rolling, extrusion.

Unit – VI: Introduction to Mechatronics (06)

Definition(S) of Mechatronics, Mechatronics system Components, Levels of Mechatronics system, Examples of Mechatronics (products and systems in manufacturing), Advantages of Mechatronics with Traditional Systems.

Text Books:

a) C.P. Aurora, '**Thermodynamics'**, *Tata McGraw Hill education*, (2001).

b) BasantAgarwal, C.M Agarwal, '**Basic Mechanical Engineering'**, *Wiley Ind. Pvt. Ltd*.

c) V B Bhandari, **'Design of Machine Elements'**, *Tata McGraw Hill*, (2nd edition), (2007).

d) S. K.HajraChoudhury, S.K.Bose, A.K.HajraChoudhury, **'Elements of workshop technology, volume I and II',** *Media promoters and publishers pvt. Ltd*(7th edition).

e) W.Bolton, '**Mechatronic-a multidisciplinary approach',** *Prentice Hall*, (4th edition), (2009).

f) Class room notes.

Reference Books:

a) Moran, Shapiro, Boettner, Bailey, '**Principles of engineering thermodynamics'**, *Wiley*, (7^{th} edition).

b) Rayner Joel, '**Basic engineering thermodynamics'**, *Addison-Wesley*, (5^{th} edition).

c) Y. A. Cengel and M. A. Boles, '**Thermodynamics, an Engineering Approach**', (4th edition).

d) S.S. Rattan, '**Theory of Machine'**, *McGraw Hill*, (4^{th} edition).

e) B.S. Raghuwanshi, '**A course in workshop technology'**, *DhanpatRai&co*.

f) Kalpakjian, Schmid, **'Manufacturing engineering and technology**', *Pearson*, (4^{th} edition).

7. Nptel course112105127/1, 112105127/2

ES 1204 Engineering Mechanics

Teaching Scheme:

Lectures: 2Hrs/Week

Tutorial: 1Hr/Week

Credits: 3

Examination Scheme:

In-Semester: **50** Marks

End-Semester: **50** Marks

Course Objectives:

1. To develop the ability of students to analyze any problem in a simple and logical manner.
2. To make the students understand the fundamental principles of mechanics which are the foundation of much of today's engineering.
3. To develop logical thinking of the students for application in engineering.
4. To provide an introduction to the basic quantities of mechanics.

Course Outcomes:

A student should be able to obtain/develop:

1. An ability to apply knowledge of mathematics, science and engineering

2. A recognition of the need for, and an ability to engage in, life-long learning.

3. Application of Newton's laws of motion

4. Knowledge of kinematic & kinetic analysis.

Unit – I: Introduction to Statics (06)

1. Fundamental concepts and principle (The parallelogram law of addition of forces, the principle of transmissibility, Newton's laws of motion**,** Newton's law of gravitation). Introduction to a force in a plane, Types of force system, resolution & composition of forces, Methods of composition to find resultant, moment of force, Varignon's theorem, couple, equivalent force couple system.
2. Introduction to force in a space, problems on resultant of concurrent force system
3. Equilibrium- Introduction to concept of equilibrium, Conditions of equilibrium, Free body diagram, equilibrium under different forces, equilibrium of concurrent parallel & general forces in a plane.

Unit – II: Introduction to type of Supports and Beam (05)

1. Types of supports (Fixed, roller, hinged support)

   Types of loads on a beam (point load, uniformly distributed load, uniformly varying load)
   Types of beams (simple beam, cantilever beam, compound beam)

2. Problems on Reactions & analysis of beams
3. Centroid- Definitions (Center of gravity of two dimensional body, center of mass, centroid), procedure to find centroid of regular plane lamina.

Unit – III: Introduction to Friction (03)

Definition and classification of friction, coefficient of static and kinetic friction ,angle of friction, angle of repose, problems on block friction and ladder friction

Unit – IV: Rectilinear Motion (05)

2) Variables in Rectilinear motion- Time, Position, Displacement, Distance travelled, Velocity, Acceleration

   Equations of motion for constant acceleration & motion under gravity, variable acceleration, relative motion based on kinematic equations.

3) Application of Newton's second law of motion for rectangular co-ordinate system (D' Alembert's principle)

Unit – V: Curvilinear Motion (05)

1) Equation of motion in rectangular components, Normal & Tangential components, Radial & Transverse components.

2) Projectile motion- Definition and derivation (time of flight, horizontal range, angle of projection, maximum height, trajectory),Projectile on horizontal plane only

Unit – VI: Work Energy Principle (04)

1. Introduction and definition of Work, power, energy, conservative & non- conservative forces, Conservation of energy, work-energy principle.

2. Problems on Work done by different forces (External force, Frictional force, Gravitational force, Spring force).

Text books:

1. A Nelson, '**Engineering Mechanics Statics and Dynamics**', *Mc Graw Hill Education.*

2. R.S. Khurmi, '**A Textbook of Engineering Mechanics**', *S. Chand & Company Ltd.*

Reference books:

- Beer & Johnson, '**Vector mechanics for engineers**', *Mc Graw hill publication.*
- I. H. Shames & G.K.M. Rao, '**Engg. Mechanics'**, *Pearson.*
- R. C. Hibbler, '**Engg. Mechanics statics & dynamics**', *Pearson publication*
- **S. Timosenko, DPT.young & J.V.Rao, 'Engineering mechanics',** ***Tata Mc Graw hill education pvt. Ltd. New delhi.***

BS 1204 Physics Chemistry Lab – II

Teaching Scheme:

Lectures: 2Hrs/Week

Tutorial: 1Hr/Week

Practical: 2 Hrs/Week

Credits: 1

Examination Scheme:

In-Semester: **25** Marks

1: **Record** the observations as per the least counts of measuring instruments and carry out plotting and necessary calculations pertaining to solid state physics, atomic and molecular system.
2: Analyze the plotted data and experimental findings with the corresponding theoretical physical models pertaining to solid state physics, atomic and molecular system.
3: Analyze the sources of error and arrive at conclusions pertaining to the behavior of solid state physics, atomic and molecular system.
4: Determine the molecular weight of a given polymer by viscometry.
5: Evaluate a solid fuel sample for its quality by proximate analysis.
6: Implement spectral analysis for a given chemical compound.

List of Experiments:

Physics

1. Michelson Interferometer
2. Specific heat of substance
3. Hall Effect
4. Balmer Series and Emission Spectra
5. Zeeman Effect (Demo)

Chemistry

1. Qualitative & quantitative Analysis of alkali /alkaline earth metals using Flame Photometry.
2. Colorimetric verification of Beer-Lambert's law.
3. Determination of molecular weight of polymer using Ostwald Viscometer.
4. Proximate analysis of coal.

ES 1205 Basic Electronics and Electrical Engineering Lab- II

Teaching Scheme: **Examination Scheme:**

Laboratory: 2 Hrs/Week End-Semester:25 Marks

Credits: 1

Pre-requisite : Instruments ,Electronics and electrical components,semiconductor physics.

Course Objectives:

3. To make students familiar with the fundamental concepts of single phase AC circuits
4. To make students familiar with three phase supply
5. To demonstrate working of single phase transformer
6. To explain combinational logic circuits
7. To introduce Basics operational amplifier (IC 741) and its applications

Course Outcome:

Having successfully completed this course, the student will be able to:

3. Apply fundamental concepts of single phase and three phase AC circuits.
4. Test performance parameters of single phase transformers.
5. Implement basic analog and digital circuits.
6. Verify characteristics of SCR and transducer.

List of Practicals:-

1. Performance analysis of L-C-R series circuit .
2. Load test on single phase transformer for determination of voltage regulation.
3. Performance analysis of 3 phase AC circuit.
4. Analysis of summing amplifier and difference amplifier using OPAMP.
5. Design and implementation of half adder and full adder circuits.
6. Illustrate effect of variation of displacement on output voltage of LVDT.
7. Verification of static characteristics of SCR.
8. Soldering Techniques (any small circuit like clippers, clamper, circuits using basic gates).

ES 1206 Fundamentals of Programming Languages Lab - II

Teaching Scheme:
Practical: 2 Hrs/Week
Credits: 1

Examination Scheme:
Practical: 25 Marks

Course Objectives:
Familiarize students with

1. Learn and acquire art of computer programming.
2. Learn advanced C programming features.
3. Learn to write C program for a given logical solution.
4. Learn to apply programming concepts to solve simple problems using arrays, functions and structures.

Course Outcomes:
Students will be able to

1. Write program using functions for given problem statement.
2. Write code using sequential memory management
3. Apply appropriate user defined data types for given statement.
4. Write program with user defined functions similar to library functions.

Section 1 (any 07 assignments)

1. Write a C program to swap 2 integers using user defined functions (call by value, call by reference).
2. Write a program in C to compute the factorial of the given positive integer using recursive function.
3. Write functions to convert feet to inches, convert inches to centimeters, and convert centimeters to meters. Write a program that prompts a user for a measurement in feet and converts and outputs this value in meters. Facts to use: 1 ft = 12 inches, 1 inch = 2.54 cm, 100 cm = 1 meter.
4. Write a menu driven program to perform following operations using Array of integers like (accept, display, print alternate number, sum of all numbers, search a number).
5. Write a program in C to sort n integers using bubble sort.
6. Write a menu driven program to perform string operations using library functions.
7. Write a menu driven program to perform string operations using user defined functions.
8. Define an integer pointer array of 10 integers. Initialize them to any integer values from the keyboard. Find the sum, average, minimum, and maximum of these 10 integers. Sort the 10 integers in descending order.
9. Write a program in C to compute addition / subtraction / multiplication of two matrices. Use functions to read, display and add / subtract / multiply the matrices.
10. For a class an examination is conducted and the results for the students of all the 5 subjects are recorded. Write C program to display the record of students. On the basis of the record compute

11. Write a menu-based program in C that uses a set of functions to perform the following operations:

    i. reading a complex number
    ii. writing a complex number
    iii. addition of two complex numbers
    iv. Iv.subtraction of two complex numbers
    v. multiplication of two complex numbers
    vi. Represent the complex number using a structure.

12. Write a C program to create an employee database using structure and perform operations such as accept, display, search by name, search by number, update a record.

Section 2 (any 02 assignments)

1. A string is provided from the user. Calculate the total number of characters in the string and the total number of vowels in the string with the number of occurrence in the string

2. College library has n books. Write C program to store the cost of books in array in ascending order.
   Books are to be arranged in descending order of their cost

3. Write a recursive function to obtain the first 25 numbers of a Fibonacci sequence. In a Fibonacci sequence the sum of two successive terms gives the third term. Following are the first few terms of the Fibonacci sequence:1 1 2 3 5 8 13 21 34 55 89

4. A factory has 3 division and stocks 4 categories of products. An inventory table is updated for each division and for each product as they are received. There are three independent suppliers of products to the factory:

   (a) Design a data format to represent each transaction

   (b) Write a program to take a transaction and update the inventory

   (c) If the cost per item is also given write a program to calculate the total inventory values.

5. Write a program that compares two given dates. To store date use structure say date that contains three members namely date, month and year. If the dates are equal then display message as "Equal" otherwise "Unequal".

6. Create a structure to specify data of customers in a bank. The data to be stored is: Account number, Name, Balance in account. Assume maximum of 200 customers in the bank.

   (a) Write a function to print the Account number and name of each customer with balance below Rs. 100.

   (b) If a customer request for withdrawal or deposit, it is given in the form: Acct. no, amount, code (1 for deposit, 0 for withdrawal) Write a program to give a message, “The balance is insufficient for the specified withdrawal”

7. An automobile company has serial number for engine parts starting from AA0 to FF9. The other characteristics of parts to be specified in a structure are: Year of manufacture, material and quantity manufactured.

Section 3 (study assignment)

Students should design and develop a small Android application for mobile.

Text Books:

1. Reema Thareja, **'Introduction to C programming',** *Oxford University Press* (2nd edition), (2015)
2. Pradeep Day, '**Computer Fundamentals and programming in C'**, *Oxford University Press*, (2nd edition) (2013)

Reference Books:

1. B Kernighan, D Ritchie, '**C programming Language'**, *Prentice Hall Software Series*, (2nd edition) (1988)

ES1207 Engineering Mechanics Lab

Teaching Scheme:

Lectures: 2 Hrs/Week

Tutorial: 1 Hr/Week

Credits: 1

Examination Scheme:

In-Semester: 25 Marks

No. of Experiments:

Part A-Experiments (any 7 experiments)

1. Verification of law of polygon of forces.
2. Verification of Varignon's theorem.
3. Verification of Lami's theorem.
4. Support reactions of simple beam.
5. To determine forces in space force system.
6. Study of Curvilinear motion.
7. Determination of coefficient of restitution.
8. To compare coefficient of friction of various pair of surfaces in contact.

Part B- Graphical analysis -(Any one)

1. To find resultant of force system.
2. To find support reactions of simple beam.

ES 1208 Workshop Practice I

Teaching Scheme:

Practical: 2 Hr/Week

Credit: 1

Examination Scheme:

Practical/Oral Examination: 25 marks

Course Objectives:

1. To provide knowledge and skill to use tools, machines, equipment, and measuring instruments, which are used in manufacturing industries.
2. To educate students for Safe handling of machines and tools in manufacturing environment

Course Outcomes:

1. The student will be able to apply concept related to workshop safety & use of measuring instruments during process of manufacturing.
2. The student will be able suitably select basic manufacturing practices for making of component.
3. The students will be able to manufacture/produce given product from raw material using different manufacturing methods.

Unit – I: Introduction to Workshop Safety and Measuring Instruments: (05)

- Safety precautions while working in shop, safety equipment's and their use.
- Brief introduction to instruments like – Steel rule, Calipers, VernierCaliper, Micrometer, etc. Least counts, common errors and care while using them, use of marking gauge, 'V'block and surface plate.
- Introduction & working of different tools used in workshop.

Unit – II: Manufacturing Practice:(Any Two Trades) (13)

- Fitting: Preparation of joints, markings, cutting and filling for making joints like V or T for making part of any component.
- Carpentry: Wood working consists of planning, marking, sawing, chiseling and grooving to make joint like lap, T, dovetail.
- Tin smithy: Making of small parts using sheet metal such as Tray, Funnel.
- Welding Joints: Introduction to use of MIG/ TIG, arc welding for making joints like Lap, Butt joint.

Unit – III: Information technology: (06)

- Identify the peripherals of computer components in a CPU and its functions
- Disassemble and assemble the PC back to working condition
- Loading of operating system.

Unit – IV: Plumbing (06)

- Hands on practice on Cutting, bending and external threading of GI pipes using Die
- Plumbing on PVC pipes.
- Different Joint preparation on GI & PVC Pipes

Text Books:

1. Choudhary, Hajara**'Elements of Workshop Technology**', Media Promotors& Publishers, (1997).
2. Raghuvanshi B.S. "Workshop Technology" Vol. I &II,DhanpatRai& Sons, (1998).
3. H.S. Bawa'Workshop Technology' Vol.-I by, TMH Publications, New Delhi, (2009).
4. Gupta and Kaushik "Workshop Technology: Vol. – I by, New Heights,(1999).

Reference Books:

1. Chapman W.A. J and Arnold E. '**Workshop Technology-part I**' Viva low priced Student, (1998).

Autonomous Programme Structure of Second Year B. Tech. AY 2019-2020

S. Y. B. Tech. Electronics & Telecommunication Engineering Semester – I										
Course Code	Course Title	Teaching Scheme			Examination Scheme				Marks	Credit
		Hours/Week								
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
EC 2101	Electronic Devices and Circuits	3	1	0	50	50	0	0	100	4
EC 2102	Network Theory	3	1	0	50	50	0	0	100	4
EC 2103	Digital Electronics	3	1	0	50	50	0	0	100	4
EC 2104	Data Structures	3	0	0	50	50	0	0	100	3
BSEC2101	Engineering Mathematics-III	3	1	0	50	50	0	0	100	4
EC 2105	Electronic Devices and Circuits Lab	0	0	4	0	0	0	25	25	2
EC 2106	Digital Electronics Lab	0	0	2	25	0	0	0	25	1
EC 2107	Data Structures Lab	0	0	4	0	0	50	0	50	2
	Total	**15**	**4**	**10**	**275**	**250**	**50**	**25**	**600**	**24**
	Grand Total	**29**							**600**	**24**

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EC2101 Electronic Devices and Circuits

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week

Examination scheme:
In Semester: 50 Marks
Semester: 50 Marks
Credits: 4

Course Objectives:

1. Introduce the characteristics, working principles as well as concept of load line and operating point of FETs for analysing DC circuits
2. Explain the concepts of employing simple models to represent non linear elements such as JFETs and MOSFETs
3. Analyse JFET and MOSFET amplifiers and discuss general frequency response of amplifiers
4. Impart the knowledge of feedback and its effects on characteristics of amplifier
5. Familiarise the students with audio power amplifiers using BJTs

Course Outcomes:
Having successfully completed this course, the student will be able to:

1. Explain characteristics of FETs and determine transistor parameters
2. Analyse RC coupled amplifier for DC and AC conditions
3. Determine the frequency response of transistorised RC coupled circuits
4. Analyse effect of negative feedback on amplifier parameters. Explain principle of working of oscillators and calculate frequency of oscillation for given circuit
5. Calculate efficiency and harmonic distortion for Class A, Class B and Class AB Power Amplifiers and compare them

Unit 1: JFET **(09)**

Introduction, Construction and working, JFET characteristics (Transfer and Drain), Schockley's equation, JFET biasing and DC analysis, JFET as amplifier and its configurations (CS/CD/CG) and comparison, CS amplifier analysis.

Unit 2: MOSFET **(10)**

Two terminal MOS structure, EMOSFET-construction, symbols, Ideal EMOSFET V-I characteristics, additional MOSFET structures (DMOSFET and CMOS), non-ideal V-I characteristics of EMOSFET (finite output resistance, body effect, break down effect, temperature effect, short channel effects), MOSFET biasing and DC circuit analysis, MOSFET small signal amplifier (CS configuration).

Unit 3: Frequency response of amplifiers **(07)**

General frequency response for RC coupled amplifier, Low frequency response, Miller effect, High frequency response, Multistage frequency effects, square wave testing for RC coupled amplifiers.

Unit 4: Feedback Amplifiers and Oscillators **(08)**

Classification of amplifiers, feedback concept, General characteristics of negative feedback amplifiers, Feedback Topologies, Barkhausen criterion, sinusoidal oscillators: RC Phase shift and LC oscillators, Crystal oscillators.

Unit 5: Power Amplifiers **(08)**

Types (Class A, B, AB and C) and their comparison, Second Harmonic distortion, Analysis of Class A, Class B and Class AB amplifiers, Introduction to Class C amplifiers.

Text books:

1. R.L.Boylstad, L.Nashlesky, **'Electronic Devices and Circuits Theory'**, *PrenticeHall of India,* (9th Edition), (2006).
2. Donald Neaman,**'Electronic Circuit Analysis and Design'**, *Tata McGraw Hill,* (3rd Edition), (2007).

Reference Books:

1. David A. Bell, **'Electronic Devices and Circuits'**, *Oxford,* (5th Edition), (2008).
2. Millman , Halkias, **'Integrated Electronics- Analog and Digital Circuits and Systems'**, *Tata McGraw Hill,* (2nd Edition), (2010).

Websites:

1. http://nptel.ac.in/courses/117103063/24
2. http://nptel.ac.in/courses/117103063/17
3. http://www.iitg.ac.in/apvajpeyi/ph218.html
4. http://nptel.ac.in/courses/117101105/3

List of Tutorials:

1. Design biasing circuit for JFET.
2. Analyse JFET amplifier.
3. Analyse MOSFET amplifier.
4. Analyse Multistage amplifiers.
5. Analyse effect of negative feedback on amplifiers.
6. Design Oscillator Circuit.
7. Analyse Power Amplifiers.

EC 2102 Network Theory

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 4

Course Objectives:

1. Explain and apply fundamentals of network simplification techniques
2. Explain and apply network theorems to find network quantities
3. Impart knowledge of series and parallel resonant circuits
4. Analyse and apply transient analysis of RL,RC and RLC circuits
5. Familiarize students with two-port network and filter design analysis

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Apply fundamental laws and theorems to find current and voltage in elements of electrical network
2. Determine bandwidth and selectivity in resonant circuit
3. Find and analyse initial conditions and responses of RL,RC and RLC circuits for standard excitation signals
4. Design and analyse prototype filter and attenuator
5. Simplify two port network to determine the network parameters

Unit 1: Network Theorems **(10)**

Basic Circuit Analysis and Simplification Techniques such as Mesh Analysis, Nodal Analysis, Source Transformation and Source Shifting, Superposition Theorem, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem (AC & DC analysis)

Unit 2: Resonance **(06)**

Series Resonance: Impedance, voltage and current variations with frequency, Bandwidth, Selectivity. Effect of generator resistor on bandwidth and Selectivity, Parallel resonance: Admittance variation with frequency, Bandwidth and selectivity Comparison and applications of series and parallel resonant circuits

Unit 3: Transient Analysis **(10)**

Transient response of R-L, R-C, R-L-C circuits (Series and Parallel combinations) for D.C. and sinusoidal excitations, Initial conditions, Classical method and Laplace transform method of solutions. Transient response of R-L, R-C, R-L-C circuits for standard inputs such as step, ramp, pulse and impulse by using Laplace transforms method

Unit 4: Filters and Attenuator **(08)**

Filters and Attenuators- Classifications of Networks in Symmetrical and Asymmetrical networks.

Properties of two port Symmetrical Networks (T and Π only): Characteristic Impedance (Z0) and Attenuation Constant (γ) in terms of circuit components. Filters: Filter fundamentals, Constant K-Low Pass Filter (LPF), High Pass Filter (HPF), Band Pass Filter (BPF) and Band Stop Filter (BSF). Attenuators: Introduction to Neper and Decibel. Symmetrical T and Π type attenuators

Unit 5: Two Port Network **(08)**

Two Port Network Parameters and Functions- Terminal characteristics of network: Z, Y, h and ABCD Parameters, Reciprocity and Symmetry conditions, Applications of the parameters

Text Books:

1. D Roy Choudhury, '**Networks and Systems**', *New Age International Publishers,* (1st Edition), Reprint, (2005).
2. Ravish R. Singh, '**Network analysis and Synthesis**', *McGraw Hill Education,* (2013).

Reference Books:

1. John D. Ryder, '**Network Lines and Fields**', *PHI Publications,* (1st Edition), (1990).
2. M. E. Van Valkenburg, '**Network Analysis**', *PHI / Pearson Education,* (3rd Edition), Reprint (2002).

Website:

1. http://nptel.ac.in/courses/108102042/

List of Tutorials:

1. Calculation of voltage, current and power using KVL, KCL, Mesh and Nodal analysis.
2. Calculation of voltage, current and power using Superposition & Thevinin's Theorem.
3. Calculation of voltage, current and power using Norton's & Maximum Power Transfer Theorem.
4. Bandwidth and selectivity calculation in Series and Parallel Resonant Circuits.
5. Determination of initial conditions of RL, RC and RLC circuits with laplace transform.
6. Determination of network quantities in RL, RC and RLC circuits with laplace transform.
7. Designing of Constant K-LPF, HPF, BPF and BSF.
8. Calculation of Z, Y, h, ABCD parameters for given circuit.

EC 2103 Digital Electronics

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1Hr/Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 4

Course Objectives:

1. Introduce the techniques for the simplification of logic function and design arithmetic circuits
2. Make students familiar with design and applications of combinational circuits using basic logic gates and MSI chips
3. Introduce the sequential circuits, their functionality, design and applications
4. Acquaint the students with the design and implementation of state machines
5. Make students familiar with logic families, Programmable Logic Devices and VHDL

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Apply reduction techniques to design basic combinational circuits
2. Design combinational and sequential circuits using basic gates and MSI chips
3. Design sequential circuits using state machines
4. Explain digital logic families and Programmable Logic Devices
5. Explain modelling styles of VHDL and design combinational and sequential circuits using VHDL

Unit 1: Combinational Logic Design **(07)**

Standard representations for logic functions, k map representation of logic functions, SOP and POS forms, min-terms and max-terms, minimization of logical functions up to 4 variables, don't care conditions. Design Examples: Arithmetic Circuits: Adders and subtractors, Digital Comparator, ALU, code converters.

Unit 2: Combinational Logic Design using MSI chips **(06)**

Circuit design using adder, comparator ICs. Multiplexers and their use in combinational logic designs, multiplexer trees, Demultiplexers and their use in combinational logic designs, Demultiplexer trees, Decoders.

Unit 3: Sequential Logic Design **(08)**

One bit memory cell, Clocked SR, D, MS J-K flip-flop and T flip-flops, Use of preset and clear terminals, Excitation table for flip-flops, Conversion of flip-flops. Application of flip-flops: Shift registers, sequence generators, counters: ripple counters, up/down counters, synchronous counters.

Unit 4: State Machines **(06)**

Mealy and Moore machines representation. Design of state machines using State diagram, State table, State reduction, State assignment. Design of sequential circuit using Finite state machine

Unit 5: Digital Logic Families **(05)**

Classification of logic families, Characteristics of digital ICs: Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements. Operation of TTL NAND gate, active pull up, wired logic. CMOS logic: CMOS inverter, NAND, NOR gates, Comparison between TTL, CMOS technologies.

Unit 6: Introduction to VHDL, Programmable Logic Devices **(06)**

Introduction to VHDL, Entity declaration, architecture, modelling styles, data objects, concurrent and sequential statements. Simple design examples using VHDL for basic combinational and sequential circuits, attributes. Introduction to Programmable logic devices and their types: ROM, PLA, CPLD, FPGA.

Text Books:

1. R.P. Jain, **'Modern digital electronics'**, *TMH Publication,* (4th edition), (2007).
2. Anand Kumar, **'Fundamentals of digital circuits'**, *PHI Publication*, (1st edition),(2001).
3. J. Bhaskar, **'VHDL Primer'**, *PHI Publication,*(3rd Edition), (2015).

Reference Books:

1. Wakerly, **'Digital Design Principles and Practices'**, *Pearson Education*, (3rd edition),(2004.)
2. Stephen Brown, **'Fundamentals of digital logic design with VHDL'**, *TMH Publication*, (1st edition), (2002).

Website:

1. http://nptel.ac.in/courses/117106086/1

List of Tutorials:

1. Minimize the logic functions and realize using universal gates.
2. Design code converters using basic gates.
3. Design a combinational circuits using multiplexer.
4. Realize the multiple output functions using decoder.
5. Conversion from one type of Flip- Flop to another type.
6. Design mod-N asynchronous counter.
7. Design mod-N synchronous counter.
8. Design sequence generator using shift register.

EC 2104 Data Structures

Teaching Scheme
Lecture: 3 Hours/Week

Examination Scheme
In Semester: 50Marks
End Semester: 50Marks

Credits:3

Course Objectives:

1. Introduction to the theory, practice and methods of data structures
2. Introduce elementary data structures such as Arrays, Linked lists and model other data structures
3. Learn modelling of linear data structures like stacks and queues
4. Learn modelling of non-linear data structures like trees and graphs

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Classify and categorize data structures that make up for a programming language
2. Infer to the modelled data structures from the premise of the baseline models
3. Make use of algorithms on linear and non-linear data structures for performing different operations on data
4. Perceive the importance of appropriate memory allocation and efficient management in the time-space domain

Unit 1: Introduction, Arrays & Functions in C **(09)**

Introduction: Overview of Compiler and the 'C' development life cycle, brief overview of Operating System. Software Development Life Cycle (SDLC), Arrays: Single dimensional & Two dimensional Arrays. Searching Methods: Algorithms for Sequential Search, Indexed Sequential Search, and Binary Search. Sorting Methods: Algorithms for Selection sort, Bubble sort, Insertion sort. Introduction to Time complexity and Space complexity, brief overview of the Big Oh, and other notations as performance metrics for the algorithms. Abstract Data Type (ADT): Definition, ADT for arrays. Functions: Types of functions and their categories with appropriate examples. Parameter passing by value, parameter passing by reference, recursive functions.

Unit 2: Pointers & Structures in C **(07)**

Pointers: Basic concepts. Pointer declaration & initialization. Scale factor. Pointer to a pointer. Strings: Basic concepts. Structures in C: Concept, comparison with arrays as a data structure. Array of structures, pointers and arrays, pointers and structures. Bitwise Operators, Concept of ordered list & polynomial representation using array of structures.

Unit 3: Data Structure Using Linked Organization **(07)**

Concepts and definition of data, data type, data object, data structures. Concept of Singly Linked List: Algorithms for Creation, Insertion, deletion and traversals of above data structure. Concept of Doubly Linked List and Circular Linked List. Applications of Linked lists. Generalized linked list: Representation of polynomial using GLL.

Unit 4: Stacks and Queues **(07)**

Stacks: Definition & example, representation using arrays & linked list. Applications of Stacks: Concept of infix, postfix and prefix expressions, conversion of infix to postfix expression, evaluation of postfix expression. Queues: Definition & example, representation of queue using array and linked list. Concept of circular queue, concept of priority queue, applications of Queue.

Unit 5: Trees **(07)**

Difference between Linear and Non-linear data structures. Binary trees (BT): Basic terminology. Types of Binary Trees. Binary Search Tree (BST): Difference between BST and BT. Representation of BST(Static and Dynamic), Algorithms for BST traversals – pre-order, in-order & post-order(recursive), Primitive operations on BST: Create, insert, delete. Algorithm for Non-recursive in-order traversals for BST.

Unit 6: Graphs **(05)**

Graphs: Concepts and terminology, Types of graphs—directed graph, undirected graph, planar graph, representation of graph using adjacency matrix, adjacency list, Traversals: DFS & BFS. Minimal spanning tree: Kruskal's and Prim's algorithm.

Text Books:

1. Seymour Lipschutz, '**Data Structures with C',** Schaum's Outlines, *McGrawHill Education (India) Pvt. Ltd,* Special Indian Edition, (2013).
2. E Balgurusamy, '**Programming in ANSI C**', *Tata McGraw-Hill*,(3rdEdition), (2008).

Reference books:

1. Richard F. Gilberg & Behrouz A. Forouzan, '**Data Structures A Pseudocode Approach with C**', *Cengage Learning*, (2nd Edition) , (2005).
2. Yedidyah Langsam, Moshe J Augenstein, Aaron M Tenenbaum, '**Data structures using C and C++**', *PHI Publications*, (2nd Edition), (2004).
3. Ellis Horowitz, SartajSahni, '**Fundamentals of Data Structures in C'**, *Universities Press,* (2nd edition), (2008).

BSEC 2101 Engineering Mathematics III

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 4

Prerequisite:

1. Basics of integral and multiple integral.
2. Beta function , Gamma function.
3. Partial fractions.
4. First order linear differential equation.
5. Basics of vector algebra, basics of solid Geometry

Course Objectives:

Mathematics is a necessary path to scientific knowledge which opens new perspective of mental activity. Our aim is to provide sound knowledge of engineering mathematics to make the students think mathematically and strengthen their thinking power to analyse and solve engineering problems in their respective areas.

Course Outcomes:

Students will be able to

1. Formulate higher order Linear Differential Equations and apply to solve engineering applications.
2. Obtain Fourier and Laplace Transforms of various functions and apply it to solve integral equations and differential equations.
3. Interpret and evaluate results in Vector Calculus and apply it to obtain work done, surface integrals.
4. Analyse and apply concepts of analyticity of functions of complex variables. Evaluate complex integrals using results in complex analysis.

Unit 1: Higher Order Linear Differential equation and application **(08)**

Higher order Linear differential Equation with constant coefficients, complementary function, Particular integral, General method, short cut methods, Method of variation of parameter, Cauchy's and Legendre's D.E, Modelling of electrical circuits.

Unit 2 : Fourier Transform **(06)**

Fourier integral theorem, , Fourier transform, Fourier Sine transform, Fourier Cosine transform, Inverse Fourier Transform, Inverse Fourier sine Transform, Inverse Fourier cosine Transform.

Unit 3: Laplace Transform **(08)**

Definition of Laplace and Inverse Laplace transform, Properties and theorems, Laplace Transform of standard functions, Laplace Transform of some special functions viz. periodic, unit step, unit impulse, ramp function, Inverse Laplace transform using partial fraction, application of Laplace Transform for solving Linear Differential Equations.

Unit 4 : Vector Differentiation **(06)**

Physical interpretation of vector differentiation, vector differential operator, Gradient, Divergence, Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, vector identities.

Unit 5 : Vector Integration **(06)**

Line integral, Surface integral, Volume integral, Work done, Green's Lemma, Gauss' divergence Theorem, Stokes Theorem.

Unit 6 : Complex Analysis **(08)**

Functions of Complex variables, Analytic Functions, Cauchy - Riemann Equations, Cauchy's Integral Theorem, Cauchy's Integral Formula, Laurent's series, Cauchy's Residue theorem.

Text Books:

1. B. V. Ramana, **'Higher Engineering Mathematics',** *Tata McGraw Hill Publications,* (2007).
2. B.S. Grewal, **'Higher Engineering Mathematics'**, *Khanna publishers, Delhi(*40th edition), (2008)
3. Peter V. O'neil, **'Advanced Engineering Mathematics'**, *Thomson Brooks / Cole, Singapore* (5th edition), (2007).

Reference books:

1. C.R.Wylie, L.C. Barrette, **'Advanced Engineering Mathematics',** McGraw Hill Publications, New Delhi (6th edition), (2003).

2. Erwin Kreyszig, **'Advanced Engineering Mathematics',** *Wiley Eastern Ltd.*(8th Student Edition), (2004).

EC -2105 Electronic Devices And Circuits Lab

Teaching Scheme:
Practical: 4 Hrs/Week

Examination Scheme:
Practical: 25 Marks
Credits:2

Course objectives:

1. To build circuits and take measurements of circuit variables using tools such as oscilloscopes, multimeters, and signal generators
2. To compare the measurements with the behaviour predicted by mathematic models and explain the discrepancies
3. To use simulation tool for verifying circuit performance

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Plot characteristics for JFET and calculate gm,rd.
2. Design biasing circuit for amplifier and feedback circuit for oscillators.
3. Build electronic circuits like amplifiers and oscillators and measure circuit response.
4. Compare experimental results with theoretical values of performance parameters of amplifiers and oscillators.

List of Experiments:

1. Plot V-I characteristics of JFET.
2. Implement biasing circuit for JFET and verify DC operating point.
3. Implement JFET CS Amplifier and calculate Av, Ri and Ro.
4. Determine f_L and f_H of amplifier using square wave testing method.
5. Implement CG and CD amplifier.
6. Analyze the effect of different capacitors on bandwidth of amplifier.
7. Plot V-I characteristics of MOSFET.
8. Plot voltage transfer characteristics of CMOS inverter.
9. Simulate current mirror circuit.
10. Analyze effect of feedback on Av, Ri and Ro.
11. Simulate Oscillator Circuits.
12. Simulate large signal amplifier.

EC 2106 Digital Electronics Lab

Teaching Scheme:

Practical: 2 Hrs/Week

Examination Scheme:

In-Semester: 25 Marks

Credits: 1

Course Objectives:

1. Design digital circuit based on reduction techniques and digital logic
2. Implement combinational logic circuits using MSI chips
3. Design and implement sequential logic circuits using counter ICs
4. Use software tools for simulation of digital circuits

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Identify the functionality of ICs as a multiplexer, decoders and counters
2. Design digital building blocks such as multiplexer, code converter, adder and counters
3. Implement and test digital circuits and verify the truth tables
4. Use the software tools for the simulation of digital circuits

List of Experiments

1. Design and implement combinational circuits using Multiplexer.
2. Design and implement multiple output function using decoder.
3. Design and implement 1 digit BCD adder using IC7483.
4. Design 8 bit magnitude comparator.
5. Design and implement MOD-N asynchronous BCD counter using counter ICs.
6. Design and implement 4 bit counter using Synchronous counter IC.
7. Write and simulate VHDL code for D FF using reset input.
8. Write and simulate VHDL code for 4 bit logical and arithmetic operations for ALU.

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EC 2107 Data Structures Lab

Teaching Scheme
Practicals: 4 Hours/Week

Examination Scheme
Oral: 50Marks
Credits: 2

Course Objectives:

1. Understand various data searching and sorting methods with pros and cons
2. Understand various algorithmic strategies to approach the problem solution
3. Operate on the various structured data

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Utilize the principal algorithms of sorting and searching on the given data
2. Perceive the representation of data structures like arrays, records, linked lists and their use
3. Implement stacks & queues from the base models
4. Build, represent and traverse non-linear data structures

List of Assignments

Write a C program to implement:

1. Sorting methods – bubble, selection and insertion.
2. Searching techniques- linear and binary.
3. Data base Management using array of structure with operations Create, display, Modify, Append, Search and Sort.
4. Polynomial addition using array of structures.
5. Create a singly linked list with options:
   a. Insert (at front, at end, in the middle), b. Delete (at front, at end, in the middle),
   c. Display, d. Display Reverse, e. Revert the SLL.
6. Implement Stack using arrays. Perform following operations on a stack a. Push b. Pop c. Display.
7. Implement Stack using Linked List. Perform following operations on a stack a. Push b. Pop c. Display.
8. Evaluation of postfix expressions (input will be postfix expression).
9. Implement Queue using arrays. Write a menu driven program to perform following operations on a Queue a. Insert b. Delete c. Display.
10. Implement Queue using Linked List. Write a menu driven program to perform following operations on a Queue a. Insert b. Delete c. Display.
11. Binary search tree: Create, search, recursive traversals.
12. Graph using adjacency Matrix with BFS and DFS traversals.
13. Hash Table(Beyond the Syllabus)

Autonomous Programme Structure of Second Year B. Tech. AY 2019-2020

S. Y. B. Tech. Electronics & Telecommunication Engineering Semester – II										
Course Code	Course Title	Teaching Scheme			Examination Scheme				Marks	Credit
		Hours/Week								
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
EC 2201	Signals & Systems	3	1	0	50	50	0	0	100	4
EC 2202	Analog Communication	3	1	0	50	50	0	0	100	4
EC 2203	Integrated Circuits and Applications	3	1	0	50	50	0	0	100	4
EC 2204	Object Oriented Programming	3	0	0	50	50	0	0	100	3
HS 2201	Principles of Economics and Finance	3	0	0	50	50	0	0	100	3
EC 2205	Analog Communication Lab	0	0	2	0	0	0	25	25	1
EC 2206	Integrated Circuits and Applications Lab	0	0	2	25	0	0	0	25	1
EC 2207	Object Oriented Programming Lab	0	0	4	0	0	25	0	25	2
AC 2201	Self Expression	0	0	2	0	0	0	0	0	No credit
	Total	**15**	**3**	**10**	**275**	**250**	**25**	**25**	**575**	**22**
	Grand Total	**28**							**575**	**22**

EC 2201 Signals and Systems

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 4

Course Objectives:

1. Introduce basic signals and operations on signals
2. Learn systems, types and their analysis
3. Introduce the concept of Fourier transform and its applications
4. Make students familiar with the concept of correlation and spectral density
5. Introduce the concepts of Probability theory, distribution and density functions and statistical averages

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Classify signals and perform operations on signals
2. Analyse a system and identify its type
3. Resolve the signals in frequency domain and plot the spectrum
4. Apply the concepts of correlation and spectral density for different applications
5. Evaluate PDF, CDF and the statistical parameters

Unit 1: Introduction to Signals **(10)**

Definition of signals and systems, conversion of analog signal to digital signal. Classification of signals: Continuous Time (CT) and Discrete Time (DT), Even, Odd, Periodic and Non-periodic, Deterministic and Non-deterministic, Energy and Power. Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shifting and folding, precedence rule. Elementary signals: Exponential, Sine, Step, Impulse and its properties, Ramp, Rectangular, Triangular, Signum, Sinc.

Unit 2: Systems and their analysis **(10)**

Systems: Definition, Classification: linear and non-linear, time-variant and invariant, causal and non-causal, static and dynamic, stable and unstable, invertible. System modelling: Input-output relation, impulse response, Definition of impulse response, convolution integral, convolution sum, Computation of convolution integral using graphical method, Computation of convolution sum. Properties of convolution, system interconnection, system properties in terms of impulse response, step response in terms of impulse response.

Unit 3: System Analysis using Fourier analysis **(08)**

Definition and necessity of CT and DT Fourier Series and Fourier Transform (FT). Orthogonality concept, Magnitude and phase spectrum, CT Exponential Fourier series (FS), CT Fourier Transform and its properties, problem solving using properties, Interplay between time and frequency domain, Inverse Fourier transform.

Unit 4: Correlation and Spectral Density **(08)**

Definition of Correlation and Spectral Density, Correllogram, analogy between correlation and convolution, Auto-correlation and Cross-correlation for CT and DT signals, Energy / Power spectral density of CT signals, properties of correlation and spectral density, inter-relation between correlation and spectral density, Applications of correlation and spectral density.

Unit 5: Probability and Random Variables **(06)**

Sample space, Event, Probability, Conditional probability and statistical independence, Random Variables: Discrete Random Variables, Cumulative Distributive Function, Continuous Random Variable, Probability Density Function, Properties of CDF and PDF, Statistical averages, Mean, Moments and exceptions, Standard Deviation and variance, Probability models: Uniform, Gaussian, Rayleigh, Binomial, Poisson.

Text books:

1. Simon Haykins and Barry Van Veen, **'Signals and Systems'**, *Wiley India,* (2nd Edition),(2004).
2. Simon Haykins, **'An Introduction to Analog and Digital Communications'**, *Wiley India,* (2nd Edition), (2008).

Reference Books:

1. Charles Phillips, **'Signals, Systems and Transforms'**, *Pearson Education,* (4th Edition), (2004).
2. Lathi B. P., **'Signals, Systems and Communication'**, *BS Publication,* (1st Edition), (2009).
3. Mrinal Mandal and Amir Asif, **'Continuous and Discrete Time Signals and Systems'**, *Cambridge University Press,* (1st Edition), (2007).
4. Peyton Z. Peebles, Jr., "Probability, Random Variables and Random Signal Principles", (4th Edition), (2013).

Website:

1. https://nptel.ac.in/courses/117101055/

List of Tutorials:

3. Classification of the signals as Even/Odd, Periodic / Non-Periodic and Energy / Power.
4. To perform operations like amplitude scaling, addition, multiplication, time scaling, time shifting and folding on CT and DT signals.
5. Apply system analysis to determine whether the given system is, memory less, causal, linear, stable, time invariant, invertible.
6. Perform convolution operation on continuous time and discrete time signals.
7. Apply the concept of Fourier Series on time domain signals.
8. Evaluate ESD and PSD of CT signals.
9. Apply concepts of CDF, PDF and Statistical averages.
10. MATLAB/C assignment on signal operations

seely discriminator, ratio detector

Unit 5: Noise **(06)**

Sources of Noise, Types of Noise, White Noise, Thermal noise, shot noise, partition noise, Low frequency or flicker noise, burst noise, avalanche noise, Signal to Noise Ratio, SNR of tandem connection, Noise Figure, Noise Temperature, Friss's formula for Noise Figure, Noise Bandwidth. Behaviour of base band systems, DSBSC, SSBSC and AM in the presence of noise

Unit 6: Pulse Analog modulation **(06)**

Multiplexing- FDM,TDM, Band limited and time limited signals, Narrowband signals and systems, Sampling theorem in time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing and Aperture effect. Block diagram approach of PAM, PWM and PPM

Text Books:

1. B. P. Lathi, '**Modern Digital and Analog Communication Systems**', *Oxford University Press,* (3rd Edition) ,(2003).
2. George Kennedy, '**Electronic Communication Systems**', *McGraw-Hill,* (5th Edition), (2013).

Reference Books:

1. Dennis Roddy and Coolen, '**Electronic Communication**', *Prentice Hall,* (4th Edition), (2011).
2. R.P.Singh and S.D.Sapre, '**Communication Systems**', *McGraw-Hill. (*3rd Edition), (2016).
3. Blake R.,'**Electronic Communication Systems**', *Thomson Publication,* (2nd Edition), (2002).
4. Simon Haykin, '**Communication Systems**', *John Wiley and Sons,(* 4th Edition), (2000).
5. Taub and Schilling, '**Principles of Communication Systems**', *Tata McGraw-Hill,* (3rd Edition) (2012).
6. Frenzel, '**Principles of Electronic Communication Systems**', *Tata McGraw-Hill,* (3rd Edition), (2008).

Website:

6. https://onlinecourses.nptel.ac.in/noc17_ec11/preview

List of Tutorials:

9. Calculation of signal bandwidth, spectrum components and modulation index.
10. Calculation of power relationships in AM, Transmission efficiency of different modulation techniques.
11. Analysis of power saving in DSB-SC, SSB-SC systems.
12. Calculation of intermediate frequency, image frequency and IFRR in AM/FM receiver system.
13. Design of super heterodyne radio receiver system.
14. Calculation of modulation index, deviation ratio in FM, PM.
15. Calculation of noise power, SNR, Noise figure.
16. Analyse behaviour of AM, DSB, SSB in the presence of noise.
17. Calculation of nyquist rate, sampling frequency in Pulse Modulation system.

EC 2202 Analog Communication

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 4

Course objectives:

2. Explain concepts of amplitude modulation and demodulation
3. Explain concepts of angle modulation and demodulation
4. Calculate the frequency and sketch waveform at stages of superheterodyne radio receiver
5. Compare types of noise and their effect on communication system
6. Explain Pulse Analog Modulation technique

Course Outcomes:
Student will be able to-

6. Identify need for modulation and explain basic concept of amplitude modulation and demodulation
7. Explain the basic concepts of Angle Modulation and demodulation
8. Calculate signal to noise ratio, noise figure and noise temperature of single and cascaded stages in communication system
9. Design of tuning circuits in AM Receiver
10. Design FM radio receiver system at block diagram level
11. Explain the concept of pulse amplitude modulation

Unit 1: Amplitude (Linear) Modulation **(08)**

Block diagram of basic communication system, Base band and Carrier communication, Need for modulation, Generation of AM (DSBFC) and its spectrum, Power relations applied to sinusoidal signals, Types of AM: DSBSC – multiplier modulator, Non linear generation, Switching Modulator, Ring modulator and its spectrum, Modulation Index. SSBSC, ISB and VSB, their generation methods and Comparison, AM Broadcast technical standards.

Unit 2 : AM Receiver **(08)**

Block diagram of AM Superheterodyne Receiver, Performance Characteristics: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection, Tracking. AM Demodulation: Rectifier detection, Envelope detection. DSB & SSB Detector

Unit 3: Angle Modulation **(08)**

Instantaneous frequency, Concept of Angle modulation, frequency spectrum, Narrow band and wide band FM, Modulation index, Bandwidth, Phase Modulation, Bessel's Function , Generation of FM (Direct and Indirect Method), Comparison of FM and PM, FM Demodulation.

Unit 4: FM Receiver **(06)**

Block diagram of FM Super heterodyne Receiver, Pre-emphasis and De-emphasis. FM stereo receiver, FM Detection using PLL, FM detector: Slope detector, balanced slope detector, Foster-

EC 2203 Integrated Circuits and Applications

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 4

Course Objectives:

3. Introduce the working principle of Op-Amp
4. Discuss characteristics of Op-Amp and explain practical limitations
5. Familiarize the students with linear and non-linear applications of Op-Amp
6. Introduce signal converters (A/D, D/A)
7. Explain the characterstics of active filters, oscillators and operating principles of PLL

Course Outcomes:

Having successfully completed this course, the student will be able to:

3. Explain the significance of internal stages to determine the performance of general purpose Op-Amp
4. Interpret and calculate performance parameters of Op Amp
5. Design and analyze linear and non linear applications of Op Amp
6. Explain the operation and charecteristics of A/D and D/A converters and phase lock loop
7. Calculate performance parameters of A/D and D/A converters and phase lock loop
8. Design Op Amp based butterworth filters

Unit 1: OP-AMP Basics **(07)**

Block diagram of OP-Amp and significance of each block, Differential Amplifier configurations, Differential amplifier analysis for dual-input balanced-output configuration, Methods for improving CMRR of Differential Amplifier, Need of level shifter, Output stage of Op-amp.

Unit 2 : OP-AMP Performance Parameters **(06)**

Symbol and ideal equivalent circuit of OP-Amp, DC characteristics: Offset Voltage, Bias current, Offset current, Thermal drift, AC characteristics: Slew rate, Rise Time, CMRR, Frequency characteristics. Ideal parameters and practical parameters of OP-AMP and their comparison, Frequency compensation.

Unit 3 : Linear Applications of OP-AMP **(08)**

Inverting and Non-inverting amplifier, Voltage follower, Summing amplifier, Difference Amplifier, Instrumentation Amplifiers, Instrumentation Amplifier Applications. Ideal integrator, errors in ideal integrator, practical integrator, design of practical integrator, Ideal differentiator, errors in ideal differentiator, practical differentiator.

Unit 4 : Non-linear Applications of OP-AMP **(08)**

Comparator, Characteristics of comparator, Applications of comparator, Schmitt trigger, Square wave generator, Triangular wave generator, Need of precision rectifier, Half wave and Full wave precision rectifiers.

Unit 5 : Signal Converters **(06)**

I to V and V to I converter, DAC: Characteristics, Specifications and Types, ADC: Characteristics,

Specifications and Types.

Unit 6 : Active filters and PLL **(07)**

First order and second order Active LP Butterworth filter, Filter design and frequency scaling, Block diagram of PLL and its function, Applications of PLL.

Text books:

5. Ramakant A. Gaikwad, **'Op Amps and Linear Integrated Circuits'**, *Prentice Hall,* (4th Edition), (2000).
6. George Clayton and Steve Winder, **'Operational Amplifiers'**, *Newnes Publication,* (4th Edition), (2004).
7. Salivahanan and Kanchanabhaskaran, **'Linear Integrated Circuits'**, *McGraw Hill Education,* (1st Edition), (2013).

Reference Books:

3. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', *McGraw Hill Education,* (3rd Edition), *(2002).*
4. **Texas Instruments Op-amp Book – Op-Amp for Everyone**: Design Reference. Sedra Smith, **'Microelectronic Circuits'**, *Oxford Publications,* (5th Edition), *(2004).*
5. **Texas Instruments Op-amp Book – Op-Amp for Everyone**: Design Reference.
6. Sedra Smith, **'Microelectronic Circuits'**, *Oxford Publications,* (5th Edition), *(2004).*
7. D. Roy Choudhury and S. B. Jain, **'Linear Integrated Circuits'**, *New age International publishers,* (2nd Edition), (2003).

Websites:

1. www.ti.com
2. www.nptel.ac.in

List of Tutorials:

6. Analyse differential amplifier circuits.
7. Calculate Op Amp Parameter.
8. Op-amp datasheet- Pin packages, Manufacturers, Technical specifications.
9. Design of integrator and differentiator.
10. Design of instrumentation amplifier.
11. Analyse an application based on Op - Amp.
12. Design of waveform generator.
13. Analyse phase-locked loop (PLL).

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EC 2204 Object Oriented Programming

Teaching Scheme
Lecture: 3 Hours/Week

Examination Scheme
In Semester: 50Marks
End Semester: 50Marks
Credits: 3

Course Objectives:

6. Make the students familiar with the basic concepts and techniques of OOP paradigm
7. Understand C++ and Java as programming languages
8. Develop ability to program in C++ and Java

Course Outcomes:
After completion of course, students will be able to:

8. Explain the principles of Object Oriented Programming
9. Apply the concepts of data encapsulation, inheritance and polymorphism in C++
10. Identify the basic program constructs in Java
11. Apply the concepts of multi-threading, inheritance, interface, exception handling and applets in Java

Unit 1: Introduction to Object Oriented Programming **(07)**
Principles of Object-Oriented Programming, Beginning with C++, Tokens, Expressions and Control Structures, Functions in C++.

Unit 2: Concepts of Object Oriented Programming with C++ **(07)**

Classes and Objects, Constructors and Destructors. Operator overloading, Inheritance and their types. Virtual functions and polymorphism

Unit 3: Java Fundamentals **(07)**

Java Evolution, Overview of Java Language, Constants, Variables, and Data Types, Operators and Expressions, Decision making.

Unit 4: Classes Methods and Objects in Java **(07)**
Classes, Objects and Methods, Arrays and Strings. Overloading methods, Recursion

Unit 5: Inheritance, packages and Interfaces **(07)**
Inheritance basics, constructors in derived class. Object class. Packages, access protection, importing packages. Interfaces: Defining interfaces, Extending interfaces, Implementing interfaces, Accessing interface variables.

Unit 6: Multithreading, exception handling and Applets **(07)**
Introduction to multithreading: Introduction, creating thread and extending thread class. Concept of Exception handling, types of errors, multiple catch statements. Applets: Concept, difference between applets and applications. Life cycle of an applet, types of applets.

Text Books:

4. E Balagurusamy, 'Object Oriented Programming with C++ and Java', McGraw Hill Education (India) Pvt. Ltd., First Reprint 2013.
5. Herbert Schildt, Java: The Complete Reference, McGraw Hill, (7th Edition), (2007).

Reference books:

5. Robert Lafore, **"Object Oriented Programming using C++"**, *SAMS publishing*, (4th Edition),(2002).
6. E Balagurusamy, **"Programming with Java A Primer"**, *Tata McGraw Hill*, (3rd Edition), First Reprint 2007.

Website:

4. http://onlinecourses.nptel.ac.in/noc16-cs19.
2. nptel.ac.in/courses/106105153.

HS 2201-Principles of Economics and Finance

Teaching Scheme:
Lectures: 3 Hrs/Week
Tutorial: Nil

Examination Scheme:
In-Semester: **50** Marks
End-Semester: **50** Marks
Credits: 3

Course Objectives:

5. Enable students to acquire knowledge and develop an understanding of basic concepts and principles of Economics & Finance
6. Make students acquaint with standard concepts and tools that they are likely to find useful in their profession when employed in the firm/industry/corporation in public or private sector
7. Sensitize students to the current economic issues of the nation
8. Develop an understanding of the role of institutions in the functioning of an economy
9. Enhance financial literacy of engineering students

Course Outcomes: Students will be able to :

13. Use the concept of Production Possibility Frontier curve to solve the the questions of What, How and for Whom for economics entities
14. Solve, with the help of Supply and Demand curves, the Equilibrium Price and Quantity for a product or service in various types of market structures
15. Analyze the performance of different business organizations using various ratios (profitability,liquidity and activity) and Break-even Analysis
16. Apply the Time Value of Money to evaluate various investment options available to individuals and firms
17. Examine current Fiscal and Monetary policies by understanding the objectives of Macro Economics
18. Apply knowledge of Economics and Finance to make personal financial decisions

Unit 1: Central Concepts Of Economics **(6hrs)**

Economics as a science of choice and scarcity, Microeconomics and Macroeconomics, Positive and Normative Economics, Basic Economic Problems, Economic Systems-Market, Command and Mixed Economies, Society's Technological Possibilities, Opportunity Cost, Efficiency.

Unit 2: Basic Elements of Supply and Demand **(6hrs)**

Concept of Demand- Demand Schedule and Curve, Law of Demand, Determinants of Demand, Concept of Supply- Supply schedule, Supply curve, Equilibrium of Supply and Demand, Market and Market Structures- Perfect Competition, Monopolistic Competition, Oligopoly, Duopoly and Monopoly.

Unit 3: Role and Environment of Managerial Finance **(6hrs)**

Role of Finance in business, Forms of business organizations, Goals of the firm, Capital structure-Debt and equity capital, Sources of finance, Time value of money, Risk and Return.

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Unit 4: Economic Analysis and Costs **(6hrs)**

Cost Concepts- Fixed and Variable Cost, Marginal Cost, Average Cost, Total Cost, Opportunity Cost, Link between production and cost, Break even Analysis, Financial analysis of a business firm- Statement of Profit and Loss, Balance Sheet, Basic Ratios.

Unit 5: Overview of Macroeconomics **(6hrs)**

Tools to measure economic activity- GDP, Employment rate, Inflation & Consumer Price Index, Fiscal and Monetary policy.

Unit 6: Money and The Financial System **(6hrs)**

Evolution of money, Role and Functions of the Financial System, Indian Financial System, Personal financial strategies.

Text Books:

14. Paul A Samuelson, **'Economics'**, Indian Adaptation, Sudip Chaudhari,Anindya Sen, *Mc Graw Hill* ,(19th Edition), (2010).
15. Lawrence J Gitman, **'Principles of Managerial Finance'**, *Pearson,* (11th Edition),(2016).
16. K.K.Dewett, **'Modern Economic Theory'**, *S.Chand,* (22nd Edition), (2005).

Reference Books:

5. Thursen Gerald, **'Engineering Economics'**, *Prentice Hall,* (9th Edition), (2008).
6. D.M.Mithani, **'Managerial Economics'**, *Himalaya Publishing House,* (8th Edition), (2016).

Websites:

4. www.economicshelp.org
5. www.rbi.org

EC 2205 Analog Communication Lab

Teaching Scheme:

Practical: 2 Hrs/Week

Examination Scheme:

Practical: 25 Marks

Credit: 1

Course objectives:

9. Explain mechanism of AM, FM generation and detection
10. Explain use of spectrum analyzer
11. Measurement of performance characteristics of superheterodyne radio receiver
12. Explain generation of flat top and natural sampling

Course Outcomes:

Having successfully completed this course, the student will be able to:

1. Draw waveforms AM, FM and explain the spectrum of the same
2. Observe effect of changes in modulating and carrier signal parameters on spectrum of AM and FM
3. Measure and plot performance characteristics of superheterodyne radio receiver
4. Draw sampling waveforms and observe effect of sampling frequency on detection of Pulse Amplitude Modulation

List of Experiments:

6. AM generation and calculation of modulation index with graphical and trapezoidal method
7. AM generation using class C amplifier and AM detection with simple and practical diode detector
8. DSB-SC generation and synchronous detection with balanced modulator
9. SSB generation and detection with phase shift method
10. FM generation with direct method and measurement of deviation ratio for different amplitudes of modulating signal
11. FM Detection using PLL
12. Measurement of performance characteristics of Superheterodyne AM Receiver
13. Generation and detection of pulse amplitude modulation (PAM)
14. Simulation of AM generation with suitable software
15. Simulation of FM generation with suitable software

EC 2206 Integrated Circuits and Applications Lab

Teaching Scheme:
Practical: 2 Hrs/Week

Examination Scheme:
In-Semester: 25 Marks
Credit: 1

Course Objectives:

1. To measure Op-Amp performance parameters and understand the difference between ideal and practical values for different ICs
2. To design and implement linear and non-linear applications of Op-Amp and verify the functionality

Course Outcomes:

Having successfully completed this course, the student will be able to:

6. Design Op-Amp based circuits
7. Select an appropriate Op-Amp IC for given application
8. Construct Op-Amp based circuits and analyse their performance

List of Practicals

4. Verify virtual ground and virtual short concept in inverting and non-inverting configuration.
5. Measure Op-Amp parameters and compare with the specifications: Input bias current, input offset current, input offset voltage, slew rate, CMRR.
6. Design, build and test integrator for given frequency fa.
7. Design, build and test three Op-Amp instrumentation amplifiers for typical application.
8. Build and test precision half and full wave rectifier.
9. Design, build and test Schmitt trigger and plot transfer characteristics.
10. Design, build and test square and triangular waveform generator.
11. Build and test 2 bit R-2R ladder DAC.

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EC 2207 Object Oriented Programming Lab

Teaching Scheme
Practicals: 4 Hours/Week

Examination Scheme
Oral: 25 Marks
Credits: 2

Course Objectives:

4. Exposure to object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism
5. Implement, test and debug programs in the object-oriented paradigm.

Course Outcomes:

3. Apply the concepts of data encapsulation, inheritance and polymorphism in C++
4. Develop programs in Java utilizing the basic constructs.
5. Apply the concepts of polymorphism, inheritance and exception handling to develop Java programs.
6. Utilize the concepts of multi-threading & applets in Java programming.

List of Experiments

Write a program in C++ :

13. To sort the numbers in an array using separate functions for read, display, sort and swap. Objective is to learn the concepts of input/output, functions and call by reference in C++.
14. To perform the following operations on Complex numbers: Add, subtract, multiply, divide, complex conjugate. The objective is to learn the concepts of classes and objects.
15. To implement a Stack. Design the class for stack and the operations to be performed on stacks using constructors and destructors.
16. To implement a database of people having different professions e.g. engineer, doctor, student etc. using the concept of multiple inheritance.
17. Write a program in Java:
    i) To find factorial of a number
    ii) To display first 50 prime numbers
    iii) To find sum and average of N numbers
18. To implement a calculator with simple arithmetic operations such as add, subtract, multiply, divide and factorial using switch case and other simple Java statements
19. To define a class rectangle with the data fields width, length, area and colour. Create two objects of rectangle and compare their area and colour.
20. To sort i) List of integers ii) List of names
21. To add two matrices. The objective is to learn arrays in Java.
22. Write a program in Java to implement multi-level inheritance. Objective is to learn the concepts of inheritance in Java.
23. Write a Java program which uses TRY and CATCH for exception handling.
24. Write a program to create multiple threads and demonstrate how two threads communicate with each other.
25. Create an Applet with three text fields and four buttons ADD, SUBTRACT, MULTIPLY and DIVIDE.

Autonomous Programme Structure of Third Year B. Tech. AY 2019-2020

T. Y. B. Tech. Electronics and Telecommunication Engineering Semester –I										
Course Code	Course Title	Teaching Scheme			Examination Scheme				Marks	Credits
		Hours / Week								
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
EC 3101	Digital Communication	3	1	0	50	50	0	0	100	4
EC 3102	Microcontrollers	3	0	0	50	50	0	0	100	3
EC 3103	Electromagnetic Theory	3	1	0	50	50	0	0	100	4
OEHS 3101	Open Elective-I	3	0	0	50	50	0	0	100	3
PEEC 3101	Programme Elective-I	3	0	0	50	50	0	0	100	3
EC 3104	Digital Communication Laboratory	0	0	2	0	0	25	0	25	1
EC 3105	Microcontrollers Laboratory	0	0	4	0	0	0	50	50	2
EC 3106	Electronic Design Laboratory	0	0	2	0	0	25	0	25	1
PEEC 3102	Programme Elective-I Laboratory	0	0	2	0	0	0	25	25	1
AC 3101	Audit Course	0	0	2	0	0	0	0	0	0
	Total	**15**	**2**	**12**	**250**	**250**	**50**	**75**	**625**	**22**
	Grand Total	**29**			**625**				**625**	**22**

OEHS 3101: Open Elective I

1. Entrepreneurship Development
2. Introduction To Digital Marketing
3. Intellectual Property Rights
4. Project Management

PEEC 3101: Programme Elective-I
PEEC 3102: Programme Elective-I Lab

1. Mechatronics
2. Power Electronics
3. System Programming and Operating Systems.
4. Probability and Statistics

AC 3101: Audit Course: Employability Skills and Development

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EC 3101 DIGITAL COMMUNICATION

Teaching Scheme
Lectures: 3 Hours / Week
Tutorial: 1 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 4

Course Objectives:

1. Explain the functional block of Digital Communication System
2. Analyze PCM, DPCM, DM, ADM source coding techniques
3. Explain conversion of digital data to digital signal and ISI for reliable baseband transmission
4. Classify random processes
5. Describe binary and M-ary digital modulation techniques
6. Explain the optimum filter, correlation receiver and response of matched filter receiver in presence of noise
7. Describe the principle of spread spectrum modulation including pseudo – noise sequence

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

1. Describe waveform coding technique and evaluate bitrate, bandwidth and signal-to-noise ratio
2. Describe and interpret data formats, multiplexing, synchronization and Intersymbol interference for reliable baseband Transmission
3. Classify random processes in terms of mean, variance and autocorrelation
4. Describe and analyze bandpass modulation techniques along with their performance measure - bit period, bandwidth, signal space representation and Euclidian distance
5. Analyze the error probability of digital modulation techniques with matched filter and correlator
6. Illustrate the concept of Direct sequence and Frequency hopped spread spectrum

Unit I: Digital Transmission of Analog Signal **(08)**
Comparison between analog and digital communication, Block diagram of digital communication system, Sampling Process, PCM Generation and Reconstruction, Quantization Noise, Non-uniform Quantization and Companding, PCM with noise: Decoding noise, Error threshold, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, and Delta Sigma Modulation.

Unit II: Baseband Digital Transmission **(08)**
Digital Multiplexing: Multiplexers and hierarchies, Data Multiplexers. Data formats and their spectra, synchronization: Bit Synchronization, Scramblers, Frame Synchronization, Inter-symbol interference, Equalization, Eye diagram.

Unit III: Random Processes **(05)**
Introduction, Mathematical definition of a random process, Stationary processes, Mean, Correlation & Covariance function, Ergodic processes, Transmission of a random process through a LTI filter, Power spectral density, Gaussian process.

Unit IV: Bandpass digital Techniques **(09)**

Binary phase shift keying, Differential phase shift keying, Differentially Encoded PSK, Quadrature phase shift keying, M-ary PSK, Quadrature Amplitude shift keying, Binary frequency shift keying, M -Ary FSK, Minimum shift keying (MSK), and GMSK.

Unit V: Optimal reception of digital signal **(06)**

Optimum Filter, Matched Filter, Probability of Error of Matched Filter, Correlation receiver. Calculation of error probability for BASK, BPSK and BFSK.

Unit VI: Spread Spectrum techniques **(06)**

Pseudo noise sequences, spread spectrum, Direct sequence spread spectrum with coherent BPSK, Frequency hop spread spectrum and types, Processing gain.

Text Books:

1. Simon Haykin, Michael Moher, "**Communication Systems**", *Wiley*, (5th Edition), (2009).
2. Bernard Sklar, "**Digital Communications fundamentals and Applications**", *Prentice Hall P T R*, (2nd Edition), (2009).

Reference Books:

1. Donald L. Schilling, Goutam Saha, Herbert Taub, "**Principles of Communication system**", *Tata McGraw-Hill Education Pvt. Ltd*, (4th Edition), (2015).
2. A. B. *Carlson* and P. B. Crilly, "**Communication Systems**", *McGraw-Hill*, (5th Edition), (2002).
3. T. L. Singal, "**Analog and Digital Communication**", *Tata McGraw-Hill*, (1st Edition), (2012).
4. K. Sam Shanmugam, "**Digital and analog communication systems**", *Wiley Publication*, (1stEdition), (1996).

Online Resources:

1. http://nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Dig%20Comm/New_index1.html
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-02-introduction-to-eecs-ii-digital-communication-systems-fall-2012/

EC 3102 MICROCONTROLLERS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain the applications of microprocessors and microcontrollers
2. Introduce the architecture and features of typical microcontrollers
3. Learn the interfacing of real world I/O devices
4. Learn hardware and software development tools

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

1. Compare architectures for microprocessors and microcontrollers
2. Describe architecture of 8051 and PIC 18F microcontroller
3. Write assembly language codes for 8051 microcontroller
4. Write assembly language codes for interfacing on-chip peripherals viz. I/O ports, Timers, Serial communication of 8051 microcontroller
5. Write C language programs for interfacing peripherals viz. LCD and DC motor using PIC 18F

Unit I: Introduction to Microprocessor/Microcontrollers Architecture (08)
Microprocessors and Microcontrollers, CISC and RISC Processors, Harvard and Von Neumann Architectures, Architecture of a Microcontroller, Family members. Microcontroller Application Development tools: Simulator, Emulator, ISP, Cross assembler, Concept of RS 232 C, RS485, SPI bus and I2C bus standards.

Unit II: 8051 Architecture (06)
MCS-51 architecture, Pin description, PSW, Internal and external memories, Counters and Timers, Serial communication, Stack and Stack Pointer, Port Structure, Interrupts.

Unit III: MCS-51 Addressing modes and Instructions (06)
8051 Addressing modes, MCS-51 Instruction set and simple assembly language programs.

Unit IV: Real World Interfacing (09)
Interfacing ADC, DAC, memory, Interfacing 8051 to LED, Interfacing 8051 to LCD, Interfacing 8051 to keypad, Interfacing 8051 to Stepper motor.

Unit V: PIC MICROCONTROLLER (06)
Architecture of PIC 18X series, registers, memory organization, Interrupts, Timers, I/O port, Power down modes, Configuration bit settings.

Unit VI: Real world interfacing with PIC (07)
Interfacing PIC 18F with Keypad, LCD, CCP, DC Motor (PWM), I2C bus for peripheral chip access, A/D converter, UART.

Text Books:

1. Mohammad Mazidi, Janice Mazidi and Rolin McKinlay, **" The 8051 Microcontroller and Embedded Systems using Assembly and C"**, *Pearson Education*, (2nd Edition), (2014).
2. Mazidi, Mckinley, Causey, **"PIC Microcontrollers and Embedded Systems"**, *Pearson Education*, (1st Edition), (2013).

Reference Books:

1. Myke Predko, **"Programming and customizing the 8051 microcontroller"**, *Tata McGraw Hill.* (2nd Edition), (2014).
2. Kenneth Ayala **"The 8051- Architecture, Programming and Applications"**, *West Publishing Company*, (3nd Edition), (2014).

Online Resources:

1. www.intel.com
2. www.microchip.com

EC 3102 ELECTROMAGNETIC THEORY

Teaching Scheme
Lectures: 3 Hours / Week
Tutorials: 1 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain the basic mathematical concepts related to electromagnetic vector field
2. Explain the fundamentals of electrostatics and application of Electrostatics
3. Explain the concepts of Magnetostatics, Magnetic Flux density, Scalar and Vector potential and its applications
4. Discuss Maxwell's equations for static and dynamic fields
5. Evaluate Transmission Line parameters using Smith Chart

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

1. Apply the relevant law for solving basic problems of Electrostatics and Magnetostatics
2. Analyze the behaviour of Electrostatics and Magnetostatics fields in material space having homogeneous and heterogeneous medium.
3. Interpret Maxwell's equations (Point form and integral form) for static and dynamic field and calculate average power using Poynting theorem
4. Determine Transmission Line parameters using Smith Chart

Unit I: Fundamentals of Electrostatic Fields **(09)**
Coulomb's law and electric field intensity, Electric field due to point charge, Line charge and surface charge distributions, Electric flux density, Gauss's law and its application to differential volume element, divergence theorem.

Unit II: Applied Electrostatics **(08)**
Electric potential, Relation between E and V, Potential gradient Electric Dipole and flux lines, Energy density in electrostatic field, current and current density, Poisson and Laplace equation, Capacitance, Boundary conditions.

Unit III: Magnetostatics Fields **(10)**
Biot-Savart's Law, Ampere's Circuit Law, Applications of Ampere's Law, Magnetic Flux Density, Maxwell Equation, Strokes theorem, Magnetic Scalar and Vector Potentials, Forces Due To Magnetic Fields, Magnetic Boundary Conditions.

Unit IV: Time varying Fields and Maxwell's Equations **(06)**
Faraday's Law, displacement current density, continuity equation of current, Maxwell's equations in phasor form Poynting theorem, Boundary conditions for time varying field, Retarded vector magnetic potential

Unit V: Transmission Line **(09)**
Line Parameters, general solution, distortionless line, infinite line, standing waves, input impedance of dissipationless line, open and short circuited lines, application of Smith Chart.

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Text Books:

1. Matthew N. O. Sadiku, "**Engineering Electromagnetics**", *Edition,Oxford University Press,* (4th Edition), (2010).
2. W. H. Hayt, J. A. Buck, **"Engineering Electromagnetics",** *Revised Edition, Tata Mcgraw Hill,*(8th Edition), (2011).

Reference Books:

1. Edminister J. A., **"Schaum's Outline Series for Electromagnetics"**, *Tata Mcgraw Hill,* (4th Edition) , (2014).
2. John D. Kraus and Daniel A. Fleisch, **"Electromagnetics : With applications"**, *Singapore : McGraw-Hill*, (5th Edition), (2011).

Online Resources:

1. **https://www.iiitd.edu.in/~mshashmi/ECE_230_2015/Lecture_Slides/Lect_1_2015.pdf**
2. **http://nptel.ac.in/downloads/115101005/** (from NPTEL)
3. **http://www.engppt.com/2009/12/fundamentals-of-electromagnetic-theory.html**
4. **https://www.rose-hulman.edu/class/ee/HTML/ECE340/PDFs/electrostatics.pdf**

PEEC 3101 MECHATRONICS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Discuss the concepts and key elements of Mechatronics system
2. Explain principles and characteristics of Sensors and Transducers
3. Describe working principle of Hydraulic and Pneumatic systems and its applications
4. Give example of applications of Mechatronics Systems

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

1. Identify key elements of Mechatronics System and its representation in terms of block diagram
2. Classify Sensors and Transducers according to their applications
3. Design Signal Conditioning circuit for given Sensors/Transducers
4. Explain working principle and applications of Hydraulic and Pneumatic Systems
5. Apply concept to Interface Hydraulic/Pneumatic System components for given task
6. Develop Mechatronics systems for automation

Unit I: Elements of Mechatronics Systems **(06)**
Introduction to Mechatronics, key element/components, level of Mechatronics system design, phases of Mechatronics design process, integrated design approach, Advantages, and disadvantages of Mechatronics systems, Mechanical components: cam, gears, gear-train, servomechanism, and its application

Unit II: Sensors and Transducers **(10)**
Overview of Sensors and Transducers, classification, and their Characteristics. Temperature: Thermistor, RTD, semiconductor (AD590, LM35, LM75), IR sensor, Force: strain gauge, Load Cell, Pressure: Strain gauge, Piezoelectric, Displacement/Position: potentiometer, LVDT, proximity, optical encoder, Ultrasonic transducer, Level and Flow: ultrasonic transducer, Vibration and acceleration: piezoelectric accelerometer

Unit III: Signal Conditioning and Data Acquisition Systems **(06)**
Signal conditioning: its necessity, Amplification, filtering and Impedance Matching, protection, 4-20 mA Transmitters, Data Acquisition system: its necessity, components of DAQ, data conversion, and data signal transmission and its representation.

Unit IV: Hydraulic and Pneumatic Actuating System **(08)**
Introduction to Hydraulic Actuating system, Physical Components of Hydraulic systems, types of Hydraulic actuators and their applications. Introduction to Pneumatic Actuators systems, Physical Components of a Pneumatic Systems, types of Pneumatic Actuators/Cylinders and its applications. Comparison of hydraulic and pneumatic actuators.**Valves:** Pressure relief, Pressure regulator and directional Control Valve (3/2 Valves, 4/2 Valves, 5/3 Valves)

Unit V: Introduction to Electrical Actuators and Electro-Mechanical Actuators (06)
Selection criteria and specifications of stepper motors, servomotors, solenoid valves, Solid State relays and Electromechanical relays. Electro-Pneumatic: Physical Components of Electro-Pneumatic systems.

Unit VI: Mechatronics Systems Applications (06)
Mechatronics Systems in Automobile, Engine Management systems, Antilock Brake systems (ABS), washing machine, pick and place robot, introduction to CNC Machines.

Text Books:

1. Bolton W., **"Mechatronics Electronic systems in Mechanical and Electrical engineering"**, *Pearson Educatio Ltd.*, (6th Edition), (2016).
2. K. P. Ramachandran, G. K. Vijayaraghavan and M.S. Balasundaram, **"Mechatronics-Integrated Mechanical Electronic Systems"**, *Wiley Publication*, (1st Edition), (2008).
3. David Alciatore and MaichaelB Histand, **"Introduction to Mechatronics and Measurement Systems"**, *Tata McGraw Hill*, (4th Edition), (2013).

Reference Books:

1. Doeblin E.O., **"Measurement System-Application and Design"**, *TMH, New Delhi*, (4th Edition), (2004)
2. Mahalik N. P., **"Mechatronics - Principles, Concepts and Applications"**, *TMH, New Delhi*, (2th Edition), (2014)
3. Devdas Shetty and Richard A. Kolk, **"Mechatronics System Design"**, *Thomson India Edition*, (1st Edition), (2007).

Online Recources:

1. http://nptel.ac.in/courses/112103174/

PEEC 3101 POWER ELECTRONICS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain the power devices structure and characteristics
2. Elaborate the line synchronization and isolation circuit/techniques
3. Compare the output voltage waveforms of power converters for R and R-L loads
4. Calculate the performance parameters of power converters
5. Explain power converter applications
6. Explain the protection circuits for the power devices

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

1. Explain the need of power devices, their structure and characteristics
2. Design gate drive circuits for Power Devices
3. Analyze power converters for output voltage, Output current, Reactive power
4. Determine the power converter performance parameters
5. Describe power converter applications
6. Design protection circuits for power devices

Unit I: Power Devices **(06)**
SCR- Construction, turn on mechanism, Static and Dynamic Characteristics, Specifications, Gate-cathode characteristic , Firing circuits, Isolation Techniques, Power MOSFET, IGBT-Construction and Gate Drive Circuits.

Unit II: Phase Controlled Rectifiers **(10)**
Concept of Line and Forced Commutation, Introduction to Forced Commutation circuits for SCR (No Derivations only operation and waveforms), Analysis of Single phase Semi converters and Full Converters for R and R-L load, Effect of Freewheeling Diode, Working of Three phases Converters for R load.

Unit III: AC Voltage Controllers **(05)**
Single Phase AC voltage Controller for R and R-L load, Three Phase AC voltage Controller for R load, Light dimmer, resistance welding, induction heating.

Unit IV: Inverters **(08)**
Working principle of Single phase Half Bridge and Full Bridge inverters for R and R-L load, Analysis of Performance parameters, Three phase Bridge inverters for R load (120° and 180° mode Operation), PWM Inverters, Working of ON Line and Off Line UPS.

Unit V: Choppers **(08)**
Circuit Diagram, waveforms and operation of Step Down chopper for R and R-L load, Different Control Strategies for the output voltage control, Step up chopper, 2-quadrant and Four Quadrant Choppers, flyback Converters, Block diagram and working of SMPS.

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Unit VI: Protection Circuits for Power Devices **(05)**

Over current, over Voltage protection for power devices, Snubbed circuit for SCR, Cooling mechanism for power devices.

Text Books:

1. M. H. Rashid, **"Power Electronics Circuit, Device and Application"** *PHI New Delhi,* (3rd Edition), (2009).
2. M. D. Singh and K. B. Khanchandani, **"Power Electronics"** *TMH, New Delhi,* (2nd Edition), (2008).
3. Ned Mohan, T. M.Undeland, and W.P. Robbins, **"Power Electronics Converter Application and Design"** *John Wiley and Sons,* (3rd Edition), (2009).

Reference Books:

1. M. S. Jamil Asghar, **"Power Electronics"**, *PHI, New Delhi,* (1st Edition), (2011).
2. P. C. Sen, **"Power Electronics"**, *John Wiley and Sons,* (1st Edition), (2008).

Online Recourses:

1. www.nptelvideos.in/2012/11/power-electronics.htm

PEEC 3101 SYSTEM PROGRAMMING AND OPERATING SYSTEM

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objective

1. Explain the fundamentals of system programming
2. Introduce the algorithmic design aspects of assembler, macro processor and compiler
3. Explain the concept of linkers and loaders
4. Explain the steps in software development along with the software tools and the code optimization techniques
5. Explain the types and functions of Operating system

Course Outcomes:
After completion of the course, the student will be able to

1. Explain the language processors: assembler, macro processor, compiler, linkers and loaders
2. Analyze the program development steps using software tools and interpret code optimization techniques
3. Describe the operating system concepts and functions
4. Analyze and evaluate the memory management techniques
5. Explain the file system concepts and mobile OS

Unit I : Basics of system programming and Macroprocessor (06)
Language processors: Language processors and processing activities
Data structures for language processing: Search data structure, Allocation data structures.
Macro Processor: Macro definition and call, macro expansion, Nested macro calls, advanced macro facilities, Design of macro pre processor.

Unit II : : Translators : Assembler, Compilers and Interpreters (08)
Assembler: Assembly language programming, simple assembly scheme, pass structure of assembler, design of two pass assembler
Compilers and Interpreters : Phases of compilation, memory allocation, code of optimization, Interpreters and comparison with compilers

Unit III : Linkers and Loaders and Software tools (06)
Linkers and Loaders: Basic loaders functions, absolute loaders, relocation loader, direct linking loader, dynamic linking and loading
Software tools: Software tools for program development, editors, debuggers, programming environment, user interfaces

Unit IV : Introduction to Operating System (OS), Process Management and Deadlocks (10)
Operating System: OS services, system calls and its types, UNIX operating system structure
Process Management: Process states, process control block, processes scheduling and scheduling algorithms
Threads: Single and multi threaded processes, types of threads, multithreading models, comparison of threads with process

Inter process communication: Shared memory and message passing mechanism, direct and indirect communication

Process synchronization: Critical section, semaphores, classic problems of syncronization namely bounded buffer problem, reader-writer problem and dining philosophers problem

Deadlocks: Necessary conditions for deadlock, deadlock prevention, deadlock avoidance, Banker's algorithm, recovery from deadlock

Introduction to mobile OS, comparison of various mobile OS and comparison of mobile OS with the UNIX based OS

Unit V : Memory Management **(06)**

Basics of memory management, swapping, memory allocation, paging, segmentation, virtual memory, demand paging, page replacement, page replacement algorithms namely First In First Out(FIFO) and Least Recently Used (LRU)

Unit VI: File System and implementation **(06)**

File System : file attributes, file operations, file types, file access methods, file directories, file protection, file system structure, file system implementation, free space management

Text Books:

1. D.M. Dhamdhere, **"Systems Programming and Operating System"**, *Tata McGraw Hill,* (2nd Edition), (2009).
2. Siberschatz A; Galvin P.B; Gagne G, **"Operating System Concepts"**, *Wiley India Pvt. Ltd.,* (8th Edition), (2010).
3. P. K. Dixit, **"Android"**, *Vikas Publishing*, (1st Edition), 2014

Reference Books:

1. J. J. Donovan, **"Systems Programming"**, *Tata McGraw Hill,* (1st Edition), (1991).
2. Andrew S. Tanenbaum, **"Modern Operating System"**, *Pearson,* (4th Edition), (2015).
3. Alfred Aho, Ravi Sethi & Jeffrey D. Ullman, **"Compilers – Principles, techniques and tools"**, *Pearson Education India Ltd.,* (2nd Edition), (2007).

Online Resources:

1. Assemblers : http://slideplayer.com/slide/7276157/
2. System Calls and its types: https://youtu.be/x6XTxhY1jZQ
3. Compiler, Interpreter, Assembler, Linker and Loaders : https://youtu.be/4sPWotthkgw
4. How OS works : https://www.youtube.com/watch?v=85_XLP1CKYs

PEEC 3101 PROBABILITY AND STATISTICS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain Axioms, rules in Probability and Distributions
2. Solve numerical on various Statistical Measures
3. Evaluation and interpretation of descriptive Statistics
4. Design and Analysis of Experiments
5. Explain Hypothesis tests

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

1. Solved problems based on Probability and Bayes Theorem
2. Identify Distributions in Data
3. Calculate Mean, Variation, Regression, Correlation on given data
4. Design and Analyze experiments and apply hypothesis tests
5. Draw inferences from statistical analysis of data
6. Describe Principle Component Analysis and Independent Component Analysis and their applications

Unit I: Probability **(06)**
Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence, Probability distribution.

Unit II: Review of Basic Statistical Measure **(08)**
Introduction, Measures of Central Tendency: Arithmetic Mean, Weighted Arithmetic Mean, Median, Geometric and Harmonic Mean. Measurement of Variation: Quartile, Average and Standard Deviations, Coefficient Variation. Measurement of Skewness.

Unit III: Design and Analysis of Experiment **(08)**
Introduction, ANOVA, Completely Randomized design, Latin Square design, Duncan's Multiple Range Test.

Unit IV: Tests of Hypotheses **(10)**
Introduction, Tests of Hypothesis Concerning Means, Hypothesis Concerning Proportions, Hypothesis Concerning Variations (Chi-square and F-Tests), Chi-square Test for checking Independent of Categorized Data, Goodness of Fit Test

Unit V: Multivariate Analysis **(10)**
Introduction, Correlation Analysis, MANOVA, Forecasting, Linear Regression, Discrimination Analysis, Factor Analysis, Principle Component Analysis and Independent Component Analysis.

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Text Books:

1. R. Panneerselvam, **"Research Methodology"**, *PHI Learning Private Limited,* (2nd Edition), (2014).
2. P. Z. Peebles, ***"Probability, Random Variables and Random Signal Principles"***, *Tata McGraw-Hill,* (4th Edition), (2013).
3. A. Papoulis, S. U. Pillai, ***"Probability, Random Variables and Stochastic Processes"***, *Tata McGraw-Hill,* (4th Edition), (2002).

Reference Books:

1. S. M. Ross, **"Introduction to Probability and Statistics for Engineers and Scientists"**, *Elsevier Publication,* (5th Edition), (2014).
2. Jay I. Devore, **"Probability and Statistics for Engineers and Scientists"**, *Elsevier Publication,* (5th Edition), (2014).
3. E. Rukmangadchari, E. K. Reddy, **"Probability and Statistics"**, *Pearson India Pvt. Ltd,* (1st Edition), (2015).
4. Rohatgi A. K., Md. E. Saleh, **"Introduction to Probability and Statistics"**, *Wiley Publication Pvt. Ltd.*, (3rd Edition), (2015).

Online Recourses:

1. http://nptel.ac.in/courses/112103174/

EC 3104 DIGITAL COMMUNICATION LAB

Teaching Scheme
Lectures: 2 Hours / Week

Examination Scheme
Practical : 25 Marks
Credits: 1

Course Objective

1. Explain pulse code modulation techniques and Companding
2. Explain Delta modulation and Adaptive delta modulation
3. Analyze data format and their spectral analyses
4. Verify shift keying techniques such as FSK, PSK and QPSK experimentally.
5. Verify properties of PN-Sequence

Course Outcome

After completion of the course, students will be able to

1. Compare bit-rate, signal-to-noise ratio, Quantization error and design implementation for waveform coding techniques
2. Interpret the data format for bit pattern and explain Inter Symbol Interference
3. Compare and measure bandwidth and bit-rate of digital modulation techniques
4. Illustrate balance and run-length property of PN-sequence

List of Experiments:

1. To measure Bit-rate, Signal to noise ratio and Quantization error for PCM.
2. To measure and plot slope overload and Grannular noise in Delta modulation.
3. To measure and plot slope overload and Grannular noise in Adaptive Delta modulation.
4. To interpret line codes (NRZ, RZ, Polar RZ, Bipolar (AMI), Manchester) and interpret spectral analysis for a given bit pattern
5. To observe BFSK waveform in presence of noise and measure bandwidth.
6. To observe BPSK and QPSK waveforms, compare and measure its bit rate and bandwidth.
7. Write program for calculation and plotting the error probability of BPSK, QPSK and QAM.
8. To observe and verify properties of PN-sequence.
8. Analyze parameters of codec IC's OR Design and implement PCM Modulator.

EC 3105 MICROCONTROLLERS LAB

Teaching Scheme
Practical: 4 Hours / Week

Examination Scheme
Practical : 50 Marks
Credits: 2

Course Objectives:

1. Explore software development tools for 8051 and PIC 18F Microcontrollers
2. Assembly language programming
3. Interfacing of real world I/O devices with 8051 microcontroller
4. Interfacing of real world I/O devices with PIC 18F microcontroller

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

1. Write assembly language codes using instructions of 8051 microcontroller
2. Write assembly language codes for interfacing on-chip peripherals viz. I/O ports, Timers, Serial communication of 8051 microcontroller
3. Write assembly language codes for interfacing external peripherals viz., LED, DAC ,7-segment display
4. Write assembly language codes for interfacing external peripherals viz., LCD, Keypad, and stepper motor
5. Write C language programs for interfacing peripherals viz. LCD and DC motor using PIC 18F

List of Experiments:

1. Write programs for Mathematical Calculator/ Temperature Conversion/Smaller-Greater numbers, Factorial of a number.
2. Program for Data transfer from Internal to Internal / Internal to External Memory.
3. Program to sort the numbers in ascending /descending order.
4. Different programs to interface LEDS — (flashing in different patterns, BCD Counter)
5. Generation of various waveforms using DAC interface to 8051.
6. Interfacing of Multiplexed 7-segment display (counting application)
7. Interfacing of LCD to 8051 (4 bit and 8 bit modes)
8. Interfacing of Stepper motor to 8051 using Timer delay
9. Interfacing 4X4 keypad to 8051 and displaying key pressed on LCD
10. Interfacing serial port of 8051 to PC.
11. Write a program for interfacing switch, LED, relay & buzzer with PIC.
12. Generation of PWM signal for DC Motor control using PIC.

13*. Simulation of interfacing switch, LED, relay & buzzer with PIC using Proteus.
14*. Interface analog voltage 0-5V to internal ADC of PIC and display the value on LCD.

Note: * Higher difficulty level Programs

EC 3106 ELECTRONIC DESIGN LAB

Teaching Scheme
Lectures: 2 Hours / Week

Examination Scheme
Oral : 25 Marks
Credits: 1

Course Objectives:

1. Apply fundamental concept of electronics to design electronic system.
2. Inculcate circuit designing skills and to use modern design tools.
3. Highlight the importance and significance of customer specification/requirements.
4. To learn electronics circuit function verification with EDA tools.

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

1. Apply the fundamental concepts and working principles of electronic devices to design electronic systems
2. Interpret data sheets and thus select appropriate components and devices
3. Design an electronic system/subsystem in the area of regulated power supplies and validate its performance
4. Select appropriate transducer and signal conditioning circuit to design prototype of Data Acquisition System and validate its performance by simulating the same with EDA tools
5. Design, Develop, Built, Test and Demonstrate Linear Power Supply
6. Write and submit a report on the Linear Power Supply

1. Linear Regulated Power Supply: **(04)**
Design, Built and Test Linear Power Supply for Laboratory use should be selected from any one type given below:

a. Single Polarity (Variable/Fixed)
b. Dual Polarity (Variable/Fixed)
c. Dual Tracking (Variable/Fixed)

Scope of Design :

1. Proper selection of transformer, rectifier and filter, with its appropriate ratings.
2. Justify selection and design of regulator circuit.
3. Current boosting using external pass/parallel transistor.
4. Over current/ short-circuit, over voltage, thermal protection.
5. Indication of voltage, current and mode of operation on panel by meter or display.
6. Indicators for over voltage and over current.
7. Thermal considerations- Heat Sink calculations.
8. Component list in the form of bill of material.
9. Performance analysis

2. Data Acquisition system (DAS) **(04)**
Design and simulate Data Acquisition System in the field of Instrumentation, Automotive Electronics, Bio-medical etc. It should have at least two channel input.

Scope of Design :

1. Selection of appropriate signal sensing scheme.
2. Design of signal conditioning circuit.

3. Selection of suitable A to D converter
4. Selection of Microcontroller with appropriate interfacing circuit
5. Indication of parameter using LED/LCD Display.
6. Component list in the form of Bill of Material.
7. Simulation to verify performance of DAS

3. Build and Test Electronic hardware for assignment 1 and Simulation of assignment 2 with EDA tool **(04)**

Build working model of the design and prepare report for Linear Power Supply.

References:

Data and Application Manuals and Application Notes from:

1. RS Component Catalog.
2. National Semiconductor regulator design manual.
3. Analog Devices Data Manual.
4. Motorola, "Linear / Switch mode power supplies".
5. Motorola Power Transistors and Thyristors data hand book.
6. BEL Transistor Manual
7. Tower's Data Manual.
8. "PIC 16XX data book"
9. Texas instruments, "Linear interface and applications circuit design"
10. "ATMEL micro controller data book"
11. Intel Peripheral Manual.

Reference Books:

1. Paul Horowitz, **"Art of Electronics"**, *Cambridge University Press,* (2nd Edition), (2008).
2. B. S. Sonde, **"Power Supplies"**, *McGraw-Hill Education,* (1st Edition), (1980).
3. B. S. Sonde, **"Introduction to System Design Using Integrated circuits"**, *New Age Publication (P) Ltd.*, (2nd Edition), (2003).
4. Sergio Franco, **"Design with Operational amplifiers and analog Integrated circuits"**, *McGraw-Hill Education*, (3rd Edition), (2003).
5. Muhammad Ali Mazidi and Janice Gillispie Mazidi, **"The 8051 Microcontroller and Embedded Systems"**, *Pearson Education Asia,* (2nd Edition), (2009).
6. Muhammad Ali Mazidi , **"PIC Microcontroller and Embedded System"**, *Pearsion Education,* (3rd Edition), (2008).
7. Irving M. Gotlib, **"Power Supply Design"**, *McGraw-Hill Education,* (4th Edition), (1992)

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PEEC 3102 MECHATRONICS LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Practical : 25 Marks
Credits: 1

Course Objectives:

1. Measure of displacement, velocity, liquid level, liquid flow
2. Identify and interface components of electro-hydraulic/electro-pneumatic and hydraulic/pneumatic systems
3. Study of data acquisition system

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

1. Measure load, velocity, flow and level using analog and digital sensors
2. Interface sensor with data acquisition system and monitor data trending
3. Interface components of electro-hydraulic/electro-pneumatic and hydraulic/pneumatic to build circuits.
4. Develop and demonstrate application of Mechatronics system using suitable hardware.

List of Experiments:

1. Weight measurement using Load Cell.
2. Velocity measurement using optical encoder.
3. Liquid flow measurement using Turbine flow sensor.
4. Liquid level measurement using capacitance sensor.
5. Interfacing any two sensor with Data Acquisition System and observe data trending.
6. Interface hydraulic/ electro - hydraulic system component to actuate single acting and double acting actuator.
7. Interface pneumatic/ electro-pneumatic system component to actuate single acting and double acting cylinders.
8. Design and implement Mechatronics system for any application.

PEEC 3102 POWER ELECTRONICS LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Practical : 25 Marks
Credits: 1

Course Objectives:

1. Demonstrate V-I characteristics of power devices
2. Analyze gate drive circuits of the power devices
3. Observe and analyze the output voltage of power converters for R and R-L loads
4. Demonstrate the applications of power converters
5. Examine the power converter using simulation tool

Course Outcome

After completion of the course, students will be able to

1. Measure the important parameters of power devices
2. Test synchronization at every stage in the gate driving circuits
3. Compare the theoretical and practical values of output voltage of the power converters for R and R-L loads with different values of firing angles.
4. Analyze waveforms at different stages of gate drive circuits and at the output of power conversion circuits
5. Analyze the power converter performance using simulation tool

Tools and Platforms: Power Electronics experimental kits , Multisim

List of Experiments:

1. To plot static characteristic of SCR for various gate current values. Measure holding current and Latching current for the SCR used.
2. a) Examine the output of single phase fully controlled bridge rectifier for R, R-L load and R-L with fly wheel diode.
   b) Demonstration of single phase half controlled bridge rectifier for R and R-L load.
3. To plot transfer characteristic and output characteristic of MOSFET.
4. To inspect and analyze different waveforms of single phase full bridge Inverter
5. To test the gate drive circuit and analyze the output of Step down chopper.
6. To observe the waveforms of the triggering circuit and measure the output voltage of AC Voltage controller.
7. To perform converter based DC drive for Permanent magnet DC Motor
8. To test the performance of any one power converter using Multisim.

PEEC 3102 SYSTEM PROGRAMMING AND OPERATING SYSTEM LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Practical : 25 Marks
Credits: 1

Course Objectives:

1. Implementation of language processors.
2. Introduction to Linux / Ubuntu OS and implementation of algorithms of OS functions

Course Outcome
After completion of the course, students will be able to

1. Use basic Linux/ Ubuntu OS commands and demonstrate the steps in Andriod OS application development
2. Implement and analyze stages of compilation of a C language program
3. Implement, analyze and evaluate the OS functions
4. Implement, analyze and compare memory management techniques

Tools and Platforms: C Language on Ubuntu OS
List of Experiments:

1. Implement basic Linux/ Ubuntu Commands
2. Write a shell script on Linux/ Ubuntu OS
3. Implement and analyze stages of compilation in C program
4. Write C Program to implement Lexical Analyzer for simple arithmetic operation to create output tables.(a. Identifier Table b. Literal Table c. Symbol Table d. Arithmetic table e. Keyword table)
5. Implement process scheduling algorithms First Come First Serve (FCFS) and Shortest Job First (SJF)
6. Implement Bankers Algorithm for deadlock detection and avoidance
7. Implementation of page replacement algorithm First In First Out (FIFO) / Least Recently Used (LRU)
8. Develop an application based on Android OS

PEEC 3102 PROBABILITY AND STATISTICS LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Practical : 25 Marks
Credits: 1

Course Objectives:

1. Execute program on probability and statistical methods.
2. Evaluating and Interpolation of data.

Course Outcome
After completion of the course, students will be able to
1. Compute Probability of an event
2. Find and plot distribution on a given data
3. Calculate the measure of central tendency for set of data
4. Perform ANOVA test
5. Execute PCA on given data

Tools and Platforms: MatLab/ R-Programming
List of Experiments:
1. Determine Probability of an event.
2. Plot CDF and PDF for set of data.
3. Calculate measures of Central Tendency for set of data.
4. Calculations of Variance for set of data.
5. ANOVA test for set of data.
6. To apply Chi Square test to given data.
7. To perform Regression analysis given set of data.
8. Analysis of multivariate data using PCA/ICA.

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OEHS 3101 ENTREPRENEURSHIP DEVELOPMENT

Teaching Scheme
Lectures: 3 Hours / Week
Credits: 3

Examination Scheme
In Semester: 50 Mark
End Semester: 50 Marks

Course Objectives:
Students will be able to

1. Understand the fit between individual entrepreneurial ambitions
2. Select a problem worth solving
3. Identify customers
4. Develop a solution for your customers' problems and problem solution
5. Build and demonstrate an MVP (Minimum Viable product)
6. Structure a business model around the problem, customer, and solution and present Business Model Canvas

Course Outcomes:
This course will give the students the foundational experience of the entire cycle of entrepreneurship, through a combination of theory and practice.

At the end of the course, the students shall be able to:

1. Describe what it takes to be an entrepreneur
2. Analyze business opportunities and the basics to create, launch and manage new businesses
3. Develop Business Model for their Idea/Problem
4. Create MVP (Minimum Viable Product)

Module 1: Introduction **(3)**
Discover yourself, Principles of Effectuation, Identify your entrepreneurial style

Module 2: Problem Identification and Idea generation **(4)**
Identify Problems worth Solving, Introduction to Design Thinking, Generate ideas that are potential solutions to the problem identified

Module 3: Customer Segmentation **(7)**
Customer identification, Market, Creative solution, Unique Value proposition

Module 4: Business Model Canvas **(4)**
Types of business models, Business Plan documentation, Risk identification

Module 5: Validation **(9)**
Identification of MVP, Solution development, Building products/services, Build-measure-learn loop for development, Market fit of solution

Module 6: Money (5)
Revenue streams, Pricing and cost, Venture financing, Investor expectations

Module 7: Team building (3)
Shared leadership, role of good team, Collaboration tools and techniques

Module 8: Marketing and sales (3)
Positioning, Channels and strategies, Sales planning

Module 9: Support (4)
Project management, Planning and tracking, Business Regulation

Course contents available at: https://staging.learnwise.org/ - Through a Cloud Technology Platform – WF Learn Wise Platform

PDF documents can be downloaded from the website for the distribution to students.

Sample References:

1) **Effectuation: https://necrophone.com/2014/01/20/effectuation-the-best-theory-of-entrepreneurship-you-actually-follow-whether-youve-heard-of-it-or-not/**

2) **Value Proposition: https://www.youtube.com/watch?v=jZN6CUieuOQ&list=PLw540Wq5kay866m6A6xI7KOwE_Ah7is4m**

3) **The Lean BMC: https://www.youtube.com/watch?v=FjB_e7UO1hc**

4) **Define your MVP: https://startups.fb.com/en-in/categories/development/**

5) **Designing Experiments: https://www.youtube.com/watch?v=WiMZWCg1Hu8&t=111s**

6) **Beating the Competition: https://www.youtube.com/watch?v=46uP6vOj5G0**

7) **Google : Think branding: https://www.youtube.com/watch?v=1l2CUjkg0ug**

Introduction to Digital Marketing

Teaching Scheme

Lectures: 3

Examination Scheme

In Semester: 50 marks

End Semester: 50 marks

Credits:3

Course Objective:

1. Interpret Digital marketing campaign strategy
2. Explain social media and its role in marketing strategy through various channels which it operates
3. Explore search engine optimization
4. Explain concepts related to mobile marketing

Course Outcome:

After successfully completing the course students will be able to

1. Explore methods to illustrate website and webhosting concepts
2. Develop a marketing plan for product or service by integrating social media platforms to generate leads
3. Examine mobile marketing strategies to connect with customers
4. Demonstrate importance of organic ranking through SEO

Unit: I Overview of Digital Marketing **(08)**

Introduction to Digital Marketing,Understand customer needs, Benefits of Digital marketing, Digital marketing platforms and Strategies, Comparing Digital with Traditional Marketing,Latest Digital marketing trends, What is Domain Name, Types of Domain, Web Hosting Concepts, Domain/Hosting Business,introduction to wordpress

Unit: II Digital Advertising with Google AdWords **(08)**

Introduction to Paid Marketing, Google Account setup, Account Structure, Campaigns settings, AdGroup setup, Keyword Match Types, Keyword Research Tools, Understanding Ad Auction, What is Quality Score, My Client Centre, Google AdWords Editor Tool, Interface Tour and BillingSettings

Unit: III Social Media Marketing **(08)**

Introduction to Social Media, Integrating Social Media with Other Disciplines, Facebook Marketing, Facebook account setup, Personal account properties, Facebook marketing strategy, Facebook business page setup, Types of Business pages, Cover photo designing, Page management options, twitter and Instagram marketing

Unit: IV Mobile Marketing **(06)**

Introduction to Mobile Marketing and m-commerce, create mobile app,case study:market potential of mobile commerce.

Unit: V Search Engine Optimization **(06)**

Introduction to Search Engines, On-Page Optimization, Off-Site Optimization, Social media monitoring Tool

Unit: VI Case study and Future Trends in Digital marketing **(06)**

Text Books:

1.Sudhir Sreedhara, **DigitaMarketing**, *Lulu.com, 2015*

2.Vandana Ahuja, **Digital Marketing,** *Oxford University Press, 2015*

3.Banjamin Mangold, **Google Adwords and Google Analytics**, l*oves data 2018*

4.Alex Michael, Ben Salter, **Mobile Marketing**, *Butterworth-heinemann, 2006*

5.Richard stokes, **Pay per click**, *second edition, Entrepreneur Press*

6.Steven Samson **Search Engine Optimization - SEO 101: Learn the Basics of Google SEO in One Day** *Publication:CreateSpace Independent Publishing Platform , USA ©2015*

ISBN:1517336945 9781517336943

7.Jenifer Grappone,Gradiva Couzin, Search Engine optimization An Hour a Day Third Edition, Wiley publishing Inc.

8.EricEnge, Stephen Spencer, Jessie Stricchiola, Rand Fishkin, ***The Art of SEO****, second Edition , O'Reily Media*

Reference Books:

1.Ian Dodson, **The Art of Digital Marketing:** *Wiley,Apr 2016*

2.Sira. R Bowden **Beginners Guide Digital Marketing Part 2:** *Mobile Marketing, BookRix, 2016*

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websites:

1. https://www.searchenginejournal.com/seo-guide/panda-penguin-hummingbird/
2. https://www.lynda.com/Analytics-tutorials/Online-Marketing-Fundamentals/188429-2.html

Test-1(25mks)	Test-2(25mks)	Endsem(50mks)
MCQ/Quiz	Pen-paper test	Case-study/Projects/Assignments

OEHS 3101 Intellectual Property Rights

Teaching Scheme
Lectures : 3 Hrs/week
Credits : 3

Examination Scheme
In Semester : 50 Marks
End semester : 50 marks

Course Objectives :

To facilitate the learners to -

1. Overview of Intellectual Properties (IP) regime in India and International arrangements
2. Types of IP as Patents, Copyrights, Trade Secrets etc.
3. Process and steps involved in filing Intellectual Properties
4. Understand intricacies involved in drafting patent applications

Course Outcome :

By the end of this course, the students should be able to -

1. Demonstrate the concepts of Intellectual Property Rights, patents and other forms of IP
2. Compare and apply type of Intellectual Property
3. Analyze the patentability of inventive step by searching patents
4. Construct patent drafts for given Patent specification
5. Understand the advances in patent law, in national and international scenario

Unit-I : Introduction **(6)**

Intellectual Property (IP) Vs. Physical property, History of IP in India, Importance of IP, Patentable inventions / art, types of IPR-Patents, Copyright, Industrial Design, Trade Marks etc., Basic principles of IPR, Economic Importance of Intellectual Property Rights, IPR-ownership, morality, public order, traditional knowledge

Unit-II : Patents **(8)**

Introduction to Patents, Patentable Inventions as per the Indian Patent Act, Patent searching, types of Patent applications, Procedure for filing application (National and International), Patents offices, Register of Patents, Rights and obligations of patentee, Term of patent, Patent of Addition

Unit-III : Drafting of patent applications **(8)**

Fundamentals of drafting, structure of the patent specification-Field of invention, prior art, patent classifiations, technical advance, Invention Disclosure Form, problem solution statement, claims, preamble, body, summary

Unit-IV : Transfer and Infringement of Patent Rights **(6)**

Working of patents, compulsory licensing, Revocation of patents, Transfer of Patent Rights-Assignment, License; Concept of infringement, Infringement of Patents Rights, Infringement of Patents and its remedies, Patent of Addition

Unit-V : Introduction to other types of IPs **(8)**

Copyright, Trade Marks, Geographical Indications, Industrial Designs, Trade Secrets, Layout designs of Integrated Circuits : Introduction, Work protected by, ownership and

infringement, Application process

Unit-VI : Advances in IPR **(6)**

International Patenting, Patent Co-operation Treaty (PCT), Commercialization of Patents, Advances in IPR

References:

Text Books

1. Niraja Pandey, Khushdeep Dharni, "Intellectual Property Rights", PHI
2. N. S. Rathore, "Intellectual Propoerty Rights: Drafting,Interpretation of Patents Specification and Claims" , New India Publishing Agency

Reference Books

1. Venkataraman M., "An introduction to Intellectual property Rights", Venkataraman M.
2. Mishra, "An introduction to Intellectual property Rights", Central Law Publications
3. R Anita, V. Bhanoji Rao, "Intellectual property Rights, - A Primer", Eastern book Company
4. R Puri, "Practical approach to intellectual propert Rights"
5. P Ganguly, "IPR unlisting the knowlege economy"

Web references

1. NPTEL course material on "Patent Drafting for Biginners" - https://onlinecourses.nptel.ac.in/noc18_hs17/preview
2. IP India : www.ipindia.nic.in/
3. WIPO, World Intellectual property Organization - www.wipo.int/
4. Intellectual Property (IP) Policy | USPTO - https://www.uspto.gov/intellectual-property-ip-policy

OEHS 3101: Project Management

Teaching scheme
Lectures: 3 hrs/week
Credits : 3

Examination Scheme
In-sem: 50 Marks
End-Sem: 50 Marks

Course Objectives:

1. To introduce concepts of Project management
2. To discuss life cycle of real life projects and activities involved in projects
3. To understand risks involved in a project

Course Outcomes:

After successful completion of the course the student will be able to:

1. Identify scope of a project and lifecycle of a project
2. Develop a plan for a project
3. Determine schedule of a project
4. Assess risks involved in a project
5. Estimate budget of a project
6. Adapt project management tools and techniques

Unit I Introduction:

Definition of project, Objectives of Project Management, Classification of projects, Life cycle phases of the project. Project management and Project manager, Role and responsibilities of the project manager, Stakeholder Identification, team building

Unit II Project Planning

Project Planning: Introduction and basic requirements, establishing project objectives, Statement of work (SOW), project specifications, Work Breakdown structure (WBS).

Unit III Project Scheduling

Project scheduling: Introduction and basic requirements, milestone scheduling, Network
Scheduling techniques: PERT(Program Evaluation Review Technique), CPM(Critical Path Method), GANNT chart, Schedule control

Unit IV Risk Assessment and Management:

Risk Management Planning, Risk identification, Qualitative Risk analysis, Quantitative Risk analysis, Risk response planning, Risk monitoring and controlling

Unit V Project Cost Estimation

Resource Planning, Cost Estimating, Cost Budgeting, Budget control, Earned Value Analysis, Project Audits, Project closure

Unit VI Tools and Techniques for Project Management

Project Management tools, International Project Management, Collaborative development, Planning Quality Management, Quality metrics, Techniques for Quality Control (statistical control, six sigma, ISO)

Text Books :

1. A Guide to the Project Management Body of Knowledge (PMBOK® Guide), *PMI.*

2. PROJECT MANAGEMENT A Managerial Approach, Jack R. Meredith, *John Wiley & Sons*

Reference Books:

1. Morris, P. W. G., Pinto, J. K., **The Wiley Guide to Managing Projects**, 2004, *John Wiley & Sons*
2. Phillips, J.PMP **Project Management Professional Study Guide**, *McGraw-Hill, 2003.*

Website:
https://www.pmi.org
https://www.ipma.world/

AC3101 : Employability Skills and Developement – I

Teaching Scheme:
Lectures: 2 Hrs/Week **[Section A** - 1 Hr/Week , **Section B** - 1 Hr/Week]

Pre-requisites: High school level Mathematics ,English grammar and Verbal ability

Course Objectives:

1. To enhance the analytic and problem solving ability of students.
2. To develop English language proficiency .
3. To make them aware of communication skills necessary for getting employed and being successful in a profession.

Course Outcomes:
After successful completion of the course , students will be :

1. Able to solve Numerical ability questions without using calculators.
2. Equipped with essential language skills (written, verbal and non-verbal)
3. Able to exhibit their presentation skill and be ready for facing interviews.

Section A :Quantitative Aptitude – I [Numerical Ability] **(24)**

Use of Paper pencil practice sessions and online test on the following topics :

1. Divisibility, Remainder Theorem
2. Surds & Indices
3. LCM & HCF
4. Percentage
5. Average
6. Ratio Proportion
7. Profit Loss
8. Set Theory (Venn Diagram)
9. Alligation
10. Time & Work
11. Speed Distance Time
12. Boats & Trains
13. Equations
14. No. Series, AP GP HP
15. Simple & Compound Interest
16. Clocks
17. Calenders
18. Relations & Age
19. Permutation & Combination
20. Probability
21. Verbal & Non Verbal Reasoning
22. Data Interpretation

Section B - Communication Skill – I **(20)**
[Verbal Ability (VA) and Reading Comprehension (RC)]

Use of Language Lab and Paper pencil test on each topics below.

1 . Spotting Errors, Synonyms, Antonyms,
2. Selecting Words, Spellings, Sentence Formation,
3. Ordering of Words, Sentence Correction, Sentence Improvement,
4. Completing Statements,Ordering of Sentences,

5. Paragraph Formation, Closet Test, Comprehension,
6. One Word Substitutes, Idioms and Phrases,
7. Change of Voice, Change of Speech, Verbal Analogies
8.Resume Preparation as per College format.
9. Public Speaking : Book review, Extempore, Debates
10. Presentation skills on Seminar /Mini Project
11. Group Discussion on following topics (any three) :
12. Technical Topics
13. Current Topics, Economics & Business, Management Topics, Creative Topics
14. Social Topics, Politics, Sports, Education
15. Job Interviews : Conduct mock interviews, Interview questions
16. Business Etiquettes and Body language

Text Books:

1. Wren and Martin, "English grammar and Composition", S. Chand publications.
2. Abhijeet Guha, "Quantitative Aptitude for competitive exams", McGraw-Hill Education

Books for references:

1. Basic Managerial Skills for all E. H. McGrath, Eastern Economy Edition, Prentice hall India.
2. Personality Development and Group Discussions,Barun K. Mitra, Oxford University Press
3. Group Dissussions and Interview Skills : Priyadarshi Patnaik : Foundation Books : Cambridge University Press
4. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success: Gopalaswamy Ramesh, Mahadevan Ramesh
5. Abhijeet Guha, "Quantitative Aptitude for competitive exams", McGraw-Hill Education

Reference Website:

1. https://www.indiabix.com/
2. https://www.aptitude-test.com/
3. https://www.careerride.com/
4. https://www.freshersworld.com/

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ADVANCED COURSE IN ENTREPRENEURSHIP :
FROM BUSINESS MODEL TO PRODUCT MARKET FIT

Core Contact hours: 45 Flex Contact Hours: 15
Assignments (done after class) are 30 hours

Assessment plan:
Class Participation and Assignments - 30%
Quizzes - 10%
Final Exam - 30%
Capstone Project - 30%

Prerequisite:

Basic Course or a student who has a Business Model and an MVP

Course Objectives:

1. To understand the importance of growth and to be able to chart a path towards growth
2. To revisit your business model
3. To give a growth orientation your customer acquisition, operations, revenue and sales strategy
4. To list and comply with the requirements relating to regulatory compliance
5. To be able to effectively pitch your venture to potential stakeholders

Course outcomes:

Students will be able to

1. Validate the business model designed for product market fit
2. Formulate and test the business strategies for the growth of business
3. Comply with the requirements relating to regulatory compliance for the business proposed
4. Pitch their venture to potential stakeholders

Description about course:

In this course, students will learn about how to achieve product market fit.
They will revisit their business model and look for opportunities for growth in their customer segments, in their channels, and in the other blocks of the Business Model and validate it. Then they will set their traction goal and chase that during the course. They identify channels, enhance their revenue streams and focus on sales. They will learn to work on their financial model and make a pitch deck. They will build their Sales, Ops, Hiring, and Technology Plan. Potential show stoppers such as Compliances, Legal and Registrations will be covered as well.

Course Contents:

Module I: Getting Ready for Growth

- Why growth stage is different compared to startup phase
- Why Product-Market fit is not enough
- Case study
- To assess readiness for growth
- To chart a growth path

Module II: Expanding Customer Base

Revisit your business model and develop few variants (more business model types)
- Identify additional customer segments that your solution can address
- Evaluate business models for the new customer segments
- Relook at the Problem Statement (can you expand the scope and scalability of your business by repositioning your problem statement?)
- Explore additional ways to monetize

Module III: Scaling

- How to gain traction beyond early customers
- Defining traction (in quantifiable terms) and identifying the most important metrics to measure traction
- Calculate cost of new customer acquisition
- Estimate your customer lifetime value (LTV)
- Identifying waste in your operations and focusing your team on what is important for traction

Module IV: Channels and Strategy:

- Identify Channels using Bulls Eye Framework
- Measuring the effectiveness of selected channels
- Budgeting and planning

Module V: Growing Revenues

- Stabilizing key revenue streams
- Developing additional revenue streams (licensing, franchising)
- Exploring new channels and partnerships

Module VI: Sales Planning:

Understanding why customers buy and how buying decisions are made; listening skills
- Sales planning, setting targets
- Unique Sales Proposition (USP); Art of the sales pitch (focus on customer needs, not on product
- Follow-up and closing a sale; Asking for the sale

Module VII: Strengthening Sales:

Building a professional sales team
- Sales compensation and incentives
- Sales planning, setting targets

Module VIII: Improving Margins

Testing price elasticity
- Optimizing costs and operational expenses
- Advanced concepts of unit costing

Module IX: Financial Modeling:

- Financial modeling of your venture's growth
- Analyzing competitor and peer's financial models

Module X: Legal :

- Overview of legal issues and their impact on entrepreneurs
- Importance of getting professional help (legal and accounting)
- Importance of being compliant and keeping proper documentation
- Patents and Intellectual property
- Trademarks

Module XI: Mentors, Advisors, and Experts:

- The importance of a Mentor and how to find one
- Role of business advisors and experts for specific targets in your growth plan

References:

https://lms.learnwise.org/

http://www.unstoppablegrowth.com/core/where_to_grow.asp?groupCode=9

https://hbr.org/2003/12/growth-outside-the-core

https://www.boardofinnovation.com/business-revenue-model-examples/

https://hbswk.hbs.edu/item/do-bonuses-enhance-sales-productivity-a-dynamic-structural-analysis-of-bonus-based-compensation-plans2

http://www.mca.gov.in/MinistryV2/registrarofcompanies.html

https://cleartax.in/s/annual-compliance-checklist-startups

http://www.wipo.int/portal/en/index.html

https://www.inc.com/young-entrepreneur-council/why-mentors-and-advisors-are-must-haves-for-every-founder.html

Autonomous Programme Structure of Third Year B. Tech. AY 2019-2020

T. Y. B. Tech. Electronics and Telecommunication Engineering Semester –II										
Course Code	Course Title	Teaching Scheme			Examination Scheme				Marks	Credits
		Hours / Week								
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
EC 3201	Digital Signal Processing	3	1	0	50	50	0	0	100	4
EC 3202	Advanced Processors	3	0	0	50	50	0	0	100	3
EC 3203	Control Systems	3	1	0	50	50	0	0	100	4
PEEC 3201	Programme Elective-II	3	0	0	50	50	0	0	100	3
PEEC 3202	Programme Elective-III	3	0	0	50	50	0	0	100	3
EC 3204	Digital Signal Processing Laboratory	0	0	2	0	0	25	0	25	1
EC 3205	Advanced Processors Laboratory	0	0	4	0	0	0	50	50	2
EC 3206	Mini Project and Seminar	0	0	2	0	0	25	0	25	1
PEEC 3203	Programme Elective-III Laboratory	0	0	2	25	0	0	0	25	1
AC 3102	Audit Course	0	0	2	0	0	0	0	0	0
	Total	**15**	**2**	**12**	**275**	**250**	**50**	**50**	**625**	**22**
	Grand Total	**29**			**625**				**625**	**22**

PEEC 3201: Programme Elective-II

1. Biomedical Electronics
2. Information Theory and Coding Techniques
3. PLC and Automation
4. Artificial Intelligence
5. Swayam Online Course

PEEC 3202: Programme Elective-III
PEEC 3203: Programme Elective-III Lab

1. Embedded Design and RTOS
2. Antenna and Wave Propagation
3. Digital Image Processing
4. Robotics

AC 3102: Audit Course:- Employability Skills and Development

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EC 3201 DIGITAL SIGNAL PROCESSING

Teaching Scheme
Lectures: 3 Hours / Week
Tutorial: 1 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 4

Course Objectives

1. To discuss basics of Digital Signal Processing and analog to digital signal conversion.
2. To apply transform techniques for the analysis of discrete time LTI signals and systems.
3. To compare analog and digital filters, design digital filters and realize using block diagrams.
4. To describe practical DSP systems and relate it to DSP fundamentals.

Course Outcomes
After completion of the course, students will be able to

1. Explain basic elements of Digital Signal Processing
2. Choose an appropriate sampling frequency and apply the sampling theorem to determine discrete time signal from continuous time signal and vice versa
3. Apply the transform techniques such as Z-transform and Discrete Fourier transform on discrete time signals, interpret its frequency domain representation and compare the computational complexities of DFT and FFT algorithms
4. Analyze a given system function in Z-domain to test for system stability and causality from the inspection of the pole-zero plot
5. Design FIR and IIR digital filters for given specifications, assess performance of the digital filters and build the filter structures
6. Explain the real life applications of Digital Signal Processing

Unit I: Introduction to DSP **(06)**
Basic elements of Digital Signal Processing, Advantages of Digital over Analog signal processing, Sampling of analog signals, Sampling theorem in time domain, Recovery of analog signals, Mapping between analog frequencies to digital frequency.

Unit II: Z-Transform **(06)**
Need of transform, Definition of bilateral and unilateral Z-Transform, Properties of ROC, Properties of Z-Transform, Pole-zero plot, Pole locations and time domain behavior, Inverse Z-Transform, Analysis of LTI DT systems, Stability and causality considerations for LTI systems.

Unit III: Discrete Fourier Transform **(08)**
DTFT- Definition, Frequency domain sampling, DFT, Properties of DFT, circular convolution, Computation of linear convolution using circular convolution, FFT algorithms-decimation in time and decimation in frequency using Radix-2 FFT algorithm, Butterfly diagram, Computational complexity of FFT algorithms, Bit-reversal, In-place computation.

Unit IV: FIR Filter Design **(08)**
Ideal filter requirements, Comparison of analog and digital filters, Frequency response of Linear phase FIR filters, Types of FIR filter, Design of linear phase FIR filter using windows method, characteristics and comparison of different window functions, FIR filters realization using direct and cascade forms.

Unit V: IIR Filter Design **(08)**

Characteristics of practical frequency selective filters, Comparison of characteristics of- Butterworth, Chebyshev and elliptic filters, Design of IIR filters from analog filters, IIR filter design by impulse invariance method, bilinear transformation, Frequency warping effect, IIR filter realization using direct form, cascade form and parallel form.

Unit VI: Applications of DSP **(06)**

Overview of DSP in real world applications, Applications of DSP in- Audio Systems, Telecommunication Systems, Biomedical, Image Processing.

Text Books:

1. John G. Proakis, D. G. Manolakis, **"Digital Signal Processing"**, *Pearson Prentice Hall*, (4rd Edition), (1997).
2. Emmanuel C. Ifeachor, B. W. Jervis, **"Digital Signal Processing- A practical approach"**, *Pearson Education*, (2nd Edition), (2002).
3. S. Salivahanan, A. Vallavraj, C. Gnanpriya, **"Digital Signal Processing"**, *McGraw Hill*, (3rd Edition), (2011).

Reference Books:

1. S. K. Mitra, **"Digital Signal Processing- A Computer Based Approach"**, *McGraw Hill*, (4th Edition), (2013).
2. A. Nagoor Kani, **"Digital Signal Processing"**, *Tata McGraw-Hill Education Pvt. Ltd.*, (2nd Edition), (2012).
3. Alan V. Oppenheim, **"Discrete-Time Signal Processing"**, *Pearson Education India*, (3rd Edition), (2013).
4. Vinay K. Ingale, John G. Proakis, **"Digital Signal Processing using MATLAB"**, *Cengage Learning*, (3rd Edition), (2009).
5. S. D. Apte, **"Digital Signal Processing"**, *Wiley India Publication*, (2nd Edition), (2011).

Online Resources:

1. http://freevideolectures.com/Course/2317/Digital-Signal-Processing-IIT-Delhi
2. https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/
3. http://www.dspguide.com/

EC 3202 ADVANCED PROCESSOR

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain the architecture of ARM 7 and ARM-cortex series microprocessor
2. Describe features of on chip peripherals of ARM 7 processor
3. Interfacing real world input and output devices to ARM 7
4. Explain the need of Operating system for embedded systems
5. Describe features of cortex based Raspberry PI board

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

1. Describe the ARM microprocessor family architecture and features
2. Write algorithm / C language program for ARM 7 on chip peripheral
3. Interface external peripherals to ARM 7 and write algorithm/ C program
4. Describe features of Raspberry pi ARM-cortex board and explain concepts of Real Time Operating System

Unit I: Introduction to ARM 7 processor – LPC 2148 **(07)**
Introduction to ARM processor – LPC 2148. LPC2148: Features, GPIO, Pin Connect Block, serial communication programming for transmission and reception from computer, programming for UART, Internal register set, CPSR, SPSR. Interface LED to GPIO.

Unit II: Real world Interfacing - I **(06)**
Introduce GSM AT commands, Interface GSM to LPC 2148 (Hardware / algorithm), Introduce GPS module and interface to LPC 2148, Memory Map.

Unit III: Real world Interfacing - II **(08)**
Architecture and pin configuration of LCD/GLCD and interface to LPC 2148, On chip ADC registers (algorithm), on chip DAC for waveform generation, interface EEPROM using I2C protocol, Programming examples Using timers of LPC2148 to generate delay.

Unit IV: ARM 7 Core **(08)**
ARM7 data flow model, programmers model, modes of operations. ARM7 Architecture (Block Diagram and Its Description), System Control Block (PLL and VPB divider), timer, Interrupt structure of LPC2148, Interfacing with KEYPAD, ARM versions: ARM7, ARM9 and ARM11 feature comparison.

Unit V: ARM CORTEX **(08)**
Introduction to ARM CORTEX series, improvement over classical series and advantages for embedded system design. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications. Firmware development using CMSIS standard for ARM Cortex.

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Unit VI: Introduction of Raspberry-Pi **(05)**

Introduction of Raspberry-Pi – Features, processor. Different OS of Raspberry Pi board. Installation procedure of OS. Booting sequence. Introducing GCC compiler, writing Hello world program.

Text Books:

1. Rajkamal, **"Embedded System Architecture Programming Design"**, *Tata Graw Hill Publication,* (2nd Edition), (2008).
2. Dr. K. V. K. K. Prasad **"Embedded / real time System: Concepts, Design, &Programming"***Black Book Dreamtech Press Publication.(*2003)
3. Andrew N. Sloss, DomiicSymes, Chris Wright, **"ARM System Developer's Guide-Designing and Optimizing Software"**, *Elsevier Publication,* (2004).
4. Joseph Yiu, **"The Definitive Guide to the ARM Cortex-M"**, *Newnes, ELSEVIER,* (2007)

Reference Books:

1. Tammy Noergaard, **"Embedded Systems Architecture"** Elsevier, (2nd Edition), (2004).
2. Dr. K. V. K. K. Prasad, Gupta Dass, Verma, **"Programming for embedded system"**,*Wiley – Dreamtech India Pvt. Ltd.*
3. I2C Specification Protocol Standard.
4. ARM7/TDMI (ReV4) – Technical Ref Manual

Online Resources:

1. LPC 214x User manual (UM10139) :- www.nxp.com
2. LPC 17xx User manual (UM10360) :- www.nxp.com
3. ARM architecture reference manual : - www.arm.com

EC 3203 CONTROL SYSTEMS

Teaching Scheme
Lectures: 3 Hours / Week
Tutorial:1 Hour / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 4

Course Objectives:

1. Explain the need of Laplace transform and develop the ability to analyze the system in s domain
2. Explain the components and types of control systems
3. Find response of first order and second order systems using standard input signals
4. To analyze feedback control system stability in time domain using Routh-Hurwitz criterion and Root Locus technique
5. Analyze feedback control system stability in frequency domain using Bode and Nyquist plot
6. Explain state space approach for control system analysis

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

1. Find the Laplace transform of signals and determine the transfer function of the system in s domain
2. Classify and explain different systems, interpret transfer function of physical components and construct system transfer function
3. Determine and analyze system response to find time and frequency domain specifications and steady state error
4. Examine system stability in time domain and in frequency domain
5. Examine the stability of system by plotting Root Locus, Bode and Nyquist plots
6. Analyze control system using state space approach

Unit I: Laplace Transform and its Applications (05)
Definition of Laplace Transform (LT), need of Laplace transform, Laplace transform of standard periodic and aperiodic functions, properties of Laplace transform, Laplace transform evaluation using properties, Inverse Laplace transform(ILT), stability considerations in s domain, application of Laplace transforms to the LTI system analysis.

Unit II: Basics of Control Systems (08)
Introduction, types of control systems: open loop and closed loop, feedback control system, effect of feedback, concept of transfer function, characteristics equation, poles and zeros, block diagram algebra, signal flow graph, Mason's gain formula.

Unit III: Time Domain Analysis (07)
Type and order of the control systems, types of standard inputs, response of first order system to step, ramp and parabolic inputs, response of second order system to standard input signals, time domain specifications of second order systems, steady state error and error coefficients.

Unit IV: Stability (07)
Concept of stability, absolute, relative, marginal and unstable system in s plane, dominant poles and zeros, Routh-Hurwitz criterion, concept of Root Locus.

Unit V: Frequency Domain Analysis **(09)**

Need of frequency domain analysis, correlation between time and frequency domain, frequency domain specifications, Bode plot, construction of Bode plot, gain and phase margin, determination of relative stability, Nyquist stability criterion.

Unit VI: State Space Analysis **(06)**

Advantages of state space analysis over classical control, concept of state, state variables and state model, state space representation using state model, state transition matrix and its properties, solution of state equations for LTI system, concept of controllability and observability.

Text Books:

1. I. J. Nagrath, M. Gopal, **"Control Systems Engineering"**, *New Age International Publishers, New Delhi,* (5th Edition), (2007).
2. Katsuhiko Ogata, **"Modern Control Engineering"**, *PHI Learning Private Limited, New Delhi,*(5th Edition), (2010).
3. Barry Van Veen, Simon Haykin, **"Signals and Systems"**, *Wiley,* (2nd Edition), (2007).

Reference Books:

1. B. C. Kuo, **"Digital Control Systems"**, Oxford *University Press, New York,* (2nd Edition), (1992).
2. Richard C. Drof, Robert N. Bishop, **"Modern Control Systems"**, *Addison Wesley Pub. Company,* (1st Edition), (2001).

Online Resources:

1. http://nptel.ac.in/courses/108101037/1
2. https://www.tutorialspoint.com/control_systems/index.htm
3. https://www.youtube.com/watch?v=s8rsR_TStaA&list=PLBInK6fEyqRhG6s3jYIU48CqsT5cyiDTO

PEEC 3201 BIOMEDICAL ELECTRONICS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objective

1. Analysis of biomedical signals, its origin and classification of biosignals
2. Explain characteristics of biosignals and their Acquisition
3. Enhance the students ability in analysis for biomedical signals
4. Explain the functionality of biomedical electronic instruments

Course Outcome

After completion of the course, students will be able to

1. Explain anatomy of cardiovascular and nervous system
2. Describe sources, signal conditioning and processing techniques of biosignals
3. Analyze ECG and EEG signals using transform techniques
4. Design digital filter for removal of artifact and noises from biosignals
5. Explain biomedical instruments for diagnosis with consideration of patient safety

Unit: I Human Anatomy and Biomedical Electronic System **(08)**

Cell, Nerve cell, Human Anatomy: Body Skeleton, Muscles, Heart, Respiratory System, Nervous System, Introduction to Biomedical Electronics, its advantages and applications.

Unit: II Bioelectric Signals and Recording System **(07)**

Action Potential, Classification of Biomedical Signals. Bioelectric Signals: ECG, EEG, EMG, EOG, MEG. Sources and Contamination of Noise in Bioelectric signals. Recording Electrodes, Skin impedance measurement, Bio-Amplifiers, Isolation amplifiers, Filtering and Patient safety.

Unit: III Cardiovascular System **(06)**

Electrical Activity of the Heart, Lead Configuration to measure ECG, Einthoven Triangle, Normal and Abnormal ECG, ECG Machine, Heart Sounds and Blood Pressure Measurement.

Unit: IV Central Nervous System **(06)**

Electroencephalogram(EEG) – Types and Significance of EEG Signal, 10-20 Electrode Placement, Evoked potential, EEG Machine, EEG amplifier and filters, EEG applications: Epilepsy, sleep disorder and Human Brain Computer Interface.

Unit: V Biosignal Processing **(07)**

Removal of artifact and noise using digital filter, time frequency analysis of biosignals, event detection of ECG and EEG, cancellation of maternal ECG from fetal ECG using Adaptive filter.

Unit: VI Medical Instruments and Measurements **(08)**

Blood Flow Measurement, Finger Plethesmography, Echocardiography, Bedside Monitors, Central Monitoring System, X Ray properties, Generation of X Rays, block diagram of X Ray machine image intensifier, Drawbacks of X Ray imaging, CT Scan and MRI

Life Saving Devices: Pacemakers, Defibrillators, Ventilators.

Text Books:

1. Joseph J. Carr and John M. Brown, **"Introduction to Biomedical Equipment Technology",** *Prentice Hall India,* (4th Edition), (2000).
2. R. Rangayan, **"Biomedical Signal Analysis",** *Wiley India Pvt. Limited,* (1st Edition), (2002).
3. R. S. Khandpur, **"Handbook of Biomedical Instrumentation"**, *Tata McGraw Hill New Delhi,* (2nd Edition), (2003).

Reference Books:

1. D. C. Reddy **"Biomedical Signal Processing: Principles and techniques",** *Tata McGraw Hill New Delhi,*(1st Edition), (2005).
2. Bruce, **"Biomedical Signal Processing & Signal Modeling,"** *Wiley India Pvt. Limited,* (Wiley student edition), (2009).
3. John L Semmlow, **"Bio-signal and Medical Image Processing",** *CRC Press,* (2nd Edition), (2009).

online Resources:

1. http://nptelonlinecourses.iitm.ac.in/
2. https://onlinecourses.nptel.ac.in/noc18_ec02/preview

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PEEC 3201 INFORMATION THEORY AND CODING TECHNIQUES

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To introduce the basic concepts of information theory to the students
2. To demonstrate calculation of channel performance using the basic concepts of information theory
3. To learn source coding techniques for data compression
4. To learn channel coding techniques for error detection and correction
5. To write algorithms for source coding and channel coding techniques

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

1. Explain entropy, mutual information and channel capacity for Discrete Memoryless Channel, Prefix condition, Kraft's inequality, Hamming Bound, Shannon's Theorem
2. Calculate channel performance in terms of entropy, mutual information and channel capacity for Discrete Memoryless Channel
3. Apply Shannon Fano, Huffman and Lempel Ziv techniques for data compression
4. Apply Linear Block Code, Cyclic Code, Convolution Code, BCH Code and RS Code for error detection and correction
5. Write algorithms for source coding and channel coding techniques

Unit I: Information Theory and Source Coding **(09)**
Introduction to information theory, Entropy and its properties, Source coding theorem, Huffman coding, Shannon-Fano coding, The Lempel Ziv algorithm, Run Length Encoding, Discrete memory less channel and Mutual information.

Unit II: Information Capacity and Channel Coding **(08)**
Channel capacity, Channel coding theorem, Information capacity theorem, Linear Block codes: Matrix description, Error detection and correction capability, Encoding and decoding circuit, Single parity check codes, Repetition codes, dual codes, Hamming code and Interleaved code.

Unit III: Cyclic Codes **(07)**
Galois field, Primitive element, Primitive polynomial, Minimal polynomial and generator polynomial, Cyclic Codes: Encoding for systematic and non-systematic cyclic code, Syndrome decoding of cyclic codes, Circuit implementation of cyclic code.

Unit IV: BCH and RS Codes **(09)**
Binary BCH code, Generator polynomial for BCH code, Decoding of BCH code, RS codes, generator polynomial for RS code, Decoding of RS codes.

Unit V: Convolutional Code **(09)**
Convolution code: Introduction of convolution code, Transform domain and Time domain approach, Graphical representation: State diagram, Tree diagram and Trellis diagram, Sequential decoding and Viterbi decoding.

Text Books:

1. Simon Haykin, Michael Moher, **"Communication Systems"**, *Wiley,* (5th Edition), (2009).
2. Ranjan Bose, **"Information Theory Coding and Cryptography"**, *Tata McGraw-Hill*, (3rd Edition), (2016).

Reference Books:

1. Bernard Sklar, **"Digital Communication-Fundamentals and Application"**, *Pearson Education,* (2nd Edition), (2006).
2. Khalid Sayood, **"Introduction to Data Compression"**, *Morgan Kaufmann Publishers,* (3rd Edition), (2006).
3. Shu Lin and Daniel J. Cistello Jr., **"Error control Coding"**, *Pearson Publications India,* (2nd Edition), (2004).
4. Todd Moon, **"Error Correction Coding: Mathematical Methods and Algorithms"**, *Wiley India Pvt. Limited,* (1st Edition), (2006).

Online Resources:

1. http://nptel.ac.in/courses/117101053/1

PEEC 3201 PLC and Automation

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To recognize industrial control problems suitable for PLC control.
2. To analyze the essential elements and practices needed to develop and implement the Engineering Automation using PLC approach
3. To familiarize advanced topics such as SCADA, DCS Systems, Digital Controller, CNC Machines.

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

1. Explain the basics of Process Control System, its components & Automation System.
2. Design the subsystems of a Process Control application.
3. Develop P.L.C. ladder diagram for a process control application.
4. Explain architecture and communications of P.L.C. (Programmable Logic Control), SCADA(Supervisory Control and Data acquisition) and DCS (Distributed Control System).
5. Explain C.N.C. machines and industrial communication standards in modern

Unit I: Process Control & Automation **(08)**
Process control principles, Servomechanisms, Control System Evaluation, Analog control, Digital control, Types of Automation, Architecture of Industrial Automation Systems, Advantages and limitations of Automation.

Unit II: Transmitters and Signal Conditioning **(07)**
Need of transmitters, Standardization of signals, Current, Voltage and Pneumatic signal standards, 2-Wire & 3-Wire transmitters, Analog and Digital signal conditioning for R.T.D., Thermocouple, D.P.T. (Differential Pressure Transmitter) etc., Smart and Intelligent transmitters.

Unit III: Controllers and Actuators **(08)**
PID Controller, Cascade PID control, Microprocessor Based control, PAC (Programmable Automation Controller), Mechanical switches, Solid state switches,
Electrical actuators : - Solenoids, Relays and Contactors, A.C. Motor, V.F.D., D.C. Motor, B.L.D.C. Motor, Stepper Motor, Servo Motor, Pneumatic and Hydraulic actuators.

Unit IV: PLC and Human Machine Interface (HMI) **(07)**
Functions of P.L.C., Types of PLCs, Advantages, Architecture, Working of P.L.C., Selection of P.L.C., Networking of P.L.C.s, Ladder Programming basics, Ladder Programming examples, Interfacing Input and Output devices with P.L.C., P.L.C. programming standard IEC61131.

Unit V: Industrial Automation [Supervisory Control And Data Acquisition (S.C.A.D.A.) & Distributed Control System (D.C.S.)] (06)

Introduction to S.C.A.D.A. (Features, MTU- functions of MTU, RTU- Functions of RTU, Applications of S.C.A.D.A., Communications in S.C.A.D.A.- types & methods used, Media used for communication), Introduction to DCS (Architecture, Input and Output modules, communication module, Specifications)

Unit VI: Automation and CNC (Computer Numeric Control) Machines (06)

Introduction of C.N.C. Machines : - Basics and need of C.N.C. machines, N.C., C.N.C. and D.N.C. (Direct N.C.) systems, Structure of N.C. systems, Applications of C.N.C. machines in manufacturing, Advantages of C.N.C. machines.

Industrial Communication : - Devicenet, Interbus, Device network : - Foundation Fieldbus-H 1, H.A.R.T., C.A.N., PROFIBUS-PA,

Control network : - ControlNet, FF-HSE, PROFIBUS-DP, Ethernet, T.C.P./ I.P.

Text Books:

1. Curtis Johnson, **"Process Control Instrumentation Technology"**, 8th Edition, Pearson Education.
2. S.Sen, S.Mukhopadhyay, A.K.Deb,**"Industrial Instrumentation Control *and* Automation"**, Jaico publishing house.
3. Madhuchhanda Mitra, Samarjit Sen Gupta, **"Programmable Logic controllers and Industrial Automation"**, Penram International Publishing India Pvt. Ltd.
4. Stuart A. Boyer, SCADA supervisory control and data acquisition, ISA Publication.

Reference Books:

1. John W. Webb, Ronold A Reis, "Programmable Logic Controllers, Principles and Applications", 5th Edition, Prentice Hall of India Pvt. Ltd.
2. Kilian, "Modern control technology: components & systems, Delmar 2nd edition
3. Bela G Liptak, "Process software and digital networks", 3rd edition, (2002).
4. Pollack. Herman, W & Robinson.T. "Computer Numerical Control", Prentice Hall. NJ.
5. Pabla, B.S. & Adithan, M. "CNC Machines", New Age Publishers, New Delhi.

Online Resources:

1. http://www.nptel.ac.in/courses/108105062/
2. https://www.honeywellprocess.com/library/support/Public/Documents/A%20Process%20control%20primer.pdf
3. https://nptel.ac.in/courses/112102011/downloads/faq%20of%20module%201.pdf

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PEEC 3201 Artificial Intelligence

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objective

1. To explain the basics of Artificial Intelligence (AI)
2. To introduce various types of algorithms useful in AI
3. To explain the concepts of machine learning, pattern recognition, and natural language processing.
4. To explain the numerous applications and huge possibilities in the field of AI

Course Outcomes:
After completion of the course, the student will be able to

1. Explain the components of intelligent agents and expert systems.
2. Apply knowledge representation techniques and problem solving strategies to AI applications.
3. Explain and analyze the search and learning algorithms
4. Describe the AI techniques in Expert/intelligent system development

Unit I : Basics of AI and Problem Solving **(06)**
Categories of AI, applications of AI, intelligent agents, agents and environments, good behavior, the nature of environments, structure of agents, problem solving, problem solving agents, searching for solutions, uninformed search strategies.

Unit II : Problem Solving : Beyond Classical Search, Adversarial Search And Constraint Satisfaction Problems **(08)**
Informed search strategies, heuristic function, local search algorithms and optimistic problems, local search in continuous spaces, online search agents and unknown environments, Games: optimal decisions in games, Alpha- Beta Pruning, imperfect real-time decision, games that include an element of chance. Constraint satisfaction problems (CSP), Backtracking search and Local search for CSP.

Unit III : Knowledge Representation **(08)**
Logic, Propositional logic, First order logic, Knowledge engineering in first order logic, inference in first order logic, prepositional versus first order logic, unification and lifting, forward chaining, backward chaining, resolution, knowledge representation, uncertainty and methods,Bayesian probability and belief network, probabilistic reasoning, Bayesian networks, inferences in Bayesian networks.

Unit IV : Learning **(07)**
Learning from observations: forms of learning, Inductive learning, Learning decision trees, Ensemble learning, Knowledge in learning, Logical formulation of learning, Explanation based learning, Learning using relevant information, Inductive logic programming, Statistical learning methods, Learning with complete data, Learning with hidden variable, EM algorithm, Instance based learning, Neural networks - Reinforcement learning, Passive reinforcement learning, Active reinforcement learning, Generalization in reinforcement

learning.

Unit V : Expert Systems **(07)**

Introduction to Expert System, Architecture and functionality, Examples of Expert system Visual perception-Waltz's algorithm,Basic steps of pattern recognition system, Feature Extraction- Principal Component Analysis, Linear Discriminant Analysis, Object Recognition- Template Matching theory, Prototype Matching Theory, Pattern Mining,Robotics, robot hardware, robotic software architecture, applications.

Unit VI: Natural Language Processing **(06)**

Language Models, text classification, formal grammar for a fragment of English, syntactic analysis, augmented grammars, semantic interpretation, ambiguity and disambiguation, discourse understanding, grammar induction, probabilistic language processing, probabilistic language models.

Text Books:

1. Stuart Russell, Peter Norvig, **"Artificial Intelligence, A Modern Approach"**, *Pearson Education/Prentice Hall of India,* (3rd Edition), (2010).
2. Elaine Rich, Kevin Knight and Shivshankar Nair, **"Artificial Intelligence"**, *Tata McGraw Hill,* (3rd Edition), (2009).

Reference Books:

1. Nils J. Nilsson, **"Artificial Intelligence: A new Synthesis"**, *Morgan Kaufmann Publishers,* (1th Edition), (1998).
2. George F. Luger, **"Artificial Intelligence: Structures and Strategies for Complex Problem Solving"**, *Pearson Education,* (6th Edition) (2008)

Online Resources:

1. NPTEL Lectures on AI : http://nptel.ac.in/courses/106105077/

PEEC 3202 EMBEDDED DESIGN AND RTOS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain embedded system design challenges
2. Discuss Operating system (OS) requirement for embedded systems
3. Describe real time operating system concepts
4. Discuss features of Linux OS
5. Interface real world input and output devices

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

1. Describe design metrics of embedded systems to design real time applications to match recent trends in technology.
2. Identify appropriate software development model for a given application
3. Apply real time systems concepts for developing embedded system
4. Explain need of open source OS with General Public License (GPL)
5. Explain kernel configuration and boot loader

Unit I : Introduction to Embedded Systems **(07)**
Introduction to Embedded Systems, Architecture, Classification and Characteristics of Embedded System, Design Process, Design Metrics and optimization of various parameters of embedded system. Embedded processor technology - IC technology, Design technology. Software development life cycle (SDLC) models like waterfall, spiral, V , Rapid Prototyping models and comparison,

Unit II: Structure of µCOS –II - Part - I **(07)**
Kernel Structure: Foreground and background systems, Pre-emptive and non-preemptive. Starting the OS. Tasks, Task States, TCB, Ready list, Task Scheduling, Task Level, Multitasking , Context Switching, , Idle Task, Statistics Task, Task Management: Creating/Deleting and Suspending/Resuming Task, Task Stacks and checking, Changing Task's Priority.

Unit III : Synchronization in µCOS-II **(07)**
Critical Session, Shared resources, Inter task communication, Mutual exclusion, Semaphore Management: Creation/Deletion, Pending/Posting/Acceptance/Query. Mutual Exclusion Semaphores: Creation/Deletion, ending/Posting/Acceptance/Query. Event Flag Management: Internals, Creation/ Deletion of Event Flag groups, Waiting/Setting/Clearing/Looking for/Querying an Event Flag Group.

Unit IV: Structure of µCOS –II **(07)**
Static and Dynamic Priorities, Priority inversion, Synchronization, mechanisms, Interrupts: Latency, Response and Recovery, Clock Tick, Memory requirements. Schedulers, Locking and unlocking of scheduler, Interrupts, Clock Tick, Initialization, Time Management: Delaying/Resuming task, System Time

Unit V: Communication in µCOS-II **(07)**

Message Mailbox Management: Creating/Deleting a Mailbox, Waiting/ Sending /Getting without waiting a Message from Mailbox, Status of Mailbox, Alternate uses of Mailbox. Message Queue Management: Creating/Deleting/ Flushing a Message Queue, Waiting/Sending/Getting without waiting a Message from Queue, Status and Alternate use of Message Queue. Memory Management: MCB, Creating a partition, Obtaining /Returning/Waiting for a memory Block, Partition Status. Porting of µCOS-II: Development tools, Directories and Files, Configuration and testing of Port.

Unit VI: Linux Kernel Construction **(07)**

Need of Linux, Embedded Linux Today, Open Source and the GPL, BIOS Versus Boot loader Linux Kernel Background, Linux Kernel Construction, Kernel Build System, Kernel Configuration. Role of a Bootloader, Bootloader Challenges. A Universal Bootloader: Das U-Boot. Porting U-Boot.

Text Books:

1. Jean J. Labrosse, **"MicroC OS II,The Real-Time Kernel"**, *CMP Books*, (2nd Edition), (2011).
2. Christopher Hallinan, **"Embedded Linux Primer - A Practical, Real-World Approach"**,*Prentice Hall Pvt.*, (2nd Edition), (2010)
3. Raj Kamal, **"Embedded Systems –Architecture, Programming and Design"**, *McGraw Hill*, (2nd Edition), (2008).

Reference Books:

1. Dr. K. V. K. K. Prasad **"Embedded / real time System: Concepts, Design, & Programming -Black Book"**.*Dreamtech Press Publication.*(2nd Edition),(2003).
2. Frank Vahid and Tony Givargis, **"Embedded System Design – A Unified hardware/ Software introduction"**, *Wiley Publication*, (3rd Edition),(2006).

PEEC 3202 ANTENNA AND WAVE PROPAGATION

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Introduce and analyze the nature of uniform plane waves
2. Explain the different modes of propagation in uniform plane waves
3. Introduce the basics of antenna theory and analyze different types of antenna arrays
4. Familiarize the students with different types of antenna used for the practical applications

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

1. Apply Maxwell's equations to explain the phenomenon of uniform plane waves and analyze the wave propagation mechanism
2. Evaluate the performance of antenna in terms of antenna parameters
3. Identify the need of antenna arrays and analyze its design parameters
4. Design and analyze uniform and non-uniform antenna arrays
5. Select the type of antenna used for the practical applications

Unit: I Electro Magnetic Waves **(10)**
Maxwell Equations in phasor form, Wave Equation, Uniform Plane wave in homogeneous, free space, dielectric, conducting medium. Polarization: Linear, circular and Elliptical polarization, unpolarized wave. Reflection of plane waves, Normal incidence, oblique incidence, Electromagnetic Power and Poynting vector.

Unit: II Wave propagation **(08)**
Fundamental equations for free space propagation, Ground, sky and space wave propagations, Structure Of atmosphere, Characteristics of ionized regions, Effects of Earth's magnetic field, Virtual height, MUF, Skip distance, Ionosphere abnormalities, Multi-hop propagation.

Unit: III Antenna Fundamentals **(08)**
Types of Antenna, Radiation Mechanism, Antenna Terminology: Radiation pattern, radiation power density, radiation intensity, directivity, gain, antenna efficiency, half power beam width, bandwidth, antenna polarization, input impedance, antenna radiation efficiency, effective length, effective area, reciprocity. Radiation Integrals: Vector potentials A, J, F, M.

Unit: IV Wire Antennas and Antenna Arrays **(08)**
Analysis of Linear wire antennas: Infinitesimal dipole, small dipole, finite length dipole, half Wave length dipole, small circular loop antenna. Antenna Arrays: Two element array, pattern multiplication, N-element linear array, uniform amplitude and spacing, broad side and end-fire array, N-element array: Uniform spacing, non uniform amplitude, array factor, binomial and Dolph Chebyshev array.

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Unit: V LF to SHF Antennas **(08)**

Beverage Antenna, Antenna towers, V, Inverted V and Rhombic antennas, Folded dipole, Yagi-Uda antenna, Loop antenna, Ferrite rod antenna, Log-periodic antennas, Horn, parabolic reflector, Helical antennas, Turnstile and Super Turnstile antennas, Microstrip antennas.

Text Books:

1. Mathew N O Sadiku, **"Elements of Electromagnetics"**, *Oxford University Press,* (3rd Edition), (2001).
2. C. A. Balanis, **"Antenna Theory: Analysis and Design"**, *John Wiley,* (3rd edition), (2011).
3. K. D. Prasad, **"Antenna and Wave Propagation"**, *Satya Prakashan,* (3rd edition), (1996).

Reference Books:

1. E. C. Jordon and E. G. Balmain, **"Electro-magnetic Waves and Radiation Systems"**, *Prentice Hall India,* (2nd Edition), (1993).
2. John D Kraus, **'"Antenna & Wave Propagation"**, *McGraw Hill,* (2nd Edition), (1988).

Online Resources:

1. http://nptel.ac.in/coursesa

PEEC 3202 DIGITAL IMAGE PROCESSING

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Basic concepts of image processing like relations between pixels, distance measures, statistical parameters, colour models and noise models and operations on images
2. Different image enhancement, segmentation, representation and classifier techniques
3. Image analysis in spatial and transform domain for image compression and filtering
4. Different applications of Image processing

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

1. Explain basic concepts of image processing, Compute distance measures and perform arithmetic, logical, geometric, set and spatial transformation operations on images
2. Apply spatial domain image enhancement, filtering and grey scale transformation techniques on image
3. Analyze, apply and explain image processing in frequency domain for image filtering and compression
4. Apply morphological image processing on an image and apply image representation and description techniques
5. Apply image representation and description techniques and explain image segmentation and classification
6. Select different image processing modules to develop an image processing application

Unit I : Digital Image Fundamentals **(08)**
Components of Image Processing System, Element of Visual Perception, Image sensing and acquisition, A Simple Image Model, Sampling and Quantization, Relationship between pixels and Distance Measures, Statistical parameters. Basic operations on images.

Unit II: Image Enhancement **(08)**
Image Enhancement in Spatial Domain, Basic Gray Level transformations, Histogram processing, Equalization, Local Enhancement, Basics of Spatial Filtering, Smoothing, Mean filter, Ordered Statistic Filter, Sharpening. Image Enhancement in Frequency Domain, Basics of Filtering in Frequency Domain Filters, Low pass, High pass, Correspondence between Filtering in Spatial and Frequency Domain, Homomorphic Filtering.

Unit III : Image Transforms and Colour Models **(08)**
Color Image Processing, Color Fundamentals, Color Models, Pseudo color Image processing, Converting Colors to different models.2-D Discrete Fourier Transform, Discrete Cosine Transform, Redundancies, Image Compression Model, Lossy and Lossless Predictive Coding, block diagram of JPEG

Unit IV: Image Segmentation, Representation and Classification **(10)**
Image analysis, Detection of discontinuities, edge linking and boundary detection,

thresholding, region based segmentation, image representation- chain codes, boundary representation by chain codes, Fourier descriptors, Shape number, Signatures.Types of classification algorithms, Minimum distance classifier, Correlation based classifier, Bayes classifier.

Unit V: Morphological Image Processing and Applications of Image processing (08)
Introduction to Logical Operations on Binary Images, Dilation and Erosion, Opening and Closing, Applications on image processing, remote sensing, fingerprint recognition, character recognition, face recognition, medical applications, CBIR etc

Text Books:

1. Rafael C. Gonzalez and Richard E. Woods, **"Digital Image Processing"**, *Pearson Education*, (2nd Edition), (2012).
2. S. Jayaraman, Esakkirajan, Veerakumar, **"Digital Image Processing"**, *McGraw Hill Education*, (1st Edition,), (2012).

Reference Books:

1. Anil K. Jain, **"Fundamentals of Digital Image Processing"**, *Prentice Hall*, (1st Edition), (1989).
2. Pratt W. K., **"Digital Image Processing"**, *John Wiley*, (2nd Edition), (2001).

PEEC 3202 ROBOTICS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain fundamentals of robotic system
2. Introduce kinematics, dynamics and control for robotics systems
3. Introduce trajectory planning for motion
4. Describe application of robots in automation

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

1. Explain and classify different components used in developing robotic system
2. Select sensors, actuators and grippers for developing robot.
3. Apply formulations to obtain kinematics, dynamics and trajectory planning of manipulator
4. Explain path planning program for robotic system
5. Develop robot for automation

Unit I: Introduction to Robotics **(06)**

Definition of robotics, components of Robot system-(manipulator, controller, sensors, power conversion unit etc.), Classification of robots based on co-ordinate systems, Robot Architecture, Degrees of freedom, links and joints, progressive advancements in robots, Present trends and future trends in robotics.

Unit II: Robotic Sensors, Actuators and End Effectors **(10)**

Classification of sensors, internal and external sensors, position, acceleration sensors, proximity, velocity sensors, force sensors, tactile sensor, camera and robot vision.
Overview of actuators: electric, pneumatic and hydraulic actuators,
Classification of end effectors, Different types of grippers: vacuum and other methods of gripping.

Unit III: Transforms and Kinematics **(08)**

Pose of rigid body, Position and orientation description, Coordinate transforms, Homogeneous transform, Denavit and Hartenberg (DH) parameters, forward and inverse kinematic analysis.

Unit IV: Dynamics and Trajectory **(08)**

Dynamics and inverse Dynamics of robots, link inertia tensor and manipulator inertia tensor, Newton – Eller formulation. Trajectory planning, joint space planning, Cartesian space planning and position and orientation trajectories.

Unit V: Programming methods **(04)**

Robot language classification, Robot language structure, elements and its functions. Simple programs on Sensing distance and direction, Line Following Algorithms, Feedback Systems Other topics on advance robotic techniques

Unit VI: Application of Robot in Automation **(06)**

Application in Manufacturing: Material Transfer, Material handling, loading and unloading processing, spot and continuous arc welding & spray painting, Assembly Inspection, Robot application in Medical, Industrial Automation, and Security

Text Books:

1. S.K. Saha, "Introduction to Robotics", Tata McGraw Hill, (2nd Edition), (2014).
2. R. K. Mittal, I. J. Nagrath, **"Robotics and Control"** , *Tata McGraw Hill, New Delhi "* , (1st Edition), (2003).
3. K.S. Fu, R.C .Gonzalez, C.S.G.Lee ,"**Robotics Control ,Sensing ,Vision and Intelligence"** , *Tata McGraw Hill* , (2nd Edition), (2008).

Reference Books:

1. Robert schilling, **"Fundaments of Robotics: Analysis and Control",** *PHI. New Delhi*, (1st Edition), (2003).
2. S. R. Deb, **"Robotics Technology and Flexible Automation",** S. Deb, Tata McGraw Hill, (1st Edition), (2010).
3. Robert J. Schilling, **"Fundamentals of Robotics- Analysis and Control",** Prentices Hall India, (1st Edition), (2008).

Online Resources:

1. https://nptel.ac.in/downloads/112101098/
2. https://nptel.ac.in/courses/112103174/module7/lec6/6.html

EC 3204 DIGITAL SIGNAL PROCESSING LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Oral: 25 Marks
Credits: 1

Course Objectives

1. To get familiar with the simulation software and build programming skills for simulating key Digital signal processing operations
2. To apply different sampling frequencies to verify sampling theorem
3. To compare the characteristics of LTI systems from pole-zero plot
4. To discuss frequency domain representation of discrete time signals
5. To verify digital filter design

Course Outcomes

After completion of the course, students will be able to

1. Select appropriate sampling frequency for the given signal to avoid aliasing
2. Simulate and verify the transform (ZT, DFT, FFT) techniques and filter design
3. Analyze LTI system characteristics- pole-zero plot, stability, causality
4. Interpret spectral representation of discrete time signals
5. Design and evaluate performance of digital filters

List of Experiments

1. To write a program to verify the sampling theorem and aliasing effects with various sampling frequencies.
2. To analyze LTI system using pole zero plot, study stability of different transfer functions.
3. To solve the difference equation and find the system response using Z transform.
4. To write a function to find DFT.
5. To write a program to verify DFT properties.
6. To compare the characteristics of different window functions.
7. To design FIR filter for the given specifications using windowing method and interpret the effect of different windows on FIR filter response.
8. To design Butterworth filter using Bilinear transformation method.
9. Design a digital filter to eliminate noise from real life signals, Example: speech or biomedical signals.

EC 3205 ADVANCED PROCESSORLAB

Teaching Scheme
Practical: 4 Hours / Week

Examination Scheme
Practical : 50 Marks
Credits: 2

Course Objectives:

1. Explain on chip peripherals of LPC 2148 processor
2. Interfacing real world input and output devices to LPC2148
3. Use of Operating system in embedded systems

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

1. Write assembly or C language program for LPC2148 on chip peripheral
2. Interface external peripherals to LPC2148 and write C code
3. Install OS on Raspberry pi

List of Experiments:

1. Using UART of LPC2148 for serial reception and transmission from/to computer.
2. Interfacing GSM with LPC2148 for sending and receiving message and voice call.
3. Interfacing GPS with LPC2148 for finding current location latitude and longitude values.
4. Interfacing LPC2148 with GLCD to display image on it.
5. Using built-in ADC of LPC2148 for displaying its values (Programming built-in ADC with interrupt and without interrupt) OR Programming of onchip ADC and displaying converted digital values.
6. Generate waveform using DAC of LPC2148.
7. Interfacing EEPROM to LPC2148 using I2C protocol.
8. Write Program for generating delays using timer/counter.
9. Installing OS in Raspberry Pi.
10. Write program in Raspberry pi to display 'hello world' and compile using GCC.

EC3206 MINI PROJECT AND SEMINAR

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Oral : 25 Marks
Credits: 1

Course Objectives:

1. Undertake and execute a Mini Project through a group of students
2. Explain the Product Development Cycle through Mini Project
3. Inculcate electronic hardware implementation skills by :
   a. PCB artwork design using an appropriate EDA tool
   b. Imbibing good soldering and effective trouble-shooting practices
   c. Knowing the significance of aesthetics and ergonomics while designing electronic product.
4. Identify the importance of technical documentation of mini project work

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

1. Select, plan and cost-estimation of the project
2. Design and simulate the project by using EDA tools
3. Test the project circuit for intended output on bread board or general purpose board
4. Develop the art work and layout of the circuit using PCB design software
5. Test the mini project for intended output
6. Compose a technical report and demonstrate the project

Guidelines:

1. Project group shall consist of not more than 3 students per group.
2. Project design ideas should be adopted from recent issues of electronic design magazines,
3. Application notes from well known component manufacturers may also be referred.
4. Hardware component is mandatory.
5. Layout versus schematic verification is mandatory.

Domains for projects may be from the following, but not limited to:

- Electronic Communication Systems
- Power Electronics
- Biomedical Electronics
- Audio , Video Systems
- Mechatronics Systems
- Embedded Systems
- Instrumentation and Control Systems

Note:

1. Microcontroller based projects should preferably use Microchip PIC controllers/ATmega controller/AVR microcontrollers.

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Reference books:

1. Meenakshi Raman, Sangeeta Sharma, " **Technical Communication, Principles and Practice",** *Oxford University Press,* (2nd Edition), (2012).
2. M. Ashraf Rizvi," **Effective Technical Communication",** *Tata McGraw Hill Education Pvt. Ltd.* (1st Edition), (2005).
3. C.Muralikrishna, Sunita Mishra," **Communication Skills for Engineers",** *Pearson Education India,* (2nd Edition), (2011)
4. Thomas C Hayes, Paul Horowitz, **"The Art of Electronics",** *Cambridge University Press,* (3rd Edition), (2015).
5. Jim Williams, **"Analog Circuit Design: Art, Science and Personalities",** *Elsevier EDN series for Design Engineers,* (1st Edition), (2013).

PEEC 3203 EMBEDDED SYSTEM AND RTOS LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
In Semester: 25Marks
Credits: 1

Course Objectives:

1. Interface real world input and output devices
2. Discuss use of µCOS-II RTOS functions in programming
3. Explain porting of Linux OS

Course Outcomes:
After completion of the course, students will be able to
1. Interface real world input and output devices
2. Apply RTOS concepts to external peripheral devices
3. Write C program using RTOS functions
4. Port Linux OS in embedded system

List of Experiments:
1. Port µCOS-II RTOS on ARM-7.
2. Multitasking in µCOS-II RTOS using min 4 tasks on ARM7
3. Semaphore as signaling and Synchronizing on ARM7.
4. Mailbox implementation for message passing on ARM7.
5. Implement MUTEX on ARM 7
6. Use OS service(s) to accept keyboard input and display/transmit
7. Building tool chain for embedded Linux and porting Kernel on ARM9 target board.
8. Write a program 'Hello world; using embedded Linux on ARM9.

PEEC 3203 ANTENNA AND WAVE PROPAGATION LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
In Semester: 25Marks
Credits: 1

Course Objectives:

1. To compare various antenna parameters for the different types of antennas
2. To analyze the nature of standing waves for different terminations
3. To design and simulate different antenna arrays

Course Outcomes:

After completion of the course, students will be able to

1. Measure and analyze antenna parameters
2. Explain the importance of impedance matching from the perspective of antenna design
3. Simulate and analyze the performance of antenna arrays
4. Design and analyze antenna arrays using antenna design software

List of Experiments:

1. To measure Radiation pattern, Half power beam width, directivity and Gain for Dipole Antenna.
2. To measure Radiation pattern, Half power beam width, directivity and Gain for Folded Dipole Antenna.
3. To measure Radiation pattern, Half power beam width, directivity and Gain for Yagi Antenna.
4. To measure Radiation pattern, Half power beam width, directivity and Gain for Parabolic Reflector Antenna.
5. To measure Radiation pattern, Half power beam width, directivity and Gain for Horn Antenna.
6. Plot and analyze standing wave pattern for open, short and matched termination.
7. Design Broadside Array using Antenna design software.
8. Design Yagi Antenna design using Antenna design software.
. Simulation of varying length Dipole Antenna.
11. Simulation for Broadside Linear Array and End Fire Linear Array.
12. Simulation for Binomial Array and Dolph Tschebyscheff Array.

PEEC 3203 DIGITAL IMAGE PROCESSING LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
In Semester: 25Marks
Credits: 1

Course Objectives:

1. Perform operations of Digital Image
2. Digital image enhancement and filtering techniques
3. Transform domain operations to achieve image compression and filtering
4. Image segmentation and representation techniques

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

1. Perform logical, set, arithmetic and geometric operations on images
2. Implement algorithms for image enhancement, filtering in spatial domain and transform domain
3. Develop an algorithm for image segmentation, compression and colour model conversions
4. Perform morphological operations on images

List of Experiments:

1. To read a BMP file and display its information using C.
2. To perform image segmentation using pseudo colouring using C.
3. To create a digital image and to perform basic operations on images.
4. To perform conversion between colour spaces.
5. To perform power law and gamma corrections.
6. To perform image filtering in spatial domain and frequency domain.
7. To perform image compression using DCT transform.
8. To perform edge detection using masks.
9. To apply morphological operators on an image.
10. Demonstration of installation of Open CV platform.
11. To perform digital image processing using Open CV and Python.

PEEC 3203 ROBOTIC LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
In Semester: 25Marks
Credits: 1

Course Objectives:

1. Demonstrate robot working and degree of freedom using physical components
2. Demonstrate robot functioning using simulation software
3. Design microcontroller based robotic system for specific task

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

1. Describe mechanical configuration of robot manipulation
2. Describe sensors and actuators used in robot manipulation
3. Apply concept to simulate to obtain work space, kinematics, and trajectory path of robot manipulator
4. Develop robots for specified task

List of Experiments:

1. Velocity and Position measurement using optical encoder.
2. Interface Pneumatic system component to actuate single acting and double acting cylinders.
3. Plot of work space of 2-link planer arm using simulation software.
4. Simulation of Forward Kinematics and Inverse Kinematic of
    1. 3-Link Robot
    2. PUMA 560 Robots.
5. Simulation of Trajectory path of :
    1. 3-Link Robot
    2. PUMA 560 Robots.
6. Design and implement Robotics system for any application..

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Autonomous Programme Structure of
Final Year B. Tech. (Electronics & Telecommunication)
Academic Year: 2019-2020 Onwards

Final Year B. Tech. Electronics and Telecommunication Engineering Semester – I										
Course Code	Course Title	Teaching Scheme			Examination Scheme				Marks	Credits
		Hours /Week								
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
EC 4101	VLSI Design	3	0	0	50	50	0	0	100	3
EC 4102	Computer Networks and Security	3	0	0	50	50	0	0	100	3
HS 4101	Management for Engineers	3	0	0	50	50	0	0	100	3
OE 4101	Open Elective-I	3	0	0	50	50	0	0	100	3
EC 4103	VLSI Design Lab	0	0	2	0	0	50	0	50	1
EC 4104	Project Phase-I	0	2	14	100	0	50	0	150	9
	Total	**12**	**2**	**16**	**300**	**200**	**100**	**0**	**600**	**22**
	Grand Total	**30**			**600**				**600**	**22**

OE 4101: Open Elective I

1. Television and Audio Engineering
2. Electronic Product Design
3. Digital Video Processing

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EC 4101 VLSI DESIGN

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To design combinational, sequential circuits using Verilog HDL
2. To describe behavioral and RTL modeling of digital circuits
3. To explain and compare Programmable Logic Devices
4. To introduce the concepts and techniques of digital CMOS design

Course Outcomes:

After completion of the course, students will be able to

1. Explain the fundamentals of Verilog HDL
2. Design digital systems using Verilog
3. Analyze the architecture of PLD's according to technology and application change
4. Analyze the impact of non ideal effects on MOSFETs
5. Design digital circuits using CMOS transistors

Unit I: Introduction to Verilog HDL **(08)**

Trends in HDL, Design Flow, Hierarchical Modeling Concepts, Modules and Ports, Instances, Lexical Conventions, Data Types, System Tasks and Compiler Directives.

Unit II: Verilog Constructs and Modeling Styles **(08)**

Continuous Assignments, Procedural Assignments, Operators in Verilog, Conditional Statements, Loop Statements, Task and Functions. Gate-Level Modeling, Gate Type, Gate Delay, Dataflow Modeling, Delays, Expressions, Operators, and Operands, Operator Types, Behavioral Modeling, Structured Procedures, Timing Controls, Sequential and Parallel Blocks, Generate Blocks.

Unit III: Modeling of Combinational and Sequential Logic **(12)**

Adder, ALU, Multiplexer, De-multiplexer, Decoders, Comparator, Parity Generator and Checker, Flip-flops, Counters, Shift registers, Memory, modeling of FSM.

Unit IV: Programmable Logic Devices **(06)**

CPLD Architecture, features, specifications and applications. FPGA Architecture, features, specifications and applications.

Unit V: Digital CMOS Circuits **(08)**

CMOS, MOSFET parasitics, Technology scaling, Channel length modulation, Body Effect, Latch Up effect, Hot electron effect, Velocity saturation, Power dissipations, CMOS Inverter, CMOS combinational logic design, Transmission gates, Layout Design Rules.

Text Books:

1. S. Palnitkar, **"Verilog HDL – A Guide to Digital Design and Synthesis"**, *Pearson*, (3rd Edition), (2010).
2. Neil H. E. Weste, David Money Harris, **"CMOS VLSI Design: A Circuit & System Perspective"**, *Pearson Publication* (4th Edition), (2010).

Reference Books:

1. J Bhaskar, **"A Verilog HDL Primer (3/e)"**, *Kluwer*, (3rd Edition), (2005).
2. Wyane Wolf, **"Modern VLSI Design (System on Chip)"**, *PHI Publication*, (3rd Edition), (2002).

Online Recourses:

1. https://onlinecourses.nptel.ac.in/noc18_cs48/

EC 4102 COMPUTER NETWORKS AND SECURITY

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Introduce network models and functions of each layer
2. Describe basic concepts of the threats for data and network
3. Introduce the fundamentals of cryptography and network security

Course Outcomes:

After completion of the course, students will be able to

1. Describe and analyze the functions of layers of OSI model and compare with the TCP/IP model
2. Explain and evaluate networking protocols, inter-networking devices and their functions
3. Explain the Quality of Service parameters for Internet applications
4. Describe the threats to the data and network and the techniques to resolve them

Unit I: Physical layer and Data Link layer **(07)**

Networks models: OSI model, Layers in OSI model, TCP / IP protocol suite, Addressing, Data Transfer: DSL, Cable TV Networks. Data link control: Framing, Flow Control (Stop and Wait and Sliding Window Protocols), error control (CRC), HDLC and PPP, Multiple access: Random access (Aloha, CSMA, CSMA/CD) protocols.

Unit II: Wired and Wireless LANS **(07)**

Wired LANS: Ethernet (IEEE 802.3), Ethernet standards (Ethernet, Fast Ethernet and Gigabit Ethernet) Wireless LANS: IEEE 802.11, Bluetooth IEEE 802.15, Connecting LANS, Connecting devices, Network emulation demonstration with NIC card and MAC address on Ubuntu platform.

Unit III: Network Layer **(08)**

Network layer functions, Logical addressing: IPv4, IPv6 addresses, IPv4 to IPv6 conversion unicast routing algorithms with the protocols (RIP, OSPF and BGP), Network layer Protocols: ARP, RARP, ICMP and IGMP, demonstration of Ipconfig/all, ping, tracert commands and analysis of IPv4, IPv6, ARP and ICMP protocols using wireshark.

Unit IV: Transport layer and Application Layer **(06)**

Process to Process Communication, addressing, Transport layer protocols: User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Stream Control Transport Protocol (SCTP), Quality of services (QoS): data flow characteristics, traffic shaping, Internet Applications and protocols, Domain Name System (DNS), E-mail, FTP, HTTP, demonstration of TCP, UDP, HTTP and DNS using wireshark.

Unit V: Data Security **(06)**

Security goals, Attacks and Defense strategies, Cryptography: Substitution cipher, DES, AES and RSA algorithms, Digital signatures, Authentication protocols: One-Way Authentication, Mutual Authentication, Dictionary Attacks, Centralized Authentication, Needham-Schroeder Protocol, Kerberos.

Unit VI: Network Security **(08)**

Network, transport and application layer security, Attacks: DoS and DDoS, Session High jacking and Spoofing, ARP Spoofing and Attacks on DNS, Viruses, Worms and Malware, Virus and Worm Features.

Text Books:

1. Behrouz A. Foruzan, **"Data communication and Networking"**, *Tata McGraw-Hill*, (5th Edition), (2013).
2. Andrew S. Tannenbaum, **"Computer Networks"**, *Pearson Education*, (4th Edition), (2003).
3. William Stallings **"Cryptography and Network Security Principles and Practice'"**, *Pearson Education* (7th Edition), (2017).
4. Leon-Garcia, Widjaja, **"Communication Networks"**, *Tata McGraw Hill*, (2nd Edition), (2004).

Reference Books:

1. Wayne Tomasi, **"Introduction to Data Communication and Networking"**, *Pearson Education*, (1st Edition), (2007).
2. James. F. Kurouse and W. Rouse, **"Computer Networking: A Top down Approach Featuring"**, *Pearson Education*, (3rd Edition), (2007).
3. William Stallings, **"Data and Computer Communication"**, *Pearson Education*, (8th Edition), (2000).
4. Greg Tomsho, Ed Tittel, David Johnson, **"Guide to Networking Essentials"**, Thomson *India Learning*, (5th Edition), (2007).

Online Recourses:

1. https://nptel.ac.in/courses/106105081/
2. https://nptel.ac.in/courses/106105031/
3. https://trai.gov.in/
4. https://www.itu.int/online/mm/scripts/gensel9?_ctryid=1000100560

HS 4101 MANAGEMENT FOR ENGINEERS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To develop understanding about the basics of management functions
2. To explain the concept of total quality management
3. To analyze cost and financial aspect of the business
4. To develop the strategic thinking and decision making abilities in the rapidly changing global business environment

Course Outcomes:

After completion of the course, students will be able to

1. Explain the principles and functions of management
2. Identify social responsibility and ethical issues involved in the Organization
3. Apply tools of quality management
4. Analyze the cost, financial aspects of business and the need of globalization

Unit I: Basics of Management **(08)**

Introduction, Definition of management, characteristics of management, functions of management: Planning, Organizing, Staffing, Directing, Co-ordination, Controlling, Motivating, Communication, Decision making.

Unit II: Organizational Environments and Cultures **(06)**

External environments, Internal environments, Ethics and social responsibility.

Unit III: Quality Management **(10)**

Definition of quality, continuous improvement definition of quality, types of quality, quality of design, conformance and performance, phases of quality management, Quality Management Assistance Tools: Ishikawa diagram, Pareto Analysis, Pokka Yoke (Mi stake Proofing), Quality circles, TQM, Kaizen, Five S (5S), Six sigma Quality Management, The ISO 9001:2015, Quality Management System Standard, Software quality management with respect to CMM level and ISO standard.

Unit IV: Cost and Financial Accounting **(10)**

Basic concepts of cost accounting, Classification and analysis of costs, Marginal costing, Break-even point, Cost Volume Profit analysis, key financial statements, financial analysis.

Unit V: Globalization **(06)**

Global trends and commerce, new opportunities offered by globalization, preparation for globalization, globalization drivers, implementation issues related to globalization, quality of global leadership.

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Text Books:

1. Stephen P. Robbins, Mary Coulter, **"Management",** *Prentice Hall of India,* (8th Edition), (2014).
2. Charles W.L Hill, Steven L McShane, **"Principles of Management",** *McGraw Hill Education, Special Indian Edition*, (2007).
3. M.Y Khan, P. K Jain, **"Financial Management"**, *McGraw Hill Education,* (8th Edition), (2018).

Reference Books:

1. Gail Freeman-Bell, James Balkwill, **"Management in Engineering",** *Prentice Hall of India*, (2nd Edition), (2005).
2. T. R. Banga, S.C. Sharma, **"Industrial organization and Engineering Economic",** *PHI Publication,* (25rd Edition), (2002).
3. M.C. Shukla, **"Business Organization and Management",** *PHI Publication,* (2rd Edition), (2002).
4. C. M. Chang, **"Engineering Management: meeting the Global Challenges",** Publisher: *CRC Press*, (2016).

OE 4101 TELEVISION AND AUDIO ENGINEERING

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To introduce the basic concepts and design of colour TV and Digital TV
2. To explain advanced TV technologies like HDTV, CATV, CCTV, DTH, CAS and case study for live telecast
3. To introduce multimedia compression standards
4. To familiarize the students with digital recording, playback systems, acoustic design, microphones and loudspeakers

Course Outcomes:

After completion of the course, students will be able to

1. Explain the concepts of colour TV design and Digital TV
2. Discuss and compare technologies like CATV, CCTV, DTH, colour TV systems, Wi-fi TV, 3D TV and different display technologies
3. Describe and analyze multimedia standards for text, audio, video and animation Techniques
4. Explain and compare optical recording, microphones, speakers and PA system
5. Design acoustics for classrooms, auditoriums and drama theatres

Unit I: Colour and Digital Television **(12)**

Resolution, interlaced scanning, BW, CVS, Color TV systems, frequency interleaving, colour difference signals, colour TV receiver, NTSC, PAL, SECAM encoders and decoders. Introduction to Digital TV, Digital TV signals and parameters, Digital TV Transmitters and receivers.

Unit II: Advanced TV systems **(10)**

HDTV standards and systems, HDTV transmitter and receiver, CCTV, CATV, direct to home TV, set top box, Conditional Access System (CAS), 3D TV systems, case study (Cricket match, Marathon, Football match), Wi-Fi TV, Video door phone systems, Display devices: LED, LCD and Plasma.

Unit III: Multimedia Compression **(10)**

Introduction to Multimedia techniques, Multimedia Applications, Hardware Software requirements, Multimedia building block, Steps of creating Multimedia, Text: Types, Compression, Hypertext, Image: JPEG, Multimedia, Audio: MIDI, MP3, Video: MPEG, Animation: Introduction, Background, uses, types, 3D animation, virtual reality.

Unit IV: Acoustics and Digital Audio/Video **(10)**

Optical recording, noise, CD, DVD, dual layer DVD, rewritable DVD, Blue Ray DVD, Studio acoustics and reverberation, acoustic chambers, PA system for auditorium, public meeting, debating hall, football stadium, college hall, advanced PA systems, different types of speakers and microphones.

Text Books:

1. R. R. Gulati, **"Modern Television Practice"**, *New Age International*, (5th Edition), (2015).
2. Ralf Steinmetz, Klara Nahrstedt, **"Multimedia: Computing, Communication and Applications"**, *Pearson Publication*,(8th Edition), (2011).
3. R.G. Gupta, **"Audio and Video Systems"**, *TMH Publication*, (2nd Edition), (2010).
4. Robert D. Finch, **"Introduction To Acoustics"**, *PHI*, (2nd Edition), (2007).

Reference Books:

1. A. M. Dhake, **"Television and Video Engineering"**, *McGraw-Hill*, (2nd Edition), (2003).
2. Ranjan Parekh, **"Principles of Multimedia"**, *Tata Mcgraw Hills*, (2nd Edition), (2013).
3. Alec Nisbett, **"The Sound Studio"**, (5th Edition), (1993).

Online Recourses:

1. https://nptel.ac.in/courses/106105082/38
2. https://en.wikipedia.org/wiki/Sound_reinforcement_system

OE 4101 ELECTRONIC PRODUCT DESIGN

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To explain the hardware and software stages of product design and development
2. To introduce different consideration of analog, digital and mixed circuit design
3. To explore methods and different tools used for PCB design
4. To describe the importance of testing in product design cycle
5. To explain the process and importance of documentation.

Course Outcomes:

After completion of the course, students will be able to

1. Interpret and relate various stages of Hardware, Software and PCB design
2. Apply special design consideration's for product development
3. Identify the test specification and test the product
4. Analyze and troubleshoot problem's in the product
5. Justify the importance of documentation in product development

Unit I: Introduction to product development **(06)**

Stages in Product Design, Five element of successful design, Reliability, Packaging and factors, Assembly and Disassembly, Wiring, Temperature, Vibration and Shock, Safety, Noise, Energy coupling, Grounding, Shielding.

Unit II: Hardware Design and Testing Methods **(08)**

Design Process, Identify the requirements, formulating specifications, Specification vs Requirements, System Partitioning, Functional design, Architectural design, Prototyping, Performance and efficiency measures, Egoless design, Black box test, white box test and Grey box test.

Unit III: Software Design and Testing Methods **(08)**

Types of software, Waterfall model of software development. Model, metrics and software limitations. Risk abatement and failure prevention, Software bugs and testing. Good programming practice, user Interface.

Unit IV: PCB Design **(08)**

Fundamental definitions and Standards, Routing topology configurations, Layer stack up assignment, Grounding Methodologies, Aspect Ratio, Image Plane, Critical frequencies, Bypass and decoupling.

Unit V: Product Debugging and Testing **(06)**

Steps for debugging, Techniques for troubleshooting, Characterization of Electromechanical, active, passive components and devices. Inspection and test of components. Simulation, Prototyping and testing, Integration, Validation and verification, EMI and EMC issues.

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Unit VI: Documentation **(06)**

Definition need and types of documentation, Record, Accountability and liability Preparation, presentation and preservation of documents. Methods of documentation, Visual techniques, Layout of documentation, Bill of material.

Text Books:

1. Kim Fowler, **"Electronic Instrument Design"**, *Oxford University Press,* (2015).
2. Robert J. Herrick, **"Printed Circuit board design Techniques for EMC Compliance"**, *IEEE Press*, (2nd Edition).

Reference Books:

1. James K. Peckol, **"Embedded Systems – A Contemporary Design Tool"**, *Wiley publication,* (1st Edition), (2008).
2. J C Whitakar, **"The Electronics Handbook"**, *CRC press.*

Online Recourses:

1. http://nptel.ac.in
2. www.ti.com

OE 4101 DIGITAL VIDEO PROCESSING

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To provide basic knowledge of Digital Video Processing concepts and its standards
2. To extend numerous concepts from still 2-D images to dynamic imagery 3-D images
3. To introduce new concepts unique to spatio-temporal data such as timeline, motion, tracking etc.

Course Outcomes:

After completion of the course, students will be able to

1. Analyze the importance of digital video standards over analog video standards
2. Explain the modeling of video image formation using projection theory
3. Compare the Block matching and Optical flow estimation algorithms
4. Compare different background subtraction techniques and tracking algorithms
5. Apply digital video processing concepts for development of the specific application

Unit I: Basics of Video **(06)**

Analog video signal and standards, Digital video signal and standards and need of digital video, sampling of video signals

Unit II: Time-Varying Image Formation Models **(08)**

Three dimensional motion models ,Rigid motion in the Cartesian Coordinates, Rigid motion in the Homogeneous Coordinates, Deformable motion, Geometric Image Formation, Perspective projection, Orthographic projection, Photometric Image Formation, Lambertian Reflectance model ,Photometric effects of 3-D motion

Unit III: 2D Motion Estimation Techniques **(12)**

2 D motion Correspondence and Optical Flow, 2-D Motion Estimation-The Occlusion Problem, Aperture Problem, 2-D Motion Field models methods using the Optical Flow Equation-The Optical Flow Equation, Second-Order differential methods, Block motion model, Horn and Schunck method, Estimation of the Gradients, Adaptive Methods. Generalized Block motion, Block matching Method, Motion estimation.

Unit IV: Background Subtraction techniques for moving object detection **(06)**

Frame differencing, Mean and Median filtering, Gaussian Mixture Model (GMM), Kernel density estimation.

Unit V: Motion Tracking **(04)**

Basic Principles, Motion Tracking using Optical flow, blob tracking, colour feature based mean shift, Kalman tracking.

Unit VI: Applications of Video Processing **(06)**

Video Surveillance, Object tracking, Video Watermarking etc.

Text Books:

1. A. Murat Tekalp, **"Digital Video Processing"**, *Prentice Hall*, (2nd Edition), (2015).

Reference Books:

1. Yao Wang, Jorn Ostermann, Ya-Qin Zhang, **"Video Processing and Communications"**, *Prentice Hall*, (2nd Edition), 2002
2. Alan C. Bovik, **"The Essential Guide to Video Processing"**, *Elsevier Science*, (2nd Edition), (2009).

Online Recourses:

1. Fundamentals of Digital Image and Video Processing - coursera

EC 4103 VLSI DESIGN LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Oral : 50 Marks
Credits: 1

Course Objectives:

1. To draw the layout of digital CMOS circuits using Microwind
2. To simulate, synthesize and implement combinational and sequential circuits using Verilog HDL on PLD

Course Outcomes:

After completion of the course, students will be able to

1. Draw and analyze the digital CMOS circuits layout
2. Design CMOS layout for any Boolean expression
3. Simulate digital circuits using Verilog and analyze its synthesis report
4. Implement digital circuits on PLD

List of Experiments:

A. To prepare CMOS layout in selected technology for:
   1. Inverter, NAND, NOR gates.
   2. Half Adder.
   3. 2:1 Multiplexer using transmission gates.
   4. Four variable Boolean expression.

B. To write, simulate , synthesize and implement Verilog code for:
   5. Mux and DeMux.
   6. Four bit ALU.
   7. 4 bit Up-Down Counter.
   8. Traffic light controller using FSM.

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EC4104 PROJECT PHASE I

Teaching Scheme
Tutorial: 02 Hours / Week
Practical: 14 Hours / Week

Examination Scheme
In Semester: 100 Marks
Oral: 50 Marks
Credits: 9

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

1. Identify a problem in a real-life application
2. Select an appropriate methodology to solve identified problem
3. Plan the stages for executing the project
4. Discuss and present methodology
5. Develop and test the modules

Guidelines:

A. **Approval of the Project Concept:** - The project should be done in a group. The Synopsis of Project's concept should be drafted and submitted for approval to the departmental committee, at the beginning of the academic year. Only after obtaining the approval, the students should start working on the Project.

B. **Guidance:** - One Guide will be assigned to each Project Group. In case of Industry-Sponsored Projects, one Guide is required to be assigned by the concerned Industry, in addition to the College Guide.

C. **Documentation of the Project-related work:** - A Log-book is required to be maintained by the students for the relevant technical documentation and logging of the tasks / activities.

D. **Reporting:** - The students should report to their Guide regularly and the Logbook should be checked and authenticated by the Guide.

E. **Expected Deliverables:**- System Design and its Simulations.

F. **Evaluation:** - A Report consisting of Literature Survey, Design Methodology etc., is required to be submitted prior to the evaluation process. The said report needs to be certified by the Guide and the department authority. The evaluation should be based on the presentation of Project's Concept and 50 percent completion of work. The said evaluation should be done by TWO EXAMINERS (Internal and External).

G. **Evaluation Criteria :** - Innovation, Depth of Understanding, Individual member's contribution, Presentation skills, Internal Guide's assessment for the work done during the semester and Report of the Project work as mentioned above.

Autonomous Programme Structure of
Final Year B. Tech. (Electronics & Telecommunication)
Academic Year: 2019-2020 Onwards

Final Year B. Tech. Electronics and Telecommunication Engineering Semester – II										
Course Code	Course Title	Teaching Scheme			Examination Scheme				Marks	Credits
		Hours /Week								
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
EC 4201	Broadband Communication Systems	3	0	0	50	50	0	0	100	3
PEEC4201	Programme Elective – I	3	0	0	50	50	0	0	100	3
OE 4201	Open Elective- II	3	0	0	50	50	0	0	100	3
EC 4202	Broadband Communication Systems Lab	0	0	2	0	0	50	0	50	1
EC 4203	Project Phase-II	0	2	16	100	0	50	0	150	10
EC 4204	Project based online course**	2	0	0	50	0	0	0	50	2
	Total	**11**	**2**	**18**	**300**	**150**	**100**	**0**	**550**	**22**
	Grand Total	**31**			**550**				**550**	**22**

****The student shall register and complete the project based online course preferably in semester- I but may complete the same till the end of semester-II**

PEEC 4201: Programme Elective I

1. Advanced DSP
2. Microwave and Radar Engineering
3. Mobile Communication

OE 4201: Open Elective II

1. Computer Vision
2. Automotive Electronics

EC 4201 BROADBAND COMMUNICATION SYSTEMS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To explain different components of Broadband communication system
2. To identify system design issues and the role of WDM components in advanced optical fiber communication system
3. To describe the basics of orbital mechanics and the look angles from ground stations to the satellite
4. To illustrate the satellite subsystems
5. To design Satellite Link for Up Link and Down Link

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

1. Estimate the losses and analyze the propagation characteristics of an optical signal in different types of fibers
2. Describe optical sources and detectors and determine their performance parameters
3. Calculate link power budget and rise time budget of optical link and describe WDM components
4. Describe satellite subsystems and compute orbital parameters for satellite
5. Design of satellite uplink and downlink

Unit I: Fiber optic communications system **(07)**
Electromagnetic Spectrum and Optical spectral bands, Key elements of fiber optic communications system, Ray theory of propagation: Fiber types, Transmission characteristics of optical fibers, Intra modal Dispersion, Intermodal dispersion.

Unit II: Optical Sources & Detectors **(06)**
Introduction to optical sources: Wavelength and Material Considerations, LEDs and semiconductor LASERs: principle of working and their Characteristics, Material Considerations, PN, P-I-N, Avalanche photodiodes and photo transistors: Principle of working and characteristics.

Unit III: Design considerations in optical links & WDM **(07)**
Point to point Links: System design considerations, Link Power budget, Rise Time budget, Analog Links: CNR, Multichannel transmission techniques, Overview of WDM, WDM Components: 2 x 2 Fiber Coupler, Optical Isolators and Circulators, Multiplexers and De-multiplexers, Fiber Bragg Grating, Diffraction Gratings, Overview of Optical Amplifiers: SOA, EDFA in brief.

Unit IV: Orbital Mechanics and Launchers **(07)**

History of Satellite Communication, Orbital Mechanics, Look angle determination, Orbital perturbations, Orbital determination, Launchers and Launch Vehicles, Orbital effects in Communication system performance.

Unit V: Satellites subsystems **(06)**

Satellite Subsystems, Attitude and control systems (AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystems, Satellite antennas, Equipment Reliability and space qualification.

Unit VI: Satellite Communication Link Design **(07)**

Introduction, Basic transmission Theory, System Noise Temperature and G/T Ratio, Design of Downlinks, Satellite Systems using Small Earth Stations, Uplink Design, Design of Specified C/N: Combining C/N and C/I values in Satellite Links, System Design Examples.

Text Books:

1. Gerd Keiser, **"Optical Fiber Communications"**, *Tata McGraw Hill,* (5th Edition), (2013).
2. John M. Senior, **"Optical Fiber Communications: Principles and Practice"**, *PHI,* (3nd Edition), (2008).
3. Timothy Pratt, Charles Bostian, Jeremy Allnutt "**Satellite Communications**", *John Wiley &Sons*, (3rd Edition), (2002).

Reference Books:

1. Djafar K. Mynbaev and Lowell L. Scheiner, **"Fiber Optic Communications Technology"**, *Pearson Education*, (1st Edition), (2000).
2. Govind P. Agrawal, **"Fiber Optic Communication Systems"**, *Wiley India,* (3rd Edition), (2002).
3. Dennis Roddy, "**Satellite Communications**", McGraw Hill, (4th Edition), (2017).

Online Recourses:

1. https://onlinecourses.nptel.ac.in/noc18_ee28

PEEC 4201 ADVANCED DIGITAL SIGNAL PROCESSING

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. Explain concepts of Multi-rate signal processing and its applications
2. Explain linear prediction and optimum filter design and its necessity
3. Introduce adaptive filters and their applications
4. Discuss Power Spectral Estimation methods
5. Explain necessity of time-frequency analysis

Course Outcomes:

After completion of the course, students will be able to-

1. Apply concepts of Multi-rate signal processing to design and realize multi-rate filters
2. Explain the necessity of adaptive filters and make use of adaptive algorithms to design adaptive filters
3. Classify and compare spectral estimation methods, analyze their performance
4. Apply linear prediction and Levinson-Durbin algorithm to compute and optimize filter coefficients
5. Apply STFT and WT transform techniques on the signals and interpret their spectra
6. Explain the applications of advanced digital signal processing techniques

Unit I: Multi-rate Digital Signal Processing **(09)**

Introduction to Multi-rate Digital Signal Processing, Decimation by integer factors, Interpolation by integer factors, Sampling rate conversion by a rational factor I/D, Multistage multi-rate implementation of sampling rate conversion, Poly-phase filter structure, Applications of Multi-rate Signal Processing.

Unit II: Linear Prediction and Optimum filter **(09)**

Overview of random process, Innovation Representation of a stationary random Process, power spectra as rational function, AR, MA, ARMA Processes, relation between autocorrelation and filter coefficients, Yule-Walker equations, forward and backward Linear Prediction, Lattice Filter, Solution of normal equation using Levinson-Durbin Algorithm.

Unit III: Adaptive filter **(08)**

Wiener filter, FIR Wiener filter, Basic Concepts of Adaptive filter as a Noise Canceller, Other configurations of the adaptive filter, components of the adaptive filter, LMS adaptive algorithm, Practical limitations of the LMS algorithm, Applications of adaptive filters.

Unit IV: Power Spectrum Estimation **(07)**

Energy Spectral Density, Power Spectral Density, Periodogram, DFT as power spectra estimator, Power spectrum estimation by parametric and non-parametric Methods: Bartlett and Welch methods.

Unit V: Time-Frequency Analysis **(09)**

Time Frequency description of signals, Uncertainty principle, Need for joint time-frequency representation, Tiling diagrams, Short Time Fourier Transform, Wigner Ville distribution,

Continuous Wavelet Transform, Discretization of STFT and CWT, Spectrograms and Scalograms, Discrete Wavelet Transform and its relation to multi-rate filter banks.

Text Books:

1. Emmanuel C. Ifeachor, Barrie W. Jervis, "**Digital Signal Processing-A Practical Approach**", *Pearson Education*, (2nd Edition), (2007).
2. J. G. Proakis, "**Digital Signal Processing, Principles, Algorithms and Applications**", *Pearson Education*, (4th Edition), (2007).
3. K. P. Soman, K. I. Ramchandran, N. G. Reshmi, "**Insight into Wavelets- from theory to Practice**", *PHI Learning Private Limited*, (3rd Edition), (2010).

Reference Books:

1. Monson Hayes, "**Statistical Digital Signal Processing and Modeling**", *John Wiley and Sons*, (1st Edition), (2008).
2. Leon Cohen, "**Time-Frequency Analysis**", *Prentice Hall*, (1995).

Online Recourses:

1. https://nptel.ac.in/courses/117101001/

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PEEC 4201 MICROWAVE AND RADAR ENGINEERING

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To introduce the basics of waveguides and various microwave components
2. To analyze microwave components using scattering parameters
3. To explore various microwave measurement techniques
4. To explain different types of Radars and its applications

Course Outcomes:

After completion of the course, students will be able to

1. Discuss the advantages and applications of microwaves
2. Analyze different modes of propagation in waveguides
3. Derive and analyze S parameters for different microwave components
4. Compare performance of different microwave tubes
5. Analyze and measure parameters at microwave frequencies
6. Discuss the principle of Radar and compare different types of Radars

Unit I: Microwave Transmission Lines **(07)**

Introduction of Microwaves and their applications, Rectangular waveguides, Solution of Wave equation in TE and TM modes, Power transmission and Power losses, Planar transmission lines.

Unit II: Wave Guide Components **(07)**

Scattering matrix representation of networks, Rectangular cavity resonator, Waveguide Tees, Directional couplers, Faraday rotation principle, Circulators and isolators.

Unit III: Microwave Tubes **(08)**

Introduction to conventional vacuum tubes, High frequency limitations of conventional tubes, Klystron tubes, Magnetron, TWT and their applications.

Unit IV: Microwave Measurements **(06)**

Introduction to microwave measurements, measurement methods of parameters such as frequency, power, attenuation, phase shift, VSWR, impedance, insertion loss, Q of a cavity resonator.

Unit V: Radar Fundamentals **(06)**

Radar block diagram and operation, radar range equation, prediction of range performance, minimum detectable signal, radar cross section of targets, Pulse repetition frequency and range ambiguities.

Unit VI: Types of Radar and Applications **(06)**

Doppler effect, CW radar, basic principle and operation of FMCW radar, MTI and Pulse Doppler Radar.

Text Books:

1. S.Y. Liao, **"Microwave Devices and Circuits"**, *Prentice Hall India,* (2nd Edition), (2014).
2. M. Kulkarni, **"Microwave and Radar Engineering"**, *Umesh Publications,* (4th Edition), (2013).
3. M. I. Skolnik, **"Introduction to Radar Systems"**, *McGraw Hill,(3rd* Edition), (2008).

Reference Books:

1. David M. Pozar, **"Microwave Engineering"**, *John Willey and Sons,* (5th Edition), (2014).
2. Nadow Levanon, **"Radar Principals"**, *John Wiley and Sons,* (5th Edition), (1989).

Online Recourses:

1. https://nptel.ac.in/courses/108101112/
2. https://nptel.ac.in/courses/117105130/

PEEC 4201 MOBILE COMMUNICATION

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To introduce the fundamentals of cellular system design and the techniques used to maximize the capacity of cellular network
2. To describe the basics of multi-path fading and various parameters used to characterize small scale fading
3. To explain various multiple access techniques
4. To explore the architecture and call processing of GSM and CDMA system

Course Outcomes:

After completion of the course, students will be able to

1. Explain the basics and design challenges of cellular networks
2. Analyze signal propagation issues and their impact on the communication system performance
3. Compare and determine capacity of different multiple access techniques
4. Describe the architecture, operation and call processing of GSM system
5. Describe CDMA system and analyze it's design parameters

Unit I: Cellular Fundamentals **(10)**

Introduction to wireless Communication Systems, Evolution in cellular standards, Cellular concepts, Introduction, Frequency reuse, Channel assignment, Handoff, Interference and System capacity, Trunking and Grade of service, Improving coverage and capacity.

Unit II: Mobile Radio Propagation **(10)**

Propagation Mechanism, Free space loss, Reflection, Diffraction, Scattering, Fading and Multipath, Small scale multipath propagation, Impulse response model of multipath channel, Parameters of mobile multipath channels, Types of small scale fading, Equalization techniques.

Unit III: Coding and Multiple Access Techniques for Wireless Communications **(06)**

Vocoders, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec, Multiple Accesses techniques, FDMA, TDMA, FHMA, CDMA, SDMA, OFDM.

Unit IV: Global System for Mobile Communications (GSM) **(07)**

Evolution of Mobile standards, System Overview, The air interface, Logical and Physical channels, Synchronization, GMSK modulation, Call establishment, Handover.

Unit V: CDMA **(07)**

System overview, Air interface, Coding, Spreading and modulation, Logical and physical channels, Handover, Comparison of WCDMA and CDMA 2000, Overview of LTE, Introduction to 5G, Comparison between 4G and 5G.

Text Books:

1. Theodore S Rappaport, **"Wireless Communications Principles and Practice"**, *Pearson Education*, (2nd Edition), (2014).
2. Andreas F Molisch, **"Wireless Communications"**, *Wiley India*, (2nd Edition), (2013).

Reference Books:

1. Vijay K Garg, Joseph E Wilkes, **"Principles and Applications of GSM"**, *Pearson Education* , (5th Edition), (2014).
2. *Vijay K Garg, Joseph E Wilkes,* **"IS-95CDMA and CDMA 2000 Cellular/PCS Systems Implementation"**, *Pearson Education*, (5th Edition), (2014).
3. R. Blake, **"Wireless Communication Technology"**, *Thomson Delmar*, (1st Edition), (2015).
4. W.C.Y. Lee, **"Mobile Communications Engineering: Theory and applications"**, *McGraw-Hill International*, (2nd Edition), (2015).

Online Recourses:

1. https://onlinecourses.nptel.ac.in/noc18_ee29/

OE 4201 COMPUTER VISION

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50Marks
Credits: 3

Course Objectives:

1. To explain the mapping from 3D world to 2D world
2. To describe hands on Camera calibration techniques and basics of stereo imaging
3. To describe the concepts of feature analysis and extraction techniques such as Corner detector, Scale Invariant Feature Transform
4. To introduce the concepts of machine learning

Course Outcomes:

After completion of the course, students will be able to

1. Analyze the image formation and working of camera as an image sensor
2. Analyze the procedure of camera calibration
3. Analyze the importance of stereo imaging
4. Compare different feature detectors and descriptors techniques
5. Apply machine learning algorithms for computer vision applications
6. Apply computer vision concepts for development of the specific application

Unit I: Camera Calibration and Stereo Imaging **(12)**

Camera calibration: pin hole, thin lens equations, FOV, DOF, CCD and COM sensor, camera parameters, camera calibration Stereo imaging: epipolar geometry, rectification, correspondence, triangulation, RANSAC algorithm, Dynamic programming.

Unit II: Feature Detection and Descriptors **(08)**

Corner detector, Edge Detector, Histogram of Gradient, Scale Invariant Feature Transform.

Unit III: Introduction to Machine Learning for Computer Vision **(13)**

Supervised and Non supervised learning, KNN, Machine learning framework, Classifiers, Neural network: Perceptron, multilayer network, back propagation, introduction to deep neural network, CNN.

Unit IV: Applications **(07)**

Non-visible-light Imagery: Infrared imaging applications, Applications of computer vision: Image mosaiking, Pedestrian classification, Image in painting.

Text Books:

1. M. Shah, **"Fundamentals of Computer Vision"**, *Online book*, (1997).
2. D. A. Forsyth, J. Ponce, **"Computer Vision, A Modern Approach"**, *Prentice Hall*, (2nd Edition), (2003).
3. R. Szeliski, **"Computer vision algorithms and applications"**, *Springer-Verlag*, (2nd Edition), (2010).
4. Tom Mitchell, **"Machine Learning.. First Edition"**, *McGraw- Hill*, (1st Edition), (2017).

Reference Books:

1. L. G. Shapiro, George C. Stockman, **"Computer Vision"**, *Prentice Hall*, (1st Edition), (2001).
2. E. Trucco, A. Verri, **"Introductory Techniques for 3-D Computer Vision"**, *Prentice Hall*, (1st Edition), (1998).
3. D. H. Ballard, C. M. Brown, **"Computer Vision"**, Prentice Hall, (1st Edition), (1982).
4. M. Sonka, V. Hlavac, R. Boyle, **"Image Processing, Analysis, and Machine Vision"**, *Thomson Press*, (3rd Edition), (2011).

OE 4201 AUTOMOTIVE ELECTRONICS

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

1. To explain the operation of basic Automotive system components
2. To explain various sensors and their interfacing in Automotive applications
3. To describe the system view of various Automotive Control and Communication systems
4. To introduce the diagnostic methodologies and safety aspects in Automotive system

Course Outcomes:

After completion of the course, students will be able to

1. Explain the functioning of automotive system components and compare I. C. Engines
2. Discuss the working principle of sensors and their use in automotive applications
3. Discuss the role of automotive control systems to improve the fuel efficiency and emission quality
4. Explain diagnostic tools and their operation
5. Discuss the safety norms, standards and safety systems in modern automobiles

Unit I: Fundamentals of Automotive Systems **(10)**

Overview of Automotive System, System Components, Basics of Petrol, Diesel and Gas Engines, Evolution of Electronics in Automotive, Engine configuration and its associated components, Ignition system, Drive Train, Suspension system, Braking system, Steering system, Fuel Delivery system, Alternator and battery charging circuit, Alternative fuels, Overview of Hybrid vehicle, Introduction to autonomous Car.

Unit II: Automotive Sensors, Actuators, Control systems **(10)**

Systems approach to Control and Instrumentation : Concept of a system, Analog and Digital system, Basic Measurement system, Analog and Digital Signal Processing, Sensor characteristics, In-vehicle Sensors :Air flow sensing, Crankshaft Angular Position sensing, Throttle angle sensing, Temperature sensing, EGO sensor, Vibration sensing (in Air Bags) , Actuators : Fuel injector, EGR actuator, Ignition system, VVT, BLDC motor, Electronic Engine Control, Engine Management System strategies and Methods of improving engine performance and efficiency.

Unit III: Microcontrollers / Microprocessors in Automotive domain **(08)**

Critical review of Microcontroller/Microprocessor, Architecture of 8-bit/16-bit Microcontrollers with emphasis on Ports, Timers / Counters, Interrupts, Watchdog Timer, PWM, Criteria to choose the appropriate microcontroller for automotive applications, Automotive grade processors.

Unit IV: Automotive Communication Protocols **(06)**

Overview of Automotive Communication Protocols, CAN, LIN, FLEXRAY, MOST, Communication Interface with ECUs, Interfacing techniques and interfacing with infotainment gadgets, Applications of telematics in automotive domain - GPS and GPRS.

Unit V: Safety systems in Automobiles and Diagnostics **(08)**

Active Safety Systems-- Anti-lock Braking System, Traction Control System, Electronic Stability Program, Passive Safety systems – Airbag System, Advanced Driver Assistance System (ADAS), Fundamentals of Diagnostics, Self Diagnostic System, On-Board Diagnostics and Off-Board Diagnostics.

Text Books:

1. Williams. B. Ribbens, **"Understanding Automotive Electronics"**, *Elsevier Science, Newnes Publication, (6th Edition), (2003).*
2. Robert Bosch, **"Automotive Electronics Handbook",** *John Wiley and Sons,* (2004).

Reference Books:

1. Ronald K Jurgen, **"Automotive Electronics Handbook"**, *McGraw-Hill,* (2nd Edition), (1999).
2. James D Halderman, **"Automotive Electricity and Electronics"**, *PHI Publication* (2005).
3. Tom Denton, **"Automobile Electrical & Electronic Systems",** *Routledge*,(4th Edition).
4. Jack Erjavec, **"A Systems Approach to Automotive Technology",** *Cengage Learning.*
5. V.A.W.Hillier, **"Fundamentals of Automotive Electronics ",** *Nelson Thornes.*
6. Tom Denton, **"Advanced Automotive Diagnosis",** *Elsevier,* (2nd Edition), (2006).

Online Recourses:

1. https://nptel.ac.in/downloads/108103009/
2. http://www.ignou.ac.in/upload/Unit-3-61.pdf

EC 4202 BROADBAND COMMUNICATION SYSTEMS LAB

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
Oral : 50 Marks
Credits: 1

Course Objectives:

1. Interpret performance parameter of optical fiber
2. Describe characteristics of optical sources& detectors
3. To design optical fiber communication link
4. To understand satellite communication link

Course Outcomes:

After completion of the course, students will be able to

1. Compute parameters of optical fiber like NA ,attenuation and bending losses
2. Illustrate characteristics of optical sources& detectors
3. Calculate link power budget and rise time budget of optical link
4. Demonstrate satellite communication link

List of Experiments:

1. To measure numerical aperture of optical fiber
2. To determine attenuation and bending loss of optical fiber
3. To Plot VI characteristics of LED used in optical fiber communication
4. Compare performance of APD for different load resistor and biasing voltage
5. Tutorial on Power budget and time budget analysis of optical fiber system
6. Establish a direct communication link between Transmitter and Receiver for tone signal.
7. To establish satellite link between Transmitter and Receiver for audio-video signal.
8. Tutorial on satellite link design

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EC 4203 PROJECT PHASE II

Teaching Scheme
Tutorial: 02 Hours/Week
Practical: 16 Hours / Week

Examination Scheme
In Semester: 100 Marks
Oral: 50 Marks
Credits: 10

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

1. Build and Test the hardware and/or software modules
2. Achieve the intended outcome through a systematic work plan
3. Draft the report and present the outcome of project
4. Demonstrate the working project and analyze the process to achieve the results

Guidelines:

A. Verification of the technical design using simulation tools and other appropriate methods. The verification results should be documented in the Logbook and authenticated by the respective guide. Weekly attendance should be logged in with the respective guide and will be monitored.

B. Assembly of the system by taking into account the appropriate design considerations.

C. Testing of the assembled system and validation of the objective proposed in the Project's Synopsis. The validation results should be documented in the Logbook and authenticated by the respective guide.

D. A report mentioning the project work done during the entire academic year, is required to be submitted. The said report should be certified by the respective guide and the college Authority. The same should be presented during the exam.

E. The working of the Project's set-up should be demonstrated during the exam. The exam should be conducted by TWO Examiners (Internal and External).

EC 4204 PROJECT BASED ONLINE COURSE

Teaching Scheme
Tutorial: 02 Hours/Week

Examination Scheme
In Semester: 50 Marks
Credits: 02

Course Objective:
To obtain the domain knowledge as required for the completion of the project

Course Outcome:
1. Explain the basics concepts as required to complete the project
2. Apply domain knowledge to implement the project

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