Course Description

1st Semester

Title: Engineering Mathematics **Code: MA101**

L-T-P scheme: 3-1-0 **Credits: 4**

Prerequisite: Students should have basic knowledge of Algebra and calculus.

Objective: This course is aimed:

1. To introduce the calculus of functions of two variables and applicability of derivatives and integrals of vector functions to Analytical geometry and physical problems.
2. To make students aware of the basic mathematical concepts and methods which will help them in learning courses in engineering and Technology.

Learning Outcomes:

Course Outcome	Description
CO1	Understand the rank, eigen values, eigen vectors, diagonalization of matrix; compute inverse of matrix by Caley-Hamilton theorem.
CO2	Recognize consistent and inconsistent systems of linear equations by the row echelon form of the augmented matrix, and solve it by Gauss elimination method.
CO3	Interpret derivatives and integrals of multivariable functions geometrically and physically; implement multivariable calculus tools in engineering, science, optimization, and understand the architecture of surfaces in plane and space etc.
CO4	Know about piecewise continuous functions, Laplace transforms and its properties; use of Laplace transform and inverse transform for solving initial value problems.
CO5	Realize importance of line, surface and volume integrals, Gauss and Stokes theorems and apply the concepts of vector calculus in real life problems.
CO6	Formulate mathematical models in the form of ordinary differential equations and learn various techniques of getting solutions of linear differential equations of second order.

Course Contents:

Unit 1: Algebra of matrices, Determinants, Rank, Gauss elimination method, Eigen values and vectors. Quadratic forms.

Unit 2: Partial differentiation. Taylor's series. Maxima and minima. Jacobians**,** Double integrals,

Unit 3: Differential Equations with constants coefficients.

Unit 4: Gradient, divergence and curl. Line and surface integrals, Normal and tangent to a surface. Gauss and Stokes theorems, Equations to a line, plane, curve and surfaces.

Unit 5: Laplace transforms.

Methodology:

The course will be covered through lectures supported by tutorials. There shall be 3 Lectures per week where the teacher will explain the theory, give some examples supporting the theory and its applications. About 12 Tutorial Sheets covering whole of the syllabus shall be given. Difficulties and doubts shall be cleared in tutorials. Apart from the discussions on the topics covered in the lectures, assignments/ quizzes in the form of questions will also be given.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Syllabus covered upto Test-1
Test-2	25 Marks	Syllabus covered upto Test-2
Test-3	35 Marks	Full Syllabus
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:

Tutorials, lecture slides and books on mathematics-1 will be available on the JUET server.

Text Books:

1. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley Publishers.
2. Lipshuts, S., Lipsom M.: Linear Algebra, 3rd Ed, Schaum series 2001.
3. B. V. Raman: Higher Engineering Mathematics, McGraw-Hill Publishers.
4. R.K. Jain, S.R.K. Iyenger: Advanced Engineering Mathematics, Narosa Publishing House, New Delhi.
5. Thomas, G.B., Finney, R.L.: Calculus and Analytical Geometry, 9th Ed., Addison Wesley,1996.
6. Grewal, B.S.: Higher Engineering Mathematics, Khanna Publishers Delhi.

Title: Physics-I **Code: PH101**

L-T-P Scheme: 3-1-0 **Credits: 4**

Objective:
Broadly, the study of Physics improves one's ability to think logically about the problems of science and technology and obtain their solutions. The present course is aimed to offer a broad aspect of those areas of Physics which are specifically required as an essential background to all engineering students for their studies in higher semesters. The course intends to impart sufficient scientific understanding of different phenomena associated with Special relativity, Modern Physics, Statistical physics, atomic physics, and lasers.

Course Outcomes:

Course Outcome	Description
CO1	Describe the limitations of Newton's laws and explain when special relativity become evant, Learn to Apply the principles of Special Relativity to an extended range of problems s olving particle kinematics
CO2	Demonstrate the ability to explain the concepts related to the consequences of Special Relativity, the nature of space-time and related dynamic observables
CO3	Acquired a profound understanding of inadequacy of classical mechanics regarding phenomena related to microscopic level, become well versed with the experimental developments, historical account and importance of probabilistic interpretation
CO4	Understand the basic quantum mechanical ideas and relevant mathematical framework, approach the solution of one-dimensional time independent Schrodinger equation
CO5	Appreciate the importance of applying statistical ideas to explore thermodynamic variables, developed ability to identify and apply appropriate statistical method for describing the assembly of microscopic particles, comprehend basic properties and working of Laser systems

Course Contents:
Unit-I (Theory of Special Relativity): Frames of reference, Galilean transformation, Michelson Morley Experiment, Postulates of special theory of relativity, time dilation and length contraction, twin paradox, Lorentz transformations, addition of velocities, Relativistic Doppler effect, Mass variation with velocity, Mass-energy relation.

Unit-II (Introduction to Modern Physics):
Quantization of Radiation, Black body radiation, Rayleigh-Jeans law, Planck's law of radiation Wien's law, Stefan's law, Photoelectric effect Compton scattering, Atomic spectra, Bohr model of hydrogen atom, Frank hertz experiment, Matter waves, de Broglie hypothesis, Davisson Germer experiment

Unit III Quantum Mechanics
Wave packets, phase and group velocity, Heisenberg's uncertainty principle, Schrödinger wave equation and its applications to the free particle in a box, potential barrier and Harmonic oscillator

Unit-IV (Statistical Mechanics): Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac distributions and their applications.

Unit- V Laser Physics & Applications

Fundamental ideas of stimulated and spontaneous emission, Einstein's coefficients, Principle and working of laser, Different types of lasers (He-Ne Laser, Ruby Laser, Semiconductor Laser), Applications of Lasers

Text Books and References:

1. A. Beiser, Perspectives of Modern Physics, Tata McGraw Hill.
2. J R Taylor, C D Zafiratos, M A Dubson, Modern Physics for Scientist &
1. Engineers, Pearson Education.
2. K Krane, Modern Physics, Wiley India
3. J Bernstein, P M Fishbane, S. Gasiorowicz, Modern Physics, Pearson
4. Education.
5. B. B. Laud, Laser and Non-Linear Optics, New Age International (P) Ltd.
6. R. Resnick, Relativity, New Age.

Title: English **Code: HS101**

L-T-P scheme: 2-0-1 **Credit: 3**

Prerequisite: None

Objective:

1. To enable understanding of basics of communication in Business environment.
2. To provide insight into structural aspect of communication in business.
3. To impart knowledge about communication theory and develop skills in oral and non-verbal communication.
4. To improve skills as critical readers, thinkers, listener and writer.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the basic concept of verbal/ nonverbal skills to understand the role of effective communication in personal & professional success.
CO2	Describe drawbacks in listening patterns and apply listening techniques for specific needs.
CO3	Develop the understanding to analyze, interpret and effectively summarize a variety of textual content
CO4	Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus.
CO5	Create effective presentations
CO6	Create professional and technical documents that are clear and adhering to all the necessary convention.

Course Content:

Unit-1: Concept and Nature of Communication: Definition of Communication, Process & Stages of Communication, Barriers to Communication, Channels of Communication.

Unit-2: Listening Skills: The listening process**,** Importance of listening, Purpose and types of listening**,** Hearing and listening, listening with a purpose, Barriers to listening.

Unit-3: Speaking/Oral Skills: Importance of acquiring oral skills, Visual aids, Body Language, Delivery, Pronunciation, Use of connectives Organization of matter: Metadiscourse features, Textual organization, 7 C'S of effective communication, improving vocabulary by learning Root words in English, some foreign words, Reading comprehension, Some important synonyms and antonyms, commonly confused words, Etiquettes & grooming.

Unit-4: Reading Skills: Skimming and Scanning, Intensive and extensive reading, SQ3R Technique

Unit-5: Writing Skills: Business letters, Memo, Circulars, Notices, Report writing, resume writing, Agenda & Minutes writing, Tips on clear writing Translation- Hindi to English, Translation -English to Hindi.

Unit-6: Introduction to Modern Communication Media: Technology based communication tools, Committee types, Advantages, Conferences, Audio-video conferencing, Barriers and overcoming negative impact.

Unit-7: Public Speaking and Interviewing Strategies: Speech Preparation, Theory of group discussion, Participation in Group discussion, Oral presentation, Power point presentation, Tips for successful job interview, Do's and don'ts while appearing for interview, Mock interview, Some interview questions, Telephonic interview tips, Resume writing

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1 & Unit-2
Test-2	25 Marks	Based on Unit-3, & Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-5 to Unit-7 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Teaching Methodology:

The course will be taught with the aid of lectures, handouts, case studies, Task-based language learning, and comprehensive language learning through language lab.

Learning Resources:
Lecture slides and e-books on ENGLISH (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. K.K. Sinha- Business Communication (Galgotia Publications)

Reference Books:

1. R.C. Bhatia- Business Communication (Ane Books Pvt. Ltd.)
2. P.D. Chaturvedi – Business Communication (Pearson Education, 1st Edition 2006).
3. Lesikar RV & Pettit Jr. JD – Basic Business Communication: Theory & Application (Tata Mc Graw Hill, 10th Edition)
4. Wren & Martin, High School English Grammar & Composition – S. Chand & Co. Delhi.
5. Raman Meenakshi & Sharma Sangeeta, Technical Communication-Principles & Practice –O.U.P. New Delhi. 2007.
6. Mitra Barum K., Effective Technical Communication – O.U.P. New Delhi. 2006.
7. Better Your English- a Workbook for 1st year Students- Macmillan India, New Delhi.
8. Raymond Murphy,' Essential English Grammar', Cambridge University Press.

Title: Computer Programming **Code: CS101**

L-T-P scheme: 3-1-0 **Credit: 4**

Prerequisite: There is no prerequisite in this course; however, students having any prior experience of programming are desirable.

Objective:

1. To provide exposure to problem-solving through programming.
2. To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.

Learning Outcomes:

Course Outcome	Description
CO1	Makes students gain a broad perspective about the uses of computers in engineering industry.
CO2	Develops basic understanding of computers, the concept of algorithm and algorithmic thinking.
CO3	Develops the ability to analyze a problem, develop an algorithm to solve it.
CO4	Develops the use of the C programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general.
CO5	Introduces the more advanced features of the C language

Course Content:

Unit-1: Introduction to Programming: Basic computer organization, operating system, editor, compiler, interpreter, loader, linker, program development. Variable naming, basic function naming, indentation, usage and significance of comments for readability and program maintainability. Types of errors, debugging, tracing/stepwise execution of program, watching variables values in memory. Constants, Variables and data Types Character Set, C tokens, Keywords and Identifiers, Constants, Variables, Data types, Declaration of Variables, assigning values to variables, typedef, and defining symbolic constants. printf & scanf function.

Unit-2: Operators and Expression: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Special Operators, Evaluation of expressions, Precedence of arithmetic operators, Type conversions in expressions, Operator precedence and associativity.
Management Input and Output Operators: Introduction, reading a character, writing a character, formatted input, formatted output.

Unit-3: Decision Making Branching: Introduction, Decision making with IF statement, the IF-ELSE statement, nesting of IF-ELSE statement, ELSE-IF ladder, SWITCH statement, ternary operator, and the GOTO statement.

Looping: Introduction, the WHILE statement, the DO statement, The FOR statement, Break and Continue.

Unit-4: Array: Introduction, One-dimensional arrays, Two-dimensional arrays, arrays, Concept of Multidimensional arrays.
Handling of Character strings: Introduction, Declaring and initializing string variables, reading string from terminal, writing string to screen, String, Operations: String Copy, String Compare, String Concatenation and String Length (using predefined functions & without using them), Table of strings.

Unit-5: User-Defined Functions (UDF): Introduction, need for user-defined functions, the form of C function, elements of UDF, return values and their types, Calling a function, category of functions, Nesting of functions, Recursion, Functions with arrays, The scope and Lifetime of variables in functions, multi file program.
Structures and Unions: Introduction, Structure definition, declaring and initializing Structure variables, accessing Structure members, Copying & Comparison of structures, Arrays of structures, Arrays within structures, Structures within Structures, Structures and functions, Unions.

Unit-6: Pointers: Introduction, understanding pointers, Accessing the address of variable, Declaring and initializing pointers, accessing a variable through its pointer, Pointer expressions, Pointer increments and scale factor, Pointers and arrays, Pointers & character strings, Pointers & Functions, Function returning multiple values, Pointers and structures.
File Management in C and CONSOLE I/O: Introduction, Defining files and its Operations, Error handling during I/O operations, Random access files, Command line arguments. Types of files, File vs. Console, File structure, File attributes, Standard i/o, Formatted i/o, Sample programs.

Teaching Methodology:

This course is introduced to help students understand the discipline of programming. The programming language used to teach this course is C. Starting from the basic computer architecture, the student will slowly be exposed to program designing and later to programming fundamentals. The entire course is broken down into six separate units, from fundamentals of programming to some complex programming structures like pointers. This theory course is well complemented by a laboratory course under the name Software Development Fundamentals Lab in the same semester that helps a student learn with hand-on experience.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 & Unit-2
Test-2	25 Marks	Based on Unit-3 & Unit-4 and around 20-30% from coverage till Test-1
Test-3	35 Marks	Based on Unit-5 to Unit-6 and around 30% from coverage till Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	

Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:

Tutorials and lecture slides on Software Development Fundamentals (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

[1] Programming in ANSI C by E. Balguruswamy, Tata Mc-Graw Hill.
[2] Programming With C, Schaum Series.

Reference Books/Material:

[1] The 'C' programming language by Kernighan and Ritchie, Prentice Hall
[2] Computer Programming in 'C' by V. Rajaraman, Prentice Hall
[3] Programming and Problem Solving by M. Sprankle, Pearson Education
[4] How to solve it by Computer by R.G. Dromey, Pearson Education

Web References:

[1] http://www2.its.strath.ac.uk/courses/c/
Notes on C programming by University of Strathclyde Computer Centre. This tutorial was awarded the NetGuide Gold Award during the 1990s.
[2] http://www.princeton.edu/~achaney/tmve/wiki100k/docs/C_%28programming_language%29.html
This site contains notes on C programming from Princeton University, USA.
These are very useful for students who are learning C as their first programming Language.
[3] http://www.stat.cmu.edu/~hseltman/Computer.html
Online reference material on Computers and Programming from Carnegie Mellon University, Pittsburgh, USA
[4] http://projecteuler.net/
Collection of mathematical problems which make you use your programming skills

Title: Physics Lab-I **Code: PH201**

L-T-P scheme: 0-0-2 **Credit: 1**

Learning Outcomes

Course Outcome	Description
CO1	Demonstrate ability to collect experimental data and understanding the working procedures within the precautionary limits
CO2	Acquired the ability to analyze the experimental data and related errors in a reflective, iterative and responsive way
CO3	Developed understanding of the basic concepts related to Modern Physics, Basic Solid-State Physics and Optics
CO4	Acquired a first hand and independent experience of verifying Kirchhoff's circuit laws and related concepts e.g. resistivity, measurement of resistance
CO5	Appreciate the importance of the laboratory work culture and ethics that is intended to impart features like regularity, continuity of self-evaluation and honesty of reporting the data

List of Experiments

1. To study the variation of magnetic field along the axis of Helmholtz Galvanometer and to determine its reduction factor.
2. To determine the resistance per unit length of a Carey Foster's bridge and to obtain the specific resistance of a given wire.
3. To determine the wavelengths of spectral lines Red, Green and Violet of mercury using plane transmission grating.
4. To determine the specific rotation of cane sugar solution using Bi-quartz polarimeter.
5. To observe Newton's rings and to determine the wavelength of sodium light.
6. To study the CRO and function generator by producing the following waveforms.

   i. 10kHz, 8Vp-p(sine wave, square wave, triangular wave)
   ii. 4kHz, 6Vp-p(sine wave, square wave, triangular wave)
   iii. 10kHz, 8Vpeak(sine wave, square wave, triangular wave)
   iv. 4kHz, $6V_{peak}$(sine wave, square wave, triangular wave)
7. To verify the Kirchhoff's current law.
8. To verify the Kirchhoff's voltage law.

Title: Computer Programming Lab **Code: CS201**

L-T-P scheme: 0-0-4 **Credit: 2**

Prerequisite: Experience in programming is desirable.

Objective:

1. To provide exposure to problem-solving through programming.
2. To provide students with understanding of code organization and functional hierarchical decomposition with using complex data types.
3. To give the student hands-on experience with the concepts.

Learning Outcomes:

Course Outcome	Description
CO1	Makes students gain a broad perspective about the uses of computers in engineering industry.
CO2	Develops basic understanding of computers, the concept of algorithm and algorithmic thinking.
CO3	Develops the ability to analyze a problem, develop an algorithm to solve it.
CO4	Develops the use of the C programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general.
CO5	Introduces the more advanced features of the C language

Course Content:

The following assignments will be carried out in synchronization with the theory classes.

Unit-1: Introduction to programming Environment (Linux commands, editing tools such as vi editor, sample program entry, compilation and execution). Development of programs using multiple arithmetic and logical operators. Programs for Roots of quadratic equation, conversion of units etc.

Unit-II: Programs using simple control statements such as if else, while, do while etc. Making a program for a calculator for example. Extracting the digits of an integer, reversing digits, finding sum of digits etc.

Unit-III: Programs using For loop, switch statement etc. For example, Finding average of numbers, printing multiplication tables etc. Checking for primes, generation of Armstrong numbers. Generation of the Fibonacci sequence, Finding the square root of a number, calculation of factorials, printing various patterns using for loop. The greatest common divisor of two integers, Raising a number to large power.

Unit-IV: Programs using Arrays: declaring and initializing arrays. Program to do simple operations with arrays. Strings – inputting and outputting strings. Using string functions such as strcat, strlen etc. Writing simple programs for strings without using string functions. Finding the

maximum number in a set, Array order reversal, Finding maximum number from an array of numbers Removal of duplicates from an ordered array,

Unit-V: Selection/ Bubble/ Insertion sort, create a linked list, traverse a linked list, insert a node and delete a node form the list. Recursion and related examples such as Tower of Hanoi, computing factorial etc. Practice sessions and sessions for missed labs

Units to Lab Mapping:

Unit	**Labs**
I	1, 2, 3
II	4, 5
III	6, 7, 8
IV	9, 10, 11
V	12, 13, 14

Teaching Methodology:

This course is introduced to help students understand the discipline of programming. The programming language used to teach this course is C. Starting from the programming environment setup, the student will slowly be exposed to program designing and later to programming fundamentals. The entire course is broken down into six separate units, from fundamentals of programming to some complex programming structures like pointers. This theory course is well complemented by a laboratory course under the name Software Development Fundamentals Lab in the same semester that helps a student learn with hand-on experience.

Evaluation Scheme:

Exams		**Marks**	**Coverage**
P-1		15 Marks	Based on Lab Exercises: 1-6
P-2		15 Marks	Based on Lab Exercises: 7-13
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:

Study material of Software Development Fundamentals Lab (will be added time to time): Digital copy will be available on the JUET server.

Text Book:

1.Programming in ANSI C by E. Balguruswamy, Tata Mc-Graw Hill.
2.Programming With C, Schaum Series.

Reference Books/Material:

1.The 'C' programming language by Kernighan and Ritchie, Prentice Hall
2.Computer Programming in 'C' by V. Rajaraman, Prentice Hall
3.Programming and Problem Solving by M. Sprankle, Pearson Education
4.How to solve it by Computer by R.G. Dromey, Pearson Education

Web References:

1. http://www2.its.strath.ac.uk/courses/c/
   a. Notes on C programming by University of Strathclyde Computer Centre. This tutorial was awarded the NetGuide Gold Award during the 1990s.

2. http://www.princeton.edu/~achaney/tmve/wiki100k/docs/C_%28programming_language%29.html
   a. This site contains notes on C programming from Princeton University, USA. These are very useful for students who are learning C as their first programming Language.

3. http://www.stat.cmu.edu/~hseltman/Computer.html
   a. Online reference material on Computers and Programming from Carnegie Mellon University, Pittsburgh, USA

4. http://projecteuler.net/
   a. Collection of mathematical problems which make you use your programming skills

Title: Workshop Practices **Code: ME201**

L-T-P scheme: 0-0-3 **Credit: 1.5**

Prerequisite: Students must have the knowledge of fundamental principles of Physic and Chemistry upto class 12^{th} which helps them to understand the various process of Workshop Lab.

Objective:

1. To demonstrate students, the basic manufacturing processes of Workshop lab: Carpentry, Fitting, Welding, Machining and Casting Processes.
2. To develop effective skills in students to identify the manufacturing process with its applications
3. To be able to perform basic manufacturing processes safely.

Learning Outcomes:

Course Outcome	Description
CO1	Identify the various processes of manufacturing.
CO2	Capable to explain the use of various holding, measuring, marking and cutting tools
CO3	Prepare a useful job by performing the various processes in proper sequence safely
CO4	Apply Bernoulli's theorem to analyze the liquid metal velocity in casting process.
CO5	Develop the skills to join two metallic specimen using welding process
CO6	Work as a team on a project

Course Content:

Carpentry Shop

1. To study about various tools/equipments used in carpentry shop
2. To make Cross lap /T joint as per given specification
3. To make Cross lap /T joint as per given specification

Foundry Shop

1. To study about various tools used in foundry shop.
2. To prepare a green sand mould with the help of a given pattern.
3. To perform permeability test on moulding sand

Machine Shop

1. To study various machine tools such as lathe, milling, shaper, drilling, grinding, EDM drill and cutting tools used by them.
2. To perform turning, step turning and taper turning operations on lathe machine
3. To perform threading operation on the lathe machine

Fitting Shop

1.To study about various tools used in fitting shop.
2.To make a fitting job as per given drawing.

Welding Shop

1. To study various types of welding processes available in the workshop such as Electric arc welding, TIG and MIG welding, gas welding and spot resistance welding,
2. To prepare welding joint by using Electric arc welding/gas welding
3. To prepare welding joint by using Spot Resistance welding

Teaching Methodology:

This Lab course has been introduced to help a student to learn with hand-on experience on machines. The entire course is broken down into fourteen experiments. Experiments are performed different shop wise by taking the proper safety precautions. Workshop lab includes five shops namely: Carpentry, Foundry, Machining, Fitting and Welding. Basic principles of manufacturing processes are applied to prepare a job. Students learn here how to handle the real world problems by using technical skills. The way of experimentation here realizes the students that they are now moving on an Engineering path. This Lab course will enable a student to learn with hand-on experience.

Evaluation Scheme:

<table>
<tr><th colspan="2">Exams</th><th>Marks</th><th>Coverage</th></tr>
<tr><td colspan="2">P-1</td><td>15 Marks</td><td>Based on Lab Experiments: 1-7</td></tr>
<tr><td colspan="2">P-2</td><td>15 Marks</td><td>Based on Lab Experiments: 8-14</td></tr>
<tr><td rowspan="4">Day-to-Day Work</td><td>Viva</td><td>20 Marks</td><td rowspan="4">70 Marks</td></tr>
<tr><td>Demonstration</td><td>20 Marks</td></tr>
<tr><td>Lab Record</td><td>15 Marks</td></tr>
<tr><td>Attendance & Discipline</td><td>15 Marks</td></tr>
<tr><td colspan="2">Total</td><td colspan="2">100 Marks</td></tr>
</table>

Learning Resources:

Laboratory Manual available in Lab. Study material of Workshop Lab (will be added time to time): Digital copy will be available on the JUET server.

Text Books:

[1] "Workshop Technology Volume- I & II", B.S. Raghuvanshi, Dhanpat Rai & Co.
[2] "Workshop Technology Volume-I & II", Khanna Publisher.

Reference Books:

[1] "Workshop Technology Vol.- 1, 2, 3 & 4", Butterworth-Heinemann.
[2] "Material Science & Engineering", W. D. Callister, John Wiley

Web References:

[1] https://nptel.ac.in/courses/112/107/112107219/
[2] https://nptel.ac.in/courses/112/107/112107144/

2nd Semester

Title: Life Skills and Effective communication **Code: HS104**
L-T-P scheme: 1-1-o **Credit: 2**

Prerequisites: None

Objective:

1. To employ positive behavior management techniques and to develop skills to manage their own behavior effectively
2. To develop one's personality by being aware of the self, connecting with others, reflecting on the abstract and the concrete.
3. To enhance the employability and maximize the potential of the students by introducing them to the principles that underlying personal and professional success, and help them acquire the skills needed to apply these principles in their lives and careers.

Learning Outcomes:

CO1	Outline different life skills required in personal and professional life.
CO2	Describe the application of different theoretical perspectives within the field of motivation and applying these motivation theories to everyday settings (e.g., business, social interactions, education)
CO3	Develop the understanding of personality and shaping behavior through personality
CO4	Identify the basic mechanics of perception by demonstrating these through presentations.
CO5	Apply well-defined techniques to cope with emotions and stress and develop an awareness of the self.
CO6	Understand the basics of leadership and Learning

Course Content:

Unit-l: Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO: Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem solving, Effective communication, interpersonal relationship, coping with stress, coping with emotion.

Unit-2: Motivation: Morale and Morale Building, Need and Importance of motivation, Process and types of motivation, Theories of motivation, Essentials of Good Motivation system.

Unit-3: Overview of Personality concept and types, Personality traits, Factors that help in shaping personality, Theories of personality, Measurement of personality.

Unit-4: Perception: - Factors affecting perception, Perceptual mechanisms Perceptual errors and distortions, Behavioral applications of perceptions.

Unit-5: Self Awareness, Coping with emotions: Identifying and managing emotions, harmful ways of dealing with emotions, Stress Management: Stress, reasons and effects, identifying stress, Managing Stress.

Unit-6: Conflict Management –sources, process and resolution of conflict.

Unit-7: Leadership: Need for Leadership, Models of leadership development, and Characteristics of a good leader.

Unit-8: Learning: Concepts and Theories, classical conditioning, operant conditioning, Biological influences, Cognitive influences, Social learning theory, Behavioral modification theory.

Teaching Methodology:

Life skills are those competencies that provide the means for an individual to be resourceful and positive while taking on life's vicissitudes .This course will equip students with the social and interpersonal skills that enable them to cope with the demands of everyday life. There will be a particular focus on social-cognitive processes and how situational factors trigger various emotions and corresponding motives that can then drive behavior. The main objectives of this course is to build self-confidence, encourage critical thinking, foster independence and help students to communicate more effectively.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1, Unit-2 & Unit-3
Test-2	25 Marks	Based on Unit-4 & Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6, Unit-7 & Unit-8 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Text Book:

1. "Effective Communication and Soft Skills"; Nitin Bhatnagar, Pearson Education India,1e, 2011
2. "Personality Development and Soft Skills"; Barun Mitra, Oxford Higher Education,2016.
3. "Sizzling Soft Skills for Spectacular Success"; P. Ameer Ali, Notion Press, 2017.
4. "Organizational Behavior"; Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, Pearson Education India, 16e, 2016.
5. "Managing Organisations"; Rachna Chaturvedi, Vikas Publications, 2013.

Reference Books/Material:

1. "The Power of Your Subconscious Mind"; Joseph Murphy, General press, 2015
2. "The Life-Changing Magic of Tidying Up: The Japanese Art of De cluttering and Organizing"; Marie Kond , 1e,Ten speed Press, 2011
3. "The Power of Habit: Why We Do What We Do in Life and Business"; Charles
4. Duhigg, Random House, 2012

Title: Discrete Mathematics **Code: MA104**

L-T-P scheme: 3-1-0 **Credits: 4**

Objectives:

The aim of the course is to cover the basic principles sets relations functions partially ordered set, lattice, Boolean algebra and its applications. The main objective of the course is to develop in student, an intuitive understanding of graphs by emphasizing on the real world problems.

Course Outcomes:

At the end of the course, the student is able to:

Course Outcome	Description
CO1	Employ De Moivre's theorem in a number of applications to solve numerical problems.
CO2	Appreciate the definition and basics of graphs along with types and their examples.
CO3	Visualize the applications of graph theory to network flows. Understand the notion of planarity and coloring of a graph. Relate the graph theory to the real-world problems.
CO4	Understand the definition of a tree and learn its applications to fundamental circuits.
CO5	Solve real-life problems using finite-state and Turing machines
CO6	Learn about partially ordered sets, lattices and their types, Boolean algebra and Boolean functions, logic gates, switching circuits and their applications.

Course Contents:

Unit 1: Basics of set theory, Mathematical induction. Relations, Equivalence relation, partial- ordered relation algorithms and functions.

Unit 2: Big O notation, Proposition, Basic logical operators, Propositional functions and Quantifiers.

Unit 3: Graphs and related definitions, Eulerian and Hamiltonian graphs, Graph colorings. Trees, Algebraic expressions and Polish notation, shortest path.

Unit 4: Algebraic Systems. Lattice and Boolean Algebra.

Unit 5: Language, Finite State Automata and Machines. Grammars.

Teaching Methodology:

The course will be covered through lectures supported by tutorials. Apart from the discussions on the topics covered in the lecture's assignments/ quizzes in the form of questions will also be given.

Evaluation scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1

Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

References:

1. B. A, Davey & H. A. Priestley (2002). "Introduction to Lattices and Order" (2nd edition) Cambridge University, Press.
2. Edgar, G. Goodaire & Michael M. Parmenter (2018). "Discrete Mathematics with Graph Theory" (3rd edition). Pearson Education.
3. Rudolf Lidl & Günter Pilz (1998). "Applied Abstract Algebra" (2nd edition).Springer.
4. Kenneth H. Rosen (2012). "Discrete Mathematics and its Applications: With Combinatorics and Graph Theory" (7th edition), McGraw-Hill.
5. C. L. Liu (1985). "Elements of Discrete Mathematics" (2nd edition). McGraw- Hill.

Title: Physics-II **Code: PH102**

L-T Scheme: 3-1-0 **Credits: 4**

Objective:

Broadly, the study of Physics improves one's ability to think logically about the problems of science and technology and obtain their solutions. The present course is aimed to offer a broad aspect of those areas of Physics which are specifically required as an essential background to all engineering students for their studies in higher semesters. At the end of the course, the students will have sufficient scientific understanding of basic vector calculus, electrostatics, magnetostatics, electromagnetic fields and waves, basic understanding of physics of semiconducting materials

Course Outcomes:

Course Outcome	Description
CO1	Learn to apply the basic concepts of vector calculus and understanding of various Coordinate systems and related properties, demonstrate basic understanding of formulation and conduction of electric field produced by static charge distributions
CO2	Evaluate the electrostatic field due to symmetric charge distributions, Understand the utility of formulation of electric potential and solve related problems using special techniques and boundary conditions
CO3	Acquired understanding of electrostatic fields inside matter, Explain the magnetic field due to moving charge distribution, evaluate the magnetic field due to current distribution in space,
CO4	appreciate the importance of Maxwell's equations and understand the electromagnetic wave propagation in free space Categorization of materials on the basis of band structure
CO5	Developed understanding of quantum mechanical origin of band formation in solids, describing the energy state of electrons in crystalline materials, comprehend basic carrier properties

Course Content:

Unit I (Electrostatics)

Review of vector calculus, Cartesian, spherical polar and cylindrical co-ordinate systems, concept of gradient, divergence and curl, Coulomb's law, Gauss law and its applications, Boundary condition on electrostatic field, electric potential, Laplace equation, Poisson equation and related boundary value problems, capacitance, electrostatic fields in matter. **[10]**

Unit II (Magnetostatics)

Lorentz force, cyclotron formula, line, surface and volume currents, , Biot-Savart law and its applications, Ampere's law and its applications, equation of continuity, Faraday's law of electromagnetic induction, boundary conditions on magnetic field, Magnetic field in matter **[08]**

Unit III (Electromagnetic field)

Maxwell's equations in free space and matter, Maxwell correction to Ampere's law, Electromagnetic waves in free space and matter, Transverse nature of em waves and Polarization, Propagation of electromagnetic field in free space and Poynting vector, Poynting theorem , Normal incidence of em waves [**10]**

Unit IV (Elements of Solid State Physics)

Basic ideas of bonding in solids, Crystal structure, X-ray diffraction, Band theory of solids, Distinction between metals, semiconductors and insulators **[04]**

Unit V (Physics of Semiconductors)

Band theory of solids, Kronig Penney model, effective mass, Direct and indirect bandgap semiconductors, optical and thermal properties, Fermi-Dirac Distribution in semi-conductors, Equilibrium carrier concentrations in intrinsic and extrinsic semiconductors, Fermi energy variation with temperature and impurity concentration, Hall Effect in semiconductors, P-N junction characteristics **[10]**

Text/ Reference Books:

1. D.J. Griffiths, *Introduction to electrodynamics*, Prentice Hall of India Ltd.
2. B.G. Streetman, S. Banerjee, Solid State Electronic Devices
3. Semiconductor Physics and Devices, Donald A. Neamen
4. Boylstad and Nashelsky, *Electronic Devices and Circuits*, PHI, 6e, 2001.
5. J. Reitz, F. Milford and R. Christy, *Foundation of Electromagnetic Theory*, Narosa Publishing.
6. J. Millman and C.C. Halkias, Electronic Devices and Circuits, Millman, McGra-Hill

Title: Electrical Science **Code: EC101**

L-T-P Scheme: 3-1-0 **Credit: 4**

Prerequisite: Students must have studied the core concepts of "*Physics-1*".

Course Objectives:

1. This course is designed for developing the understanding about basics of electrical and electronics concepts.
2. In this course students will have an enough idea about the working of systems and enable them to analyze a circuit.

Learning Outcomes:

1. The students shall acquire the generic skills to study & analyze the electrical and electronic systems.
2. This course will enable them to think and design various applications of the electrical and electronics at basic level.

The student will be able to:

Course Outcome	Description
CO1	Understand the basic electrical and electronics component and their importance determine the current, voltage and power.
CO2	Apply networks laws and theorems to solve electric circuits and may understand circuit reduction techniques with their advantages.
CO3	Understand charging discharging Steady state and transient
CO4	Demonstrate the use of semiconductor diodes in various applications.
CO5	Discuss and explain the working of transistors Amplifiers, their configurations and applications.
CO6	Analysis concept and two port networks simplification technique.

Course Content:

Unit I: Basic Electrical Circuit: Electromotive Force (EMF), Terminal Voltage; Resistance (*R*), Inductance (*L*) and Capacitance (*C*) from (i) Circuit, (ii) Energy, and (iii) Geometrical Points of View; Voltage Divider, Current Divider; Star-Delta Transformation; Voltage Source and Current Source, Source Transformation, Combination of Sources; Controlled (Dependent) Sources.

Unit 2: Methods of Analysis: Kichhoff's Circuit Laws; Loop-Current Analysis, Mesh Analysis; Node-Voltage Analysis; Choices of Method of Analysis.

Unit 3: Network Theorems (DC Circuits): Superposition Theorem; Thevenin's Theorem; Norton's Theorem; Maximum Power Transfer Theorem.

Unit 4: DC Transients: Simple *RL* Circuit, Time Constant, Decay and Growth of Current; Simple *RC* Circuit, Discharging of a Capacitor, Charging of a Capacitor.

Unit 5: Two-Port Networks: Impedance, Admittance, Hybrid, Transmission Parameters; Equivalent Networks.

Unit 6: Diodes and its Applications: Unidirectional property, *PN*-junction with no bias, with forward bias and with reverse bias, *V-I* characteristics, Comparison of Si and Ge diodes, Temperature effects, Diode resistance (static and dynamic), Diode equation, Ideal diode, Circuit model of a diode. Half-wave and full-wave (centre tap and bridge) rectifiers, PIV rating of diode, Performance of half-wave and full-wave rectifiers, Shunt capacitor filter. Clippers: Series and Parallel, Limiters, Clampers. Zener diode, Analysis of Zener voltage regulator. LED, varactor diode.

Unit 7: Transistor: BJT Structure, Working of a transistor, Transistor current equation, Collector reverse saturation current, DC alpha of a transistor. The three configurations, CB and CE input and output characteristics.

Teaching Methodology:
Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15	Based on Unit-1 & Unit-2
Test-2	25	Based on Unit-3, Unit-4 & Unit-5 and around 30% from coverage of Test-1
Test-3	35	Based on Unit-6 to Unit-7 and around 30% from coverage of Test-2
Assignment	10	Based on Unit-1, Unit-2 & Unit-3
Tutorials	5	Based on Unit-4 & Unit-5
Quiz	5	Based on Unit-6 & Unit-7
Attendance	5	Based on attendance in the theory classes
Total	**100**	

Learning Resources:

Tutorials sheets, lecture slides and handwritten notes on Electrical circuit, Electrical Science and Basic Electronics (will be added from time to time): Digital copy will be available on the JUET server.

Text-Books:

1. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill Education, 2009.
2. W.H. Hayt, J. E. Kemerlay & S.M. Durbin, "Engineering Circuit Analysis (Sixth Edition)", McGraw Hill, 2006.

3. R.C. Dorf & J.A. Svoboda, "Introduction to Electric Circuits", John Wiley, 2004.
4. D.S. Chauhan & D.C. Kulshreshtha, 'Electronics Engineering', New Age, 2e, 2009.
5. D.C. Kulshreshtha, 'Electronic Devices and Circuits', New Age, 2e, 2006.

References:

1. Van Valkenburg, "Network Analysis", Prentice-Hall India Ltd., 2001.
2. Abhijit Chakrabarti, SudiptaNath, Chandan Kumar Chanda, "Basic Electrical Engineering", Tata McGraw Hill Publishing Co, 2008.
3. Vincent Del Toro, "Principles of Electrical Engineering", Prentice Hall of India.
4. Kumar and Jain, 'Electronic Devices and Circuits', PHI, 2007.
5. Boylstad and Nashelsky, 'Electronic Devices and Circuits', PHI, 6e, 2001.

Web References:

1. https://www.electrical4u.com/electrical-engineering-objective-questions-mcq/
2. https://www.pdfdrive.com/basic-electric-circuit-analysis-books.html
3. https://lecturenotes.in/subject/842

Journals References:

1. Circuits, Systems, and Signal Processing (CSSP), Springer
2. Journal of Electrical & Electronic Systems
3. International Journal of Circuit Theory and Applications, Wiley

Title: Object Oriented Programming **Code: CS102**

L-T-P Scheme: 3-1-0 **Credit: 4**

Prerequisites:
Students must have already registered for the course, "Software Development Fundamentals"

Objectives:
To strengthen their problem solving ability by applying the characteristics of an object-oriented approach and to introduce object oriented concepts in C++.

Learning Outcomes

Course Outcome	Description
CO1	List various principles of Object-Oriented Programming (OOP).
CO2	Describe the real world problems using object-oriented programming concepts.
CO3	Develop the programs using the fundamental concepts of OOP.
CO4	Identify and use various techniques used in OOP.
CO5	Apply techniques used in OOP to solve the software design problems on a given software project.
CO6	Demonstrate the learning on the course to solve the real-life programming problems.

Course Content

Unit-1: Review of Structured programming in C, Structured versus Object-Oriented Programming, Principles of Object-Oriented Programming, Beginning with C++, Control Structures, Functions in C++, Reference Variables, Default Parameters, Function Overloading, Inline Function, Const Variables.

Unit-2: Classes, Member Functions, Objects, Static Data Members, Static Member Functions, Friend Functions, Pointer to Members, Local classes, Constructors and Destructors of objects in C++,

Unit-3: Operator overloading and Type Conversions, Inheritance and its form, Multiple Inheritance in C++, Function Overriding, Virtual Inheritance, Virtual Base Class .

Unit-4: Pointers, Early binding, late binding, Type of polymorphism, Virtual Functions, Abstract Class, Virtual Destructor

Unit-5: Managing Console I/O Operations, File handling and Exception handling.

Unit-6: Templates, Function templates, Class templates, introduction to Standard Template Library (STL), Sequence, Containers, Iterators

Teaching Methodology

The course will use the mixed technique of interactive lectures, tutorials, guided case studies, literature survey, regular assignments and project work. Teaching in this course is designed to engage the students in active and experiential learning by taking a problem solving and design-oriented approach with special emphasis on real world applications. In the lectures the

fundamental theoretical concepts will be introduced and demonstrated through examples and case studies. Discussion in lecture will be done using design problems which will be implemented in laboratory individually in C++.

Evaluation Scheme

Evaluations	**Marks**	**Remarks**
T1	15 Marks (1 Hour)	
T2	25 Marks (1.5 Hours)	
T3	35 Marks(2 Hours)	
Assignments	10 Marks	2 or 3 Assignments to given
Quiz	5 Marks	2 or 3 quizzes
Tutorials	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Text books

1. Robert Lafore, Object oriented programming in C++, Waite Group.
2. E Balagurusamy, "Object-Oriented Programming with C++"

References

1. Deitel and Deitel,"C++ How to program", - Pearson Education.
2. Stroustrap B., the C++ Programming Language, Addison Wesley.
3. Lippman F. B., C++ Primer, Addison Wesley.
4. Prata S., C++ Primer Plus, Waite Group.
5. Parimala N., Object Orientation through C++, Macmillan India Ltd. 1999.
6. Pohl I., Object oriented Programming Using C++, Addison Wesley.
7. Grady Booch, James Rambaugh, Ivar Jacobson,"Unified Modelling Language user's guide" , Addison Wesley Limited

Title: Physics Lab-II **Code: PH202**

L-T-P Scheme: 0-0-2 **Credit: 1**

Learning Outcomes

Course Outcome	Description
CO1	Demonstrate ability to collect experimental data and understanding the working procedures within the precautionary limits
CO2	Acquired the ability to analyze the experimental data and related errors in a reflective, iterative and responsive way
CO3	Developed understanding of the basic concepts related to Modern Physics, Basic Solid State Physics, Optics,
CO4	Acquired a first hand and independent experience of verifying the working principle of solar cell
CO5	Appreciate the importance of the laboratory work culture and ethics that is intended to impart features like regularity, continuity of self-evaluation and honesty of reporting the data

Experiments List

1. To determine the magnetic susceptibility of a paramagnetic, $FeCl_3$ solution by Quinck's tube method.
2. To determine dispersive power of a prism using spectrometer.
3. To study the magnetostriction in metallic rod using Michelson-Interferometer.
4. To determine the Planck's constant using Photo electric effect.
5. To study the Hall effect in P type semi conductor and to determine
   (i) Hall voltage and Hall coefficient
   (ii) Number of charge carriers per unit volume
   (iii) Hall angle and mobility
6. To study the variation of resistivity of a semiconductor with temperature and to determine the band gap using Four-Probe method.
7. To study the presence of discrete energy levels in an atom by Franck Hertz experiment.
8. Using solar cell Trainer (a) study voltage and current of a solar cell
   (b) Voltage and current in series and parallel combinations (c) Draw power curve to find maximum power point (MPP) and to obtain efficiency of a solar cell

Title: Electrical Science Lab **Code: EC201**

L-T-P Scheme: 0-0-2 **Credit: 1**

Prerequisite: Student must have already registered for the course, "*Physics Lab-I*"

Objective:

1. The main aim of the lab is to familiarize with different types of electrical and electronic circuits
2. Identify their applications to the different electrical and electronic systems.

Learning Outcomes:

1. Completion of lab students will be able to understand the different techniques to simplify circuit
2. Two port networks and basic principles of different electronic devices and their characteristics.

Course Outcome	**Description**
CO1	Simplify complex network using Thevenin theorem and verify it. State Superposition Theorem and verify. Perform and verify Maximum Power Transfer Theorem.
CO2	To determine the Z parameters of the given two port network. Calculate the Y parameters for the given two port network.
CO3	V-I characteristic of p-n junction diode
CO4	Design Clipper and Clamper Circuit.
CO5	Rectifier circuits
CO6	Transistor and their v-I characteristics

Course Content:

1. Simplify complex network using Thevenin theorem and verify it.
2. State Superposition Theorem and verify.
3. Perform and verify Maximum Power Transfer Theorem.
4. To determine the Z parameters of the given two port network.
5. Calculate the Y parameters for the given two port network.
6. Perform Clipper Circuit.
7. Design Clamper Circuit.
8. Half wave rectifier with and without filter circuit.
9. Full wave rectifier with and without filter circuit.
10. Transistor as an Amplifier.
11. Common Emitter *v-i* characteristic of n-p-n transistor.
12. Common base *v-i* characteristic of n-p-n transistor.

Teaching Methodology:
In each experiment the practical is designed and analyzed on bread board with the help of physical devices by each student and further checked and validated by faculty and lab staff.

Evaluation Scheme:

Exams	**Marks**		**Coverage**
P-1	15 Marks		Based on Lab Exercises: 1-6
P-2	15 Marks		Based on Lab Exercises: 6-12
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:

Tutorials sheets, lecture slides and handwritten notes on Electrical circuit, Electrical Science and Basic Electronics (will be added from time to time): Digital copy will be available on the JUET server.

Text-Books:

1. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill Education, 2009.
2. W.H. Hayt, J. E. Kemerlay & S.M. Durbin, "Engineering Circuit Analysis (Sixth Edition)", McGraw Hill, 2006.
3. R.C. Dorf & J.A. Svoboda, "Introduction to Electric Circuits", John Wiley, 2004.
4. D.S. Chauhan & D.C. Kulshreshtha, 'Electronics Engineering', New Age, 2e, 2009.
5. D.C. Kulshreshtha, 'Electronic Devices and Circuits', New Age, 2e, 2006.

References:

1.Van Valkenburg, "Network Analysis", Prentice-Hall India Ltd., 2001.
2.Abhijit Chakrabarti, SudiptaNath, Chandan Kumar Chanda, "Basic Electrical Engineering", Tata McGraw Hill Publishing Co, 2008.
3.Vincent Del Toro, "Principles of Electrical Engineering", Prentice Hall of India.
4.Kumar and Jain, 'Electronic Devices and Circuits', PHI, 2007.
5.Boylstad and Nashelsky, 'Electronic Devices and Circuits', PHI, 6e, 2001.

Web References:
1. https://www.electrical4u.com/electrical-engineering-objective-questions-mcq/
2. https://www.pdfdrive.com/basic-electric-circuit-analysis-books.html
3. https://lecturenotes.in/subject/842

Journals References:
1.Circuits, Systems, and Signal Processing (CSSP), Springer
2.Journal of Electrical & Electronic Systems
3.International Journal of Circuit Theory and Applications, Wiley

Title: Object Oriented Programming Lab **Code: CS202**

L-T-P Scheme: 0-0-2 **Credit: 1**

Pre-requisites

Students must have already registered for the course, "Software Development Fundamentals Lab".

Objectives

To strengthen their problem-solving ability by applying the characteristics of an object- oriented approach and to introduce object oriented concepts in C++.

Learning Outcomes

CO1	Define basic concepts of Object-Oriented Programming (OOP).
CO2	Illustrate the key features available in OOP using C++.
CO3	Apply the concepts of OOP to solve different common problems.
CO4	Utilize the knowledge of OOP in solving programming problems.
CO5	Analyze the various concepts of OOP for their suitability on a given problem.
CO6	Design the systems, from concept to executable artefact, using object oriented techniques.

Course Content

Unit-1: Structured versus Object-Oriented Programming, Principles of Object-Oriented Programming, Beginning with C++, Control Structures, Functions in C++, Reference Variables, Default Parameters, Function Overloading, Inline Function, Const Variables.

Unit-2: Classes, Member Functions, Objects, Static Data Members, Static Member Functions, Friend Functions, Pointer to Members, Local classes, Constructors and Destructors of objects in C++,

Unit-3: Operator overloading and Type Conversions, Inheritance and its form, Multiple Inheritance in C++, Function Overriding, Virtual Inheritance, Virtual Base Class .

Unit-4: Pointers, Early binding, late binding, Type of polymorphism, Virtual Functions, Abstract Class, Virtual Destructor

Unit-5: Managing Console I/O Operations, File handling and Exception handling.

Unit-6: Templates, Function templates, Class templates, introduction to Standard Template Library (STL), Sequence, Containers, Iterators

Laboratory work and project

The students shall be given regular lab assignments, which will allow them to practically apply the concepts studied in the lecture Session. The lab assignments will be designed with focus on applying the concepts learnt in object-oriented programming, Data structures in an integrated manner.

Evaluation Scheme

Evaluations		**Marks**	**Remarks**
P-1		15 Marks	
P-2		15 Marks	
Continuous Evaluations	Viva	20 Marks	
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Discipline and Punctuality and Attendance	15 Marks	
Total		**100 Marks**	

Text book

1. Robert Lafore, Object oriented programming in C++, Waite Group
2. E Balagurusamy, "Object-Oriented Programming with C++"

References

1.Stroustrap B., the C++ Programming Language, Addison Wesley.
2.Lippman F. B., C++ Primer, Addison Wesley.
3.Prata S., C++ Primer Plus, Waite Group.
4.Parimala N., Object Orientation through C++, Macmillan India Ltd. 1999.
5.Pohl I., Object oriented Programming Using C++, Addison Wesley.
6.Grady Booch, James Rambaugh, Ivar Jacobson,"Unified Modelling Language user's guide" , Addison Wesley Limited

Title: Engineering Drawing & Design Lab **Code: ME203**

L-T-P scheme: 0-0-3 **Credits: 1.5**

Objective:

1. Enables students to learn the concepts of graphic communication, their role in sanitary construction.
2. Make familiar with different drawing equipment, technical standards and procedures for construction of geometric figures.
3. Equipped with the skill that enables them to convert pictorial to orthogonal representations.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the objectives of scale and develop the imagination and mental visualization capabilities for correlating the geometrical details of objects.
CO2	To develop the constructional ability for a different curve.
CO3	To Describe BIS rules for orthogonal projection and understand the fundamental concept of orthogonal projection for point, line, plane and solids.
CO4	Understand and apply orthogonal projection for solids, section and intersection of solid objects/structures
CO5	To apply the skill of development of surfaces of three dimensional objects for evaluation of black size of the components.
CO6	Demonstrate computer aided drafting tools and techniques using CAD software's

Course Content:

Unit-1: Study and construction of lines, lettering, dimensioning, plane scales, diagonal scales, construction of different methods used for the construction of conic curves.

Unit-2: Study and construction of geometrical construction, cycloidal curves, involutes and helix etc.

Unit-3: Orthogonal projection of point in all possible positions, Study and construction of projection of line and its applications (inclined to both planes), and projection of planes (inclined to both planes).

Unit-4: Study and construction of projection of solids (right circular cone, prism, pyramid and cylinders), and true shape of sections,

Unit-5: Study and construction of oblique projection and development of surface, isometric view using orthogonal projection on isometric scales.

Unit-6: Introduction to basic and editing command of CAD software, 2-D drafting, surface modeling, and 3-D geometrical model.

Teaching Methodology:

This course is introduced to build the imagination and established the correlation between the real object and engineering drawing and CAD developed by the design engineers and the requirement of the production engineers of the different units.

Evaluation Scheme:

Exams		**Marks**	**Coverage**
P-1		15 Marks	Based on Lab Exercises: 1-7
P-2		15 Marks	Based on Lab Exercises: 8-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:
The study material of engineering drawing & design lab (will be added time to time): Digital copy will be available on the JUET server.

Text Book:
1. Bhatt, N.D., Engineering Drawing,

Reference Books:
1. Gill, PS, A Text Book of Engineering Drawing (Geometrical Drawing)
2. Dhananjay A J, Engineering Drawing with an introduction to Auto CAD, Mc Graw Hill

3rd Semester:

Title: Techniques for Decision Making **Code**: **HS103**

L-T-P scheme: 2-1-0 **Credit: 3**

Prerequisite: None

Objectives:

1. To use basic techniques of inferential data analysis, quality control, and regression modeling;
2. To analyze a set of data, to reach a conclusion based on these analyses, and to make and defend a recommended course of action;
3. To be well-equipped to take courses in Marketing, Investments, Accounting, Finance, and Operations Management that require proficiency in statistical methods.

Learning Outcomes:

Course Outcome	Description
CO1	Outline various concepts of techniques for decision making with respect to the needs of modern business management.
CO2	Describe the real world problems using basic techniques of descriptive and inferential data analysis and business forecasting.
CO3	Identify and use various index numbers used in business decision making.
CO4	Apply decision making techniques to reach a conclusion based on the data analysis, and to make and defend a recommended course of action.
CO5	Deployment and proficiency in statistical methods.
CO6	Develop the understanding to analyze a set of data using correlation analysis and regression analysis.

Course Content:

Unit-1: Collection of data and Presentation of data: Classification of data, Secondary data, Primary data, designing of questionnaire, Unstructured and structured questionnaire, Tabulation of data, Charting of data.

Unit-2: Business Forecasting: Introduction, steps in forecasting, good forecasting, Time series forecasting, secular trend, seasonal variations, cyclical variations.

Unit-3: Index numbers: Uses, classification, problems, Methods of constructing index numbers, unweighted index numbers, Consumer Price index numbers.

Unit-4: Statistical Decision making : Decision making under certainity, Risk , uncertainty and conflict, Zero sum game, Prisoner's dilemma , Payoff Table, Maximin and minimax strategy.

Unit-5: Correlation Analysis and Regression analysis: Significance of the study of correlation, Correlation and causation, Karl Pearson's coefficient of correlation, Rank correlation, Method of least squares, Difference between correlation and regression, Regression lines and regression equation, Regression equation of Y on X and regression equation of X on Y.

Teaching Methodology:

The course "Techniques for Decision Making" is introduced to explain the basic concepts in statistics that have wide applicability in business decision making. As such, the focus will be more practical than theoretical. Because statistical analysis informs the judgment of the ultimate decision-maker—rather than replaces it—we will cover some key conceptual underpinnings of statistical analysis to insure that the students understand its proper usage. Statistics is about improved decision-making, which can be achieved through a thorough understanding of the data. We want to leave our pre-conceived notions at the door, and let the data tell us what is going on in a situation. The analytical techniques should provide valuable information to decision-makers. As such, it plays an important role in management decision processes. The course will be taught with the aid of lectures, tutorials, handouts, case studies, and problem-based learning.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1 & Unit-2
Test-2	25 Marks	Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:

Lectures, tutorials and e-books on Techniques for Decision Making (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:

1. "Business Statistics"; S.P. Gupta & M.P. Gupta, S. Chand Publishing, New Delhi, 2013.

Reference Books/Material:

1. "Statistics for Business & Economics"; Anderson, Thomson Learning, Bombay.
2. "Quantitative Methods in Business"; Anderson, Thomson Learning, Bombay.
3. "Business Statistics"; R.S. Bhardwaj, Excel Books.
4. "Statistics for Management"; Levin & Rubin, Prentice Hall of India, New Delhi.
5. "Two Person Game Theory"; A. Rapport & Anne Arbric, The University of Michigan Press, 1966.

Title of Course: Data Structures and Algorithms **Course Code: CS113**

L-T-P Scheme: 3-0-1 **Credits: 3**

Prerequisite
Students must have already registered for the course, "Computer Programming" (CS101).

Scope and Objectives:

This course develops:

- problem solving ability using programming
- ability to express solutions to problems clearly and precisely
- ability to design and analyze algorithms
- introduces with fundamental data structures
- Strengthen ability to design and evaluate ADTs, nonlinear temporary and persistent data structures and related algorithms.

Learning Outcome:

The students shall acquire the generic skills to design and implement data structures and related algorithms for a broad-based set of computing problems**.**

Course Outcome: At the end of the course students will be able to

Course Outcome	Description
CO1	Summarize the various types of data structures and concept of algorithmic complexity.
CO2	Examine the various searching and sorting algorithms based on their complexity.
CO3	Apply linear and non-linear data structures techniques to solve a problem.
CO4	Analyze various data structure to design optimum algorithm for a given problem.

Course Description:
This course is intended to provide a thorough introduction to the use of data structures in programming. This course will cover the necessary mathematical background, but will assume the required programming experience.

Course Contents:

UNIT 1: Introduction to Data Structures, Algorithm and Complexity: Data structure overview, need of data structure and how to select relevant data structure for given problem, basic C data types and ADT. Algorithm overview and its properties, problem analysis and construction of algorithm, difference among algorithm, program, and software, algorithm analysis and complexity, asymptotic notations to represent the time complexity.

UNIT II: Searching and Sorting: Overview, memory representation of 1D and 2D array, sparse matrix,

operation supported by an array, Linear search, binary search (iterative), binary search (recursive), Sorting**,** Types of sorting algorithms, bubble sort, selection sort, insertion sort, quick sort, merge sort, heap sort, radix sorting, counting sorting, Bucket Sorting.

UNIT III: Linear data structures: Linked list, types of linked list, and operations on linked lists. Stack overview, stack implementation using array and linked list, basic operations on stack, applications of stack – evaluation of mathematical expression, conversion of expression from one form to another (Polish Notation), Tower of Hanoi problem. Queue overview, basic operations on queue – enqueue, dequeue, implementation of queue using array and linked list, types of queue - linear queue, circular queue.

UNIT IV: Non-linear data structures: Tree definition and its terminology, representation of graph using array and linked list, tree traversals – preorder, inorder and postorder, binary search tree (BST) with insertion, deletion and searching operations, extended binary tree and its application in Huffman tree, Introduction to graph, types of graph, traversal algorithms in graph – breadth first search, depth first search.

Unit V: Heap, Priority Queues, B-Tree, AVL, Splay Tree, Red-Black Tree, Threaded Tree. Elementary Graph algorithms: Minimum spanning trees, Kruskal's algorithm, Prim's algorithm. Single source shortest path, all pair shortest path.

Text Book::

- Sartaj Sahni, "Fundamentals of Data Structures", Tata Mc Graw Hill, New York
- Seymour Lipschutz., "Data Structures with C", Schaum's Outline Series
- Narasimha Karumanchi, "Data Structures and Algorithms" Made Easy
- Corman et al: "Introduction to Computer Algorithms", the Massachusetts institute of Technology, Cambridge, Massachusetts.

Reference Books:

- Langsam, Augestein, Tenenbaum: Data Structures using C and C++
- Weiss: Data Structures and Algorithm Analysis in C/C++
- Samir K. Bandyopadhyay," Data Structures using C"
- Hopcraft, Ullman: Data Structures and Algorithms

Evaluation Scheme:

Component & Nature	Duration	Marks / Weightage
T1	1 hr	15
T2	1&1/2 hrs	25
T3	2hrs	35
Tutorials		05
Attendance		05
Quiz		05
Assignments		10
Total		**100**

Title: Signals & Systems **Code: EC103**

L-T-P Scheme: 3-1-0 **Credits:4**

Prerequisite: Students must have already studied courses, "*Electrical Science*".

Objective:

1. To study the fundamentals of signals and systems.
2. To learn the concept of time domain and frequency domain analysis with the help of various signals transforms methods.

Learning outcomes:

Course Outcome	Description
CO1	Outline basics of signals and systems with respect to their needs in the digital and analog communication. Classification of signals and systems and examples of their applications.
CO2	Description of the LTI systems and their implementation using Matlab concepts.
CO3	Development of Fourier series and Fourier transform of continuous and discrete time signals using Matlab.
CO4	Identification and use of the Fourier transform, z-transform and Laplace transform, and their use in communication.
CO5	Application of various transforms methods on a given assignment.
CO6	Demonstration and deployment of questions based on transforms using Matlab.

Course Content:

Unit-1: Continuous-time and discrete-time signals, signal energy and power, periodic signals, even-odd signals, exponential and sinusoidal signals, Unit impulse and step functions, continuous and discrete time systems, System classifications.

Unit-2: Convolution integral and convolution sum, properties of LTI systems, LTI systems described by differential and difference equation, response of LTI systems.

Unit-3: Fourier series representation of continuous and discrete time signals, properties, Fourier Transform representation of continuous-time and discrete time signals, properties, system characterization by linear constant coefficient difference equation.

Unit-4: The Laplace Transform, ROC, properties of Laplace-transform, analysis and characterization of LTI systems using Laplace Transform, Stability and Causality using Laplace Transform.

Unit-5: The z-transform, ROC and pole-zero-plot, properties of z-transform, analysis and characterization of LTI systems using z-transform, Stability and Causality criterion.

Unit-6: Introduction to DSP, Random Variable and Random Processes, probability density function, mean, variance, correlation function, power spectral density.

Teaching Methodology:

This course is introduced to help students to understand the basics of signals and systems. Starting from frontend development, the student will slowly progress to learn other aspects of communication. Transforms that is helpful for a EC engineer. The entire course is based on: Fundamental and Designing, Matlab tools & Technologies and brief idea of the DSP. Each section includes multiple transforms to help a student gain basic knowledge of digital communication. This theory course is well complemented by a laboratory course under the name Signals & Systems Lab in the same semester that helps a student to learn with hand-on experience.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on Unit-2, Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:
Tutorials and lecture notes/slides on Signals & Systems (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

[1] A.V. Oppenheim &A.S.Willsky & S.H. Nawab, Signals & Systems, Prentice Hall
[2] Hwei P. Hsu, Signals & Systems, Schaum's Outline, McGraw-Hill.
[3] B.P.Lathi, Signal Processing and Linear Systems, Cambridge Press, Carmichael, CA 1998

Reference Books:

[1] Symon Haykin, Signal & Systems, John Willey and Sons.

Web References:

[1] https://swayam.gov.in

Journals References:

[1] Journal of Signal Processing Systems - Springer
[2] Signal Processing - Journal - Elsevier

Title: Analog Electronics **Code: EC104**

L-T-P Scheme: 3-1-0 **Credit: 4**

Prerequisite: Students must have already studied courses, "*Electrical Science*".

Objective:

1. Extend knowledge of the theory and applications of transistors and transistor amplifier, operational amplifier, integrated circuits.
2. The concepts and use of feedback and feedback (amplifier) design.
3. To provide sufficient knowledge and experience so that students will be able to the use of a variety of analog electronic components.

Learning Outcomes:

1. The students shall acquire the generic skills to design and implement of basic electronics circuits and op-amp based circuits. The student will be able to:

Course Outcome	Description
CO1	Demonstrate the use of various review of diode and transistor in various applications.
CO2	Discuss and explain the working of transistors and operational Amplifiers, their configurations and applications.
CO3	Determine operating point and various stability factors of transistor.
CO4	Analyze low and high frequency transistor model. Evaluate the performance parameters of various multistage and power amplifiers.
CO5	Analyze the concept of feedback amplifier and its characteristics. Design oscillator circuits and analyze its performance.
CO6	Design oscillator circuits and analyze its performance.

Course Content:

Unit-1: Introduction: Review of Diode and BJT, Working of a transistor, Transistor current equation, Collector reverse saturation current, DC alpha of a transistor. The three configurations, CB and CE input and output characteristics, DC load line, transistor as an amplifier.

Unit-2: Field-Effect Transistor (FET): Junction Field-Effect Transistor (JFET): Basic construction, Types of FET, Pinch-off voltage, Drain saturation current, Output and transfer characteristics, MOSFET, Types MOSFET, Threshold voltage, Depletion and Enhancement type MOSFET-Construction, Operation and their Characteristics.

Unit-3: Transistor Biasing: Need of biasing, Choice of operating region, Need for bias stabilization, Fixed bias circuit, Analysis of fixed bias circuit, Saturation point. Emitter-feedback bias circuit, its analysis and drawbacks, Emitter-bias circuit, its analysis, Collector to base bias and its analysis, Voltage divider bias circuit, approximate analysis, more accurate analysis, Analysis of fixed bias circuit, Saturation point. Biasing of FET, Bias stabilization of JFET, Biasing of MOSFETs.

Unit-4: Single stage and Multistage Amplifiers: Biasing for the BJT amplifier design, AC analysis of BJT Common Emitter, Common Base and Common Collector BJT amplifiers, Small signal equivalent and large signal models of BJT. Biasing for the FET amplifier design, AC analysis of FET Common source amplifier, Common Gate and Common Drain amplifiers, Miller Theorem, Small-signal high-

frequency hybrid-pi model of a BJT, Calculation of bandwidth of single and multistage Amplifiers.

Unit-5: Operational Amplifier: General configuration and basic stages of an operational amplifier (Op-amp). Analysis of simple BJT op-amp, Op-amp parameters: ideal and practical. Ideal characteristics of an operational Amplifier – Differential Amplifier. Linear and non-linear applications of op-amp..

Unit-6: Feedback Amplifiers: Advantages of negative feedback, Loop gain, feedback factor, Closed-loop gain. Basic feedback topologies: Series- Shunt, Series-Series, Shunt-Shunt and Shunt-Series configurations, oscillators.

Teaching Methodology:

Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15	Based on Unit-1, & Unit-2
Test-2	25	Based on Unit-1, Unit-2, Unit-3 & Unit-4 and around 30% from coverage of Test-1
Test-3	35	Based on Unit-1, Unit-2, Unit-3, Unit-4, Unit-6 and around 30% from coverage of Test-2
Assignment	10	Based on Unit-1, Unit-2, Unit-3, Unit-4 Unit-5, & Unit-6
Tutorials	5	Based on Unit-1, Unit-2, Unit-3, Unit-4 Unit-5, & Unit-6
Quiz	5	Based on Unit-1, Unit-2, Unit-3, Unit-4 Unit-5, & Unit-6
Attendance	5	Based on attendance in the theory classes
Total	**100**	

Learning Resources:

Tutorials sheets, lecture slides and handwritten notes on Analog Electronics (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

[1] J. Milliman and C.C.Halkias: Integrated Electronics, Mc Graw Hill
[2] Bolleystead, Electronic Devices and Circuits
[3] Ramakant A.Gayakwad: Op-Amps and Linear Integrated Circuits, P.H.I.
[4] D.S. Chauhan & D.C. Kulshreshtha, 'Electronics Engineering', New Age, 2e, 2009.
[5] D.C. Kulshreshtha, 'Electronic Devices and Circuits', New Age, 2e, 2006.

Reference Books:

[1] David A. Bell: Electronics Devices & Circuits, PHI
[2] J B Gupta: Electronics Devices & Circuits

[3] Kumar and Jain, 'Electronic Devices and Circuits', PHI, 2007.
[4] Boylstad and Nashelsky, 'Electronic Devices and Circuits', PHI, 6e, 2001.

Web References:

[1] https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-101-introductory-analog-electronics-laboratory-spring-2007/study-materials/
[2] https://www.sanfoundry.com/1000-analog-circuits-questions-answers/
[3] https://www.examveda.com/electrical-engineering/practice-mcq-question-on-analog-electronics/

Journals References:

[1] Analog Integrated Circuits and Signal Processing International Journal, Springer
[2] Electrical, Electronics and Telecommunications Journals
[3] Springer journal of Electrical and Electronics

Title: Measurement & Instrumentation **Code: EC105**

L-T Scheme: 3-0-0 **Credits: 3**

Prerequisite: Nil

Objectives:

1. To introduce students to the automatic measurement process.
2. To understand students how different types of meters work and their construction.
3. To provide a student knowledge of the various types of sensors and their signal conditioning circuits.
4. To develop the ability to use modern tools necessary for hardware projects.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the measurement process and instrument characteristics concerning their needs in the industry.
CO2	Describe the working principle and operation of various types of measuring instruments.
CO3	Develop a measurement setup to meet industry expectations.
CO4	Identify and use various electrical instruments used in the measurement process.
CO5	Apply error analysis on a given measurement setup.
CO6	Demonstrate the application of various measurement devices.

Course Contents

Unit 1: Fundamentals of Measurement: Measurement Methods, Generalized measurement System, Classification of Instruments, Static & Dynamic Characteristics, Errors & Uncertainty measurement of system, Linear & Non-linear Systems.

Unit 2: Transducers: Transducers – Classification of transducers, Temperature transducer, Pressure transducer, Displacement transducer, Strain gauge, LVDT, RTD, Thermistor, Thermocouple, Piezo-electric transducer.

Unit 3: Signal Conditioning Circuits: D.C. bridges and their application in measurement of resistance, Kelvin's double bridge, A.C. Bridges- general equation, Potentiometer- DC potentiometer, multi-range potentiometer, Q-meter and its applications. Amplifiers, Attenuators, Filters, Instrumentation Amplifier, Analog to digital converts.

Unit 4: Electrical Instruments: Moving coil, Moving iron, PMMC, Dynamometer and Induction type instruments, Measurement of Voltage, Current, Power, Power Factor, Energy, Instrument Transformer - current and potential transformer, Measurement of Phase & Frequency.

Unit 5: Signal Generators and Display Devices: Multivibrators: a stable, monostable and bistable types. Generation of square and triangular waveforms. IC 555 timer and its application in multivibrators. Construction & working of Basic CRO, its Components (Deflection plates, Screen, Aquadag, Time Base Generator, Oscilloscope Amplifiers), Measurements of phase and frequency (Lissajous Patterns), Types of CRO, Special types of CRO, Types of CRO Probes. Digital Voltmeter.

Teaching Methodology:

This course is introduced to familiarize the student with the devices and processes utilized in the automation industry. Starting from the basic concepts, the student will gradually develop an

understanding of practical setups used in the industry. The entire course is broken down into five units, such that each unit covers a particular aspect of the measurement process. This theory course is well complemented by a laboratory course under the name Measurement and Instrumentation Lab in the same semester that helps a student learn with hands-on experience.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1, Unit-2 (Selected topic)
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:
Tutorials and lecture slides on Measurement & Instrumentation (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

[1] A.K.Sawhney & Puneet Sawhney, A Course in Mechanical Measurements and Instrumentation, 12/e, Dhanpat Rai & Co. (P) Ltd.,2004
[2] Albert D.Helfrick & William D.Cooper, "Modern Electronic Instrumentation and Measurement Technique",Low Price Edition, Pearson Education, 2005
[3] Ernest O.Doebelin, "Measurement Systems Application and Design", 5/e, Tata McGraw –Hill Publishing Company Ltd., 2004

Reference Books/Materials:

[1] H.S.Kalsi, "Electronic Instrumentaion", Technical Education Series, Tata McGraw –Hill Publishing Company Ltd.,2001
[2] D.C. Kulshreshtha, "Principles of Electrical Engineering", Tata McGraw Hill Publishing Co

Web References:

[1] https://nptel.ac.in/courses/108105153/
[2] https://nptel.ac.in/courses/108/105/108105064/

Journals References:

[1] International Journal of Instrumentation Technology (Inderscience)
[2] IEEE Transactions on Instrumentation and Measurement

Title: Environmental Science **Code: GE101**

L-T-P Scheme: 2-0-0 **Credit: 2**

Prerequisite: The students must be aware of basic Environmental Science upto class 12^{th}. Basic knowledge of Environmental Science helps them to correlate in various division of Engineering during this course.

Objective:
The purpose behind this course is to make the students familiar with Environment (surrounding) and to understand the significance/importance of natural resource, biodiversity, environment pollution and impact of intervention of human being in the Ecosystem. This course is mandatory for all branches of the Engineering and Sciences.

Course Learning Outcomes:

Course Outcome	Description
CO1	The outline, outcomes and attributes provide students with learning experiences that help in learning the significance and importance of environment in their life.
CO2	Describe the real world problems, challenges with the suitable case study based on conservation (natural resource and biodiversity), ecosystem, socio-economic development and remedial measure of the various pollutions (air, water, soil, noise and radiation).
CO3	Develop in students the ability to apply the knowledge and skills they have acquired to the solution of specific theoretical and applied problems in their surrounding (the Environment).
CO4	Identify and use of various techniques for solving the Environmental Problems.
CO5	Apply filed visit and justification by using various analytical techniques.
CO6	Demonstrate students with the knowledge and skill base that would enable them to undertake further studies in the Environmental Science and related multidisciplinary areas that involve Environmental Science and help to develop a range of generic skills that are relevant to wage employment, self-employment and entrepreneurship.

Modules	Description	No. of lectures
Unit 1:	Introduction to Environmental Science: Multidisciplinary nature of environmental science; components of environment –atmosphere, hydrosphere, lithosphere and biosphere. Scope and importance; Concept of sustainability and sustainable development.	2
Unit 2:	Ecosystems: What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chain, food web and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	4
Unit 3:	Natural Resources: Renewable and Non-renewable Resources • Land Resources and land use change; Land degradation, soil erosion and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). • Heating of earth and circulation of air; air mass formation and precipitation. • Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	5
Unit 4:	Biodiversity and its conservation: Levels of biological diversity: genetic, species and ecosystem diversity; Biogeography zones of India; Biodiversity patterns and global biodiversity hot spots. • India as a mega-biodiversity nation; Endangered and endemic species of India. • Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ Conservation of biodiversity. • Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	4
Unit 5:	Environmental Pollution: Environmental pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution. • Nuclear hazards and human health risks. • Solid waste management: Control measures of urban and industrial waste. • Pollution case studies.	5
Unit 6:	Environmental Policies & Practices: Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.• Environment Laws : Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; International agreements; Montreal and Kyoto protocols and conservation on Biological Diversity (CBD). The Chemical Weapons Convention (CWC). • Nature reserves, tribal population and rights, and human, wildlife conflicts in Indian context.	4
Unit 7:	Human Communities and the Environment Human population and growth: Impacts on environment, human health and welfares.	4

	• Carbon foot-print. • Resettlement and rehabilitation of project affected persons; case studies. • Disaster management: floods, earthquakes, cyclones and landslides. • Environmental movements: Chipko, Silent valley, Bishnios of Rajasthan. • Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. • Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).	
Unit 8:	Field Work: Visit to a local area to document assets-river / forest / grassland /hill / mountain. polluted sites(Urban, rural ,industrial, agriculture), plants, insects, bird, Ecosystem (pond, river, hill slopes etc)	4
	Total	**32**

Teaching Methodology:

The core module Syllabus for Environment Science includes class room teaching and Field Work. The syllabus is divided into eight units covering lectures. The first seven units will cover 28 lectures, which are class room based to enhance knowledge skills and attitude to environment. Unit eight is based on field activities which will be covered in 4 lecture hours and would provide student firsthand knowledge on various local environmental aspects. Field experience is one of the most effective learning tools for environmental concerns. This moves out of the scope of the text book mode of teaching into the realm of real learning in the field, where the teacher merely acts as a catalyst to interpret what the student observes or discovers in his/her own environment. Field studies are as essential as class work and form an irreplaceable synergistic tool in the entire learning process. Course material provided by UGC for class room teaching and field activities is utilized.

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	Based on Unit-1 Unit 2 and Unit-3
Test-2	25 Marks	Based on Unit-4 & Unit-5 (70 %) and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6 to Unit-7 and around 30% from coverage of Test-1 and Text-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:

Tutorials and lecture slides on Web Development (will be added from time to time): Digital copy will be available on the JUET server.

Text Book

1. Bharucha Erach, 2003. The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmadabad – 380013, India.
2. De Anil Kumar, Environmental Chemistry, Wiley Eastern Ltd, 2007.
3. Agarwal KC, 2001. Environmental Biology, Nidhi Publishers Ltd. Bikaner.

Reference Book

1. Brunner RC, 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480pgs.
2. Clark R B, Marine Pollution, Clanderson Press, Oxford (TB).2001.
3. Cunningham WP, Cooper TH, Gorhani E & Hepworth MT, 2001. Environmental Encyclopedia, Jaico Publishing House, Mumbai, 1196 pgs.
4. Gleick HP, 1993. Water in Crisis, Pacific Institute for Studies in Development, Environment and Security. Stockholm Environmental Institute, Oxford University Press, 473pgs.
5. Heywood VH, and Watson RT, 1995. Global Biodiversity Assessment. Cambridge University Press 1140pgs.
6. Jadhav H and Bhosale VM, 1995. Environmental Protection and Laws. Himalaya Publishing House, Delhi 284pgs.
7. Mckinney ML and Schoch RM, 1996. Environmental Science Systems and Solutions. Web enhanced edition, 639pgs.

Title: Data Structures and Algorithms Lab **Code: CS220**

L- T-P Scheme: 3-0-0 **Credit: 3**

Prerequisite: Students must have already registered for the course, "Software Development Fundaments" (18B11CI111).

Objective:
This course develops:
1. problem solving ability using programming
2. ability to express solutions to problems clearly and precisely
3. ability to design and analyze algorithms
4. introduces with fundamental data structures
5. Strengthen ability to design and evaluate ADTs, nonlinear temporary and persistent data structures and related algorithms.

Learning outcomes:

Course Outcome	Description
CO1	List various types of data structures with respect to their requirements in different fields.
CO2	Describe the various methods to evaluate the algorithms.
CO3	Develop algorithms based on linear and non-linear data structures
CO4	Identify the suitability of the data structures and algorithms as per the requirements.
CO5	Apply data structures to develop efficient algorithms.
CO6	Demonstrate the learning of the course to solve the real life programming problems.

Course content:
This course is intended to provide a thorough introduction to the use of data structures in programming. This course will cover the necessary mathematical background, but will assume the required programming experience.

Unit I: UNIT 1: Introduction to Data Structures, Algorithm and Complexity
Data structure overview, need of data structure and how to select relevant data structure for given problem, basic C data types and ADT. Algorithm overview and its properties, problem analysis and construction of algorithm, difference among algorithm, program, and software, algorithm analysis and complexity, asymptotic notations to represent the time complexity.

UNIT II: Searching and Sorting
Overview, memory representation of 1D and 2D array, sparse matrix, operation supported by an array, Linear search, binary search (iterative), binary search (recursive), Sorting, Types of sorting algorithms, bubble sort, selection sort, insertion sort, quick sort, merge sort, heap sort, radix sorting, counting sorting, Bucket Sorting.

UNIT III: Linear data structures
Linked list, types of linked list, and operations on linked lists. Stack overview, stack implementation

using array and linked list, basic operations on stack, applications of stack – evaluation of mathematical expression, conversion of expression from one form to another (Polish Notation), Tower of Hanoi problem. Queue overview, basic operations on queue – enqueue, dequeue, implementation of queue using array and linked list, types of queue - linear queue, circular queue.

UNIT IV: Non-linear data structures
Tree definition and its terminology, representation of graph using array and linked list, tree traversals – preorder, inorder and postorder, binary search tree (BST) with insertion, deletion and searching operations, extended binary tree and its application in Huffman tree,
Introduction to graph, types of graph, traversal algorithms in graph – breadth first search, depth first search.

Unit V: Heap, Priority Queues, B-Tree, AVL, Splay Tree, Red-Black Tree, Threaded Tree. Elementary Graph algorithms: Minimum spanning trees, Kruskal's algorithm, Prim's algorithm. Single source shortest path, all pair shortest path.

Teaching Methodology:

Evaluation Scheme:

Exams	Marks	Coverage
Test-1	15 Marks	
Test-2	25 Marks	
Test-3	35 Marks	
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:
Tutorials and lecture notes/slides on Data Structures and Algorithm (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. Sartaj Sahni, "Fundamentals of Data Structures", Tata Mc Graw Hill, New York
2. Seymour Lipschutz., "Data Structures with C", Schaum's Outline Series
3. Narasimha Karumanchi, "Data Structures and Algorithms" Made Easy
4. Corman et al: "Introduction to Computer Algorithms", the Massachusetts institute of Technology, Cambridge, Massachusetts.

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Reference Books:

1. Langsam, Augestein, Tenenbaum: Data Structures using C and C++
2. Weiss: Data Structures and Algorithm Analysis in C/C++
3. Samir K. Bandyopadhyay," Data Structures using C"
4. Hopcraft, Ullman: Data Structures and Algorithms

Web References:

Journals References:

Title: Signals & Systems Lab **Code: EC203**

L-T-P scheme: 0-0-2 **Credit: 1**

Prerequisite: Students must have already studied the courses, "*Electrical Science Lab*" and *"Physics-1 Lab"*.

Objective:

1. To learn and be able to understand the characteristics of Signals by using the MATLAB.
2. To develop the abilities to design the applications of communication systems based on the signal processing.

Learning Outcomes:

Course Outcome	**Description**
CO1	Outline basics of signals and systems with respect to their needs in the digital and analog communication. Examples of MATLAB Programs.
CO2	Description of the LTI systems and their implementation using MATLAB concepts.
CO3	Development concept of Fourier series and Fourier transform of continuous and discrete time signals using MATLAB.
CO4	Identification and use of the Fourier transform, z-transform and Laplace transform, and their implementation in MATLAB.
CO5	Application of various transforms methods on a given assignment.
CO6	Demonstration and deployment of questions based on transforms using MATLAB.

Course Content:

Unit I: Lab exercise based on continuous-time and discrete-time signals, signal energy and power, periodic signals, even-odd signals, exponential and sinusoidal signals, Unit impulse and step functions, continuous and discrete time systems, System classifications.

Unit II: Lab exercise based on **c**onvolution integral and convolution sum, properties of LTI systems, LTI systems described by differential and difference equation.

Unit III: Lab exercise based on Fourier series representation of continuous and discrete time signals, Fourier Transform representation of continuous-time and discrete time signals.

Unit IV: Lab exercise based on **t**he Laplace Transform, ROC, properties of Laplace-transform.

Unit V: Lab exercise based on **t**he z-transform, ROC and pole-zero-plot, properties of z-transform, and analysis.

Unit VI: Lab exercise based on Random Variable and Random Processes function.

Teaching Methodology:

This course is based on: Fundamental and Designing, MATLAB tool. Brief idea of the DSP. Each section includes multiple transforms to help a student gain basic knowledge of digital communication system design. This laboratory course that helps a student learn with hand-on experience.

Evaluation Scheme:

Exams		**Marks**	**Coverage**
P-1		15 Marks	Based on Lab Exercises: 1-6
P-2		15 Marks	Based on Lab Exercises: 6-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:

Lab Manual of Signals & Systems Lab. Digital copy will be available on the JUET server.

Text Book:

[1] Laboratory Manual available in Lab
[2] Study material available in related folder of Server
A.V. Oppenheim &A.S.Willsky & S.H. Nawab, Signals & Systems, Prentice Hall
[3] Hwei P. Hsu, Signals & Systems, Schaum's Outline, McGraw-Hill.
[4] B.P.Lathi, Signal Processing and Linear Systems, Cambridge Press, Carmichael, CA 1998

Reference Books:

1. Symon Haykin, Signal & Systems, John Willey and Sons.

Web References:

[1] https://swayam.gov.in

Journals References:

[1] Journal of Signal Processing Systems - Springer
[2] Signal Processing - Journal - Elsevier
[4] ACM Transactions on the Information Systems
[5] ACM Transactions on Graphics
[6] ACM Transactions on Internet Technology

Title: Analog Electronics Lab **Code: EC204**

L-T-P Scheme: 0-0-2 **Credit: 1**

Prerequisite: Student must have already registered for the course, "Electrical science"

Objective:

1. Students will be capable to acquire the knowledge of bread board implementation of analogue circuits.
2. They will be able to understand the difference between expected output and actual output of any analogue circuits.

Learning Outcomes:

1. They will be able to understand the difference between expected output and actual output of any analogue circuits.
2. The students will be able to understand the reason due to that actual output differ from the expected output.

Course Outcome	Description
CO1	Design and analysis of op-amp amplifier
CO2	Performance of rectifier
CO3	Design and implement of filter Circuits Plot and plot its frequency response.
CO4	Design and implement Oscillators circuits.
CO5	Demonstrate square wave and triangular wave generator
CO6	Mathematical operation using Op-Amp

Course Content:

1. Design and analysis of Inverting amplifier, non-inverting amplifier and voltage follower.
2. To test the performance of Half-wave Precision Rectifier using Op-Amp (IC741).
3. Design and implement an Integrator using 741 Op-Amp IC.
4. Design and implement a first order low pass filter at a high cut off frequency of 1 KHz with a pass band gain of 2 or more. Plot its frequency response.
5. Design and implement a differentiator using 741 Op-Amp IC.
6. Design and implement a first order high pass filter at a high cut off frequency of 10 KHz with a pass band gain of 2 or more. Plot its frequency response.
7. Design and implement a Wein Bridge Oscillator to generate a sinusoidal wave of frequency f_o =1KHz.
8. Design and implement a Phase Shift Oscillator to generate a sinusoidal wave of frequency f_o =200 Hz.
9. Design and implement square wave generator using 741 Op-Amp IC.
10. Design and implement triangular wave generator using 741 Op-Amp IC.
11. Design and Implement a first order wide band pass filter with a cut off frequency 200Hz to 1 KHz and a pass-band gain of 4.Plot its frequency response and hence find out its Q.
12. To implement full wave precision rectifier using 741 Op-Amp IC.
13. Design Summing Amplifier using Op-Amp (741 IC).

Teaching Methodology:
In each experiment the practical is designed and analyzed on bread board with the help of physical devices by each student and further checked and validated by faculty and lab staff.

Evaluation Scheme:

Exams	**Marks**		**Coverage**
P-1	15 Marks		Based on Lab Exercises: 1-6
P-2	15 Marks		Based on Lab Exercises: 7-13
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:
Tutorials sheets, lecture slides and handwritten notes on Analog Electronics lab and viva-voce related digital content is also ensured to available on the JUET server for registered students.

Text Books:

[1] J. Milliman and C.C.Halkias: Integrated Electronics, Mc Graw Hill
[2] Bolleystead, Electronic Devices and Circuits
[3] Ramakant A.Gayakwad: Op-Amps and Linear Integrated Circuits, P.H.I.
[4] D.S. Chauhan & D.C. Kulshreshtha, 'Electronics Engineering', New Age, 2e, 2009.
[5] D.C. Kulshreshtha, 'Electronic Devices and Circuits', New Age, 2e, 2006.

Reference Books:

[1] David A. Bell: Electronics Devices & Circuits, PHI
[2] J B Gupta: Electronics Devices & Circuits
[3] Kumar and Jain, 'Electronic Devices and Circuits', PHI, 2007.
[4] Boylstad and Nashelsky, 'Electronic Devices and Circuits', PHI, 6e, 2001.

Web References:

[1] https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-101-introductory-analog-electronics-laboratory-spring-2007/study-materials/
[2] https://www.sanfoundry.com/1000-analog-circuits-questions-answers/
[3] https://www.examveda.com/electrical-engineering/practice-mcq-question-on-analog-electronics/

Journals References:

[1] Analog Integrated Circuits and Signal Processing International Journal, Springer
[2] Electrical, Electronics and Telecommunications Journals
[3] Springer journal of Electrical and Electronics

Title: Measurement & Instrumentation Lab **Code: EC205**

L-T-P scheme : 0-0-2 **Credit: 1**

Prerequisite: Nil

Objectives:

1. To introduce students to the automatic measurement process.
2. To understand students how different types of meters work and their construction.
3. To provide a student knowledge of the various types of sensors and their signal conditioning circuits.
4. To develop the ability to use modern tools necessary for hardware projects.

Learning Outcomes: In reference to Measurement & Instrumentation (18B11EC314), the students will be able to:

Course Outcome	Description
CO1	Outline the measurement process and instrument characteristics concerning their needs in the industry.
CO2	Describe the working principle and operation of various types of measuring instruments.
CO3	Develop a measurement setup to meet industry expectations.
CO4	Identify and use various electrical instruments used in the measurement process.
CO5	Apply error analysis on a given measurement setup.
CO6	Demonstrate the application of various measurement devices.

Course Content:

Unit 1: Lab exercise based on introduction to DC bridges and measurement of resistance
Unit 2: Lab exercise based on working of AC bridges and measurement of inductance and capacitance
Unit 3: Lab exercise based on operation of transducer for strain and displacement measurement
Unit 4: Lab exercise based on measurement of temperature using active and passive transducers
Unit 5: Lab exercise based on implementation of signal conditioning circuits such as amplifier, analog to digital converter etc.

Teaching Methodology:

This course is introduced to help the students to familiarize with the devices and methods used for automatic measurement. In this course, the mixed technique of interactive discussion, regular assignments will be used. In the discussion the fundamental theoretical concepts will be introduced and demonstrated through examples. Discussion will be implemented in laboratory by using the practical setups.

Evaluation Scheme:

Exams	Marks	Coverage
P-1	15 Marks	Based on Lab Exercises: 1-5

P-2		15 Marks	Based on Lab Exercises: 6-11
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:

Study material of Measurement & Instrumentation Lab (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

[1] Laboratory Manual available in Lab
[2] A.K.Sawhney & Puneet Sawhney, A Course in Mechanical Measurements and Instrumentation, 12/e, Dhanpat Rai & Co. (P) Ltd.,2004
[3] B.C.Nakra & K.K.Chaudhary,Instrumentation Measurement And Analysis, Tata McGraw-Hill Publishing Company Ltd, New Delhi.,1996
[4] D.Patranabis, Principles of Industrial Instrumentation, 2/e, Tata McGraw-Hill Publishing Company Ltd, New Delhi.,1998

Reference Books/Materials:

[1] James W. Dally, William F. Riley & Kenneth G.McConnell, Instrumentation for Engineering Measurements,2/e,Wiley Student Edition, John Wiley & Sons,INC,2003.
[2] John P.Bentley, Principles of Measurement Systems, Low Price Edition, Pearson Education Asia,2000
[3] Dr.D.S.Kumar, Mechanical Measurements and Control, 3/e, Reprint-2004, Metropolitan Book Co. Private Ltd.,2004
[4] Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005.

Web References:

[1] https://nptel.ac.in/courses/108/108/108108147/
[2] https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/112104250/lec21.pdf
[3] https://www.electronics-tutorials.ws/io/io_1.html

Journals References:

[1] Sensors and Actuators A: Physical (Elsevier)
[2] Journal of Sensors (Hindawi)

Title: Programming in Python **Code: CS002**

L-T-P scheme: 0-0-2 **Credit: Audit**

Prerequisite: No explicit prerequisite course work is required, but students are expected to have a fundamental understanding of basic computer principles and previous experience using a personal computer.

Objective:
To emphasize object-oriented programming. Problem decomposition and principles of programming are stressed throughout the course. Advance aspects of programming may be taken care off through Python.

Learning Outcomes:

Course Outcome	Description
CO1	Installation and understanding features of Python.
CO2	Describe Python data types to handle programming problems
CO3	Develop understanding looping to handle new data types
CO4	Identify appropriate methods to solve challenging problems.
CO5	Apply programming knowledge to solve real world problems in the form of Project

Course Contents:

An Introduction to Python: Introductory Remarks about Python, Strengths and Weaknesses, A Brief History of Python, Python Versions, Installing Python, Environment Variables, Executing Python from the Command Line, IDLE, Editing Python Files, Getting Help, Dynamic Types, Python Reserved Words, Naming Conventions.

Basic Python Syntax: Introduction, Basic Syntax, Comments, String Values, String Operations, The format Method, String Slices, String Operators, Numeric Data Types, Conversions, Simple Input and Output, The print Function.

Language Components: Introduction, Control Flow and Syntax, Indenting, The if Statement, Relational Operators, Logical Operators, True or False, Bit Wise Operators, The while Loop, break and continue, The for Loop.

Collections: Introduction, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections, Summary.

Functions: Introduction, Defining Your Own Functions, Parameters, Function Documentation, Keyword and Optional Parameters, Passing Collections to a Function, Variable Number of Arguments, Scope Functions- “First Class Citizens”, Passing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Closures.

Text Book

1. Programming Python /Mark Lutz.

Reference Books

1. Think Python / Allen B Downey
2. Python 101 / Dave Kuhlman

Evaluation scheme:

Exams		**Marks**	**Coverage**
P-1		15 Marks	Based on Lab Exercises: 1-7
P-2		15 Marks	Based on Lab Exercises: 8-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

4th Semester

HSS Elective – 1

Title: Concept of Digital Marketing **Code: 18B14HS441**

L-T-P Scheme: 3-0-0 **Credit: 3**

Prerequisite: None

Objective:

1. Learn cutting-edge Digital Marketing techniques like Search Engine Optimization, Search Engine Marketing, Social Media Marketing, Mobile Marketing, Analytics and Digital Strategy.
2. Measure, Analyze and Optimize Social Media Marketing Campaigns

Learning Outcome
At the end of the course, the students should:

Course Outcome	Description
CO1	Develop successful written, visual, and digital communication skills essential for a career in digital marketing including social media marketing. Discuss the key elements of a digital marketing strategy.
CO2	Apply digital marketing methods to select the best digital & social media tools for the target audience to achieve optimum results.
CO3	Acquire and illustrate social media listening skills for effective evaluation of social media tools and marketing.
CO4	Understand the need to identify cultural, global and societal influences to digital marketing.
CO5	Identify the social trends that influence digital and social media tools and strategy.
CO6	Describe how changing technology impacts the Digital Marketing environment.

Course Description
Unit 1: Introduction to Digital Marketing, Strategies in Digital Marketing. Search Engine Optimization – (Understand the search engine as default entry point to internet. Learn how to get website listed among top search engine results) - Search Engine working, Crawlers, ranking algorithm and techniques.Types of search engines, white hat SEO, black hat and grey hat SEO, on page optimization and techniques.

Unit 2: Search Engine Marketing – Basics of marketing, Inbound and outbound marketing, Appreciate the role of pay per click in website listing. Learn how to effectively run ads on Search Engines. Email Marketing– Learn how to effectively build your users lists, deliver e-mails & generate relevant clicks.

Unit 3: Social Media Marketing– Learn how to build brand, generate leads & aggregate audience on social media. Inbound Marketing– Learn how to attract & convert customers by earning their trust through various techniques such as content marketing.

Unit 4: Web Analytics – Basic web analytics process, web analytics technologies, log file analysis, Best Web Analytics Tools: Clickstream Analysis Tools, Content and Blog Marketing– Increasing audience engagement through content marketing. Learn to use white paper, brochure, and case studies for unique interaction.

Unit 5: Mobile Marketing– Strategizing marketing through smart devices. Learn App-based marketing, QR codes, Location-based marketing, SMS marketing.

Teaching Methodology:
This course will be taught through the Powerpoint, case studies and discussions.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:
Lecture slides and other study material on Digital Marketing (will be added from time to time): Digital copy will be available on the JUET server.

Text Books

1. ” Digital Marketing: Strategy, Implementation & Practice”; Dave Chaffey & Fiona Ellis-Chadwick, Pearson, 2019
2. “The Power of Visual Storytelling”; Ekaterina Walter, McGrawHill, 2014

Web References:
1. https://neilpatel.com › what-is-digital-marketing
2. https://www.digitalvidya.com › blog › learn-digital-marketing-guide

Title: Life Skills **Code: 18B11HS411**

L-T-P scheme: 2**-0-0** **Credit: 2**

Prerequisites*:* **None Objective:**

1. To employ positive behavior management techniques and to develop skills to manage their own behavior effectively
2. To develop one's personality by being aware of the self, connecting with others, reflecting on the abstract and the concrete.
3. To enhance the employability and maximize the potential of the students by introducing them to the principles that underlying personal and professional success, and help them acquire the skills needed to apply these principles in their lives and careers.

Learning Outcomes:

CO1	Outline different life skills required in personal and professional life.
CO2	Describe the application of different theoretical perspectives within the field of motivation and applying these motivation theories to everyday settings (e.g., business, social interactions, education)
CO3	Develop the understanding of personality and shaping behavior through personality
CO4	Identify the basic mechanics of perception by demonstrating these through presentations.
CO5	Apply well-defined techniques to cope with emotions and stress and develop an awareness of the self.
CO6	Understand the basics of leadership and Learning

Course Content:

Unit-1: Overview of Life Skills: Meaning and significance of life skills, Life skills identified by WHO: Self-awareness, Empathy, Critical thinking, Creative thinking, Decision making, problem solving, Effective communication, interpersonal relationship, coping with stress, coping with emotion.

Unit-2: Motivation: Morale and Morale Building, Need and Importance of motivation, Process and types of motivation, Theories of motivation, Essentials of Good Motivation system

Unit-3: Overview of Personality concept and types, Personality traits, Factors that help in shaping personality, Theories of personality, Measurement of personality

Unit-4: Perception: - Factors affecting perception, Perceptual mechanisms Perceptual errors and distortions, Behavioral applications of perceptions

Unit-5: Self Awareness, Coping with emotions: Identifying and managing emotions, harmful ways of dealing with emotions, Stress Management: Stress, reasons and effects, identifying stress, Managing Stress

Unit-6: Conflict Management –sources, process and resolution of conflict

Unit-7: Leadership: Need for Leadership, Models of leadership development, and Characteristics of a good leader.

Unit-8: Learning: Concepts and Theories, classical conditioning, operant conditioning, biological influences, Cognitive influences, social learning theory, Behavioral modification theory

Teaching Methodology:

Life skills are those competencies that provide the means for an individual to be resourceful and positive while taking on life's vicissitudes. This course will equip students with the social and interpersonal skills that enable them to cope with the demands of everyday life. There will be a particular focus on social-cognitive processes and how situational factors trigger various emotions and corresponding motives that can then drive behavior. The main objectives of this course is to build self-confidence, encourage critical thinking, foster independence and help students to communicate more effectively

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1, Unit-2 & Unit-3
Test-2	25 Marks	Based on Unit-4 & Unit-5 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-6, Unit-7 & Unit-8 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:
Case studies, video lectures and lecture slides on Life Skills (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:
1. "Effective

Communication and Soft Skills"; Nitin Bhatnagar, Pearson Education India,1e, 2011
2. "Personality Development and Soft Skills"; Barun Mitra, Oxford Higher Education,2016
3. "Sizzling Soft Skills for Spectacular Success"; P. Ameer Ali, Notion Press, 2017
4. "Organizational Behavior"; Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, Pearson Education India, 16e, 2016
5. "Managing Organisations"; Rachna Chaturvedi, Vikas Publications, 2013

Reference Books/Material:

1. "The Power of Your Subconscious Mind"; Joseph Murphy, General press, 2015
2. "The Life-Changing Magic of Tidying Up: The Japanese Art of De cluttering and Organizing"; Marie Kondō, 1e,Ten speed Press, 2011
3. "The Power of Habit: Why We Do What We Do in Life and Business"; Charles Duhigg, Random House, 2012.

Title: Digital Circuit Design **Code: EC107**

L-T-P Scheme: 3-0-0 **Credit: 3**

Prerequisite: Students must have already studied courses, "*Analogue Electtronics*".

Objective:

1. The objective of this course is to analyze and design combinational circuits and sequential circuits
2. Introduce the concept of memories, programmable logic devices and digital ICs.

Learning outcomes:

1. At the end of the course the student will be able to analyze, design, and evaluate digital circuits, of medium complexity, that are based on SSIs, MSIs, and programmable logic devices.
2. Recognize and apply the number systems and Boolean algebra.
3. Reduce Boolean expressions and implement them with Logic Gates.
4. Analyze, design and implement combinational and sequential circuits.
5. Perform Logic Minimization for single/multiple output function(s) and evaluate the performance of a given Digital circuit/system.
6. Draw the timing diagrams for the identified signals in a digital circuit.

Course Outcome	**Description**
CO1	Recognize and apply the number systems and Boolean algebra.
CO2	Reduce Boolean expressions and implement them with Logic Gates.
CO3	Analyze, design and implement combinational and sequential circuits.
CO4	Perform Logic Minimization for single/multiple output function(s) and evaluate the performance of a given Digital circuit/system.
CO5	Draw the timing diagrams for the identified signals in a digital circuit. Design and implement various types of Counters and registers circuit
CO6	Assess the performance of a given digital circuit with Mealy and Moore configurations. Analyze and differentiate logic families, TTL and CMOS. Compare the performance of a given digital circuits/systems with respect to their speed, power consumption, number of ICs, and cost.

Course Contents:

Unit-1: Conversion of bases, Representation of negative numbers, 9's and 1's complement, 10's and 2's complement, Binary arithmetic, BCD code, Excess-3 code, Gray Code and Alphanumeric code. Logic gates and Boolean algebra, Standard and canonical representation and minimization of Boolean expressions using Karnaugh Map and Quine – McClausky methods.

Unit-2: Half & full adder and subtractor, Parallel adder, BCD adders, Lookahead carry generator. Decoders, Encoders, Multiplexers and De-multiplexers, Code convertor, Comparator, Parity generator and Checker. Binary multiplier.

Unit-3: Flip Flops: SR, JK, Master slave JK, T and D. Shift Registers and their Applications. Synchronous and Asynchronous counters, Design of counters using flip flops.

Unit -4: Moore and Melay machines, State tables, state diagrams and timing diagrams. ROM, PROM, EPROM, EEPROM, PAL, and PLA.

Unit-5: Characteristics of logic families, RTL, DTL, TTL, ECL and CMOS logic family, Interfacing between TTL and CMOS and vice-versa.

Teaching Methodology:

Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15	Based on Unit-1 & Unit-2
Test-2	25	Based on Unit-2, Unit-3 & Unit-4 and around 30% from coverage of Test-1
Test-3	35	Based on Unit-3, Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10	Based on Unit-1, Unit-2, Unit-3, Unit-4 & Unit-5
Tutorials	5	Based on Unit-1, Unit-2, Unit-3, Unit-4 & Unit-5
Quiz	5	Based on Unit-1, Unit-2, Unit-3, Unit-4 & Unit-5
Attendance	5	Based on attendance in the theory classes
Total	**100**	

Learning Resources:

Tutorials sheets, lecture slides and handwritten notes on Digital Circuit Design (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

[1] M. Morris Mano, "Digital Design," Pearson Education, 3rd edition,

Reference Books:

[1] Morris Mano, Digital Logic and Computer Design, PHI
[2] 2. Taub and Schilling, Digital Integrated Electronics, McGraw Hill, Int. Ed.
[3] Zainalabdil Navabi, Analysis & Modeling of Digital System, TMH
[4] Charles H. Roth, Jr., Fundamental of Logic Design, Cengage Learning, 5th edition.

Web References:

[1] https://www.sanfoundry.com/digital-circuits-multiple-choice-questions-answers/
[2] https://www.examveda.com/electrical-engineering/practice-mcq-question-on-digital-electronics/

Journals References:

[1] Digital logic circuits, IEEE publisher
[2] Logic Circuits, ScienceDirect, Elsevier
[3] Digital Circuits, ScienceDirect, Elsevier

Title: Analog and Digital Communication **Code: EC108**

L-T-P scheme: 3-1-0 **Credit: 4**

Prerequisite: Students must have already studied courses, "*Signals and System*".

Objective:

1. To learn the principles and techniques of modern communication system.
2. To analyze the performance of communication system in presence of noise.

Learning Outcomes:

Course Outcome	Description
CO1	Understand basic elements of a communication system and signal analysis
CO2	Accomplish the behavior of analog communication in time and frequency domain
CO3	Express the conversion of analog to digital communication system
CO4	Explicit the performance of line codes and methods to mitigate inter symbol interference
CO5	Describe and analyze the various modern digital modulation techniques
CO6	Evaluate the performance of noise in analog communication and Bit error rate in digital communication

Course Content:

Unit-1: Introduction: Electronic communication system, Signal properties, Frequency Translation and spectrum. Baseband and carrier Communication.

Unit-2: Linear Modulation: Principles of Amplitude Modulation (AM), Double Side Band Modulation with suppressed carrier, Single Side Band, Quadrature Amplitude Modulation, Vestigial Side Band modulation, Generation and Demodulation, carrier Acquisition, Superhetrodyne AM receiver.

Unit-3:Exponential Modulation: Concept of Instantaneous Frequency, Bandwidth, Frequency Modulation (FM), Phase Modulation (PM), Armstrong and Indirect Generation, Demodulation, Pre-emphasis and De-emphasis, Stereophonic broadcasting system.

Unit-4:Pulse Modulation: Sampling Theorem, Natural and Flat-top sampling, Pulse Code Modulation (PCM), Quantization, Companding, Differential Pulse Code Modulation(DPCM), Delta Modulation (DM), Adaptive Delta Modulation(ADM), Pulse Amplitude Modulation(PAM), Pulse Width Modulation(PWM), Pulse Position Modulation(PPM).

Unit-5: Digital Modulation schemes: Digital communication system, Line coding, Pulse shaping, Digital Modulation schemes, Amplitude Shift Keying (ASK), Phase Shift Keying (PSK), Frequency Shift Keying (FSK), M-ary communication, Quadrature Amplitude Modulation(QAM), Minimum Shift Keying (MSK) etc, Generation and Reception, Power spectral density, Constellation.

Unit-6: Optimal Reception: Optimal reception of Digital signal, Maximum likelihood detection and Bayes Receiver, Matched Filter, Equalization Techniques.

Unit-7: Multiplexing: Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM).

Unit-8: Noise Analysis: Mathematical representation, Gaussian and white noise characteristics, Noise in analog communication, Calculation of Signal-to-Noise Ratio (SNR) and Bit Error Rate (BER).

Teaching Methodology:
This course is introduced to help students for understanding the basic concept of communication systems. Initially an overview of communication systems along with signals and Fourier Transforms will be discussed briefly. In the first part, Analog communication techniques including AM and FM will be covered and followed by analog to digital conversion using sampling with pulse communication are explained in details. In the second part, digital communication is start from line coding and pulse shaping. Later, modulation techniques such as PSK and MSK etc. will be covered. At the end multiplexing techniques, noise performance on analog communication along with SNR and BER calculation has been evaluated.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15	Based on Unit-1, Unit-2 & Unit-3
Test-2	25	Based on Unit-4 & Unit-5 and around 30% from coverage of Test-1
Test-3	35	Based on Unit-6 to Unit-8 and around 30% from coverage of Test-2
Assignment	10	
Tutorials	5	
Quiz	5	
Attendance	5	
Total	**100**	

Learning Resources:
Tutorials and lecture slides on theory course will be added from time to time and a digital copy of study material will be available on the JUET server.

Text Book:

[1] "Modern Digital and Analog Communications Systems", Lathi B. P., 3rd Edi. , Oxford university press, 2005.
[2] "Principles of Communication Systems", Taub H., Schilling D.L. and Saha G., 3rd Edi., Tata McGraw Hill, 2008.

Reference Books:

[1] "Communications Systems", Haykin S., 4th Edi. , John Wiley and Sons, 2004.
[2] "Digital Communications", Proakis J. G., 4th Edi. , Tata McGraw Hill, 2000.

Web References:

[1] https://www.wisdomjobs.com/e-university/analog-communication-tutorial-1677/
[2] https://www.tutorialspoint.com/principles_of_communication/

Journals References:

[1] International Journal of Communication Systems Wiley publication
[2] International Journal of Digital Communication and Analog Signals

Title: Control System **Code: EC110**

L-T-P Scheme: **3-1-0** **Credits: 4**

Prerequisite: Not Applicable

Objective:

1. To provide knowledge of the various physical system, their mathematical modeling.
2. To analyze the performance of a system using time-domain analysis techniques.
3. To familiarize the student with the basic concept of stability and apply stability analysis techniques.
4. To introduce concepts of controller and designing of convention control schemes.

Learning Outcomes:

Course Outcome	Description
CO1	Outline various control system models with respect to their needs in the industry.
CO2	Describe the working of industrial control systems using the control theory and concepts.
CO3	Develop a mathematical model to represent a physical system.
CO4	Identify the stability conditions of a control scheme.
CO5	Apply time-domain and frequency domain analysis to evaluate the performance of a control system.
CO6	Demonstration and deployment of basic PID controller.

Course Content:

Unit-1: Introduction to control systems: Concept of control system, Open-Loop and Closed-loop systems, Elements of feedback control system. Advantages and applications of close loop control system. Review of laplace transform, Initial final value theorem, Final value theorem.

Unit- 2: Mathematic modeling: Mathematical modeling of electrical systems, mechanical systems, thermal system, liquid level system. Electrical analogues of other dynamic systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Block diagram reduction techniques. Signal Flow graph.

Unit-3: Time Domain Analysis: Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second-order systems based on the time-response.

Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

Unit 3: Frequency Domain analysis and Design: Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Closed-loop frequency response.

Unit 4: Introduction to Controller Design: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs.

Unit 5: State variable Analysis: Concepts of state variables. State variable representation. State space model. Conversion from State Variable model to Transfer Function model, Equivalence between Transfer Function model and State Variable representation. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability.

Teaching Methodology:
This course is introduced to develop the understanding of control systems in various areas of engineering. Starting from the basic concepts, the student will gradually develop an understanding of automatic systems used in the industry. The entire course is broken down into five units, such that each unit covers a particular aspect of the control and automation.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1, Unit-2 (Selected topics)
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:
Tutorials and lecture slides on Control Systems (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:
[1] M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
[2] K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.

Reference Books/Material:
[1] B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
[2] J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009

Web References:
[1] https://nptel.ac.in/courses/107106081/
[2] https://web.stanford.edu/class/archive/ee/ee392m/ee392m.1034/
[3] https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-30-feedback-control-systems-fall-2010/lecture-notes/

Journals References:
[1] IEEE Control Systems
[2] IFAC Journal of Systems & Control, Elsevier
[3] International Journal of Control Systems and Robotics – IARAS

Title: Digital Circuit Design Lab **Code: EC207**

L-T-P Scheme: 0-0-2 **Credit: 1**

Prerequisite: Student must have already registered for the course, "*Analog Electronics Lab*"

Objective:

1. Students will be capable to acquire the knowledge of bread board implementation of digital circuits.
2. The objective of this course is to analyze and design combinational circuits and sequential circuits
3. Introduce the concept of memories, programmable logic devices and digital ICs.

Learning Outcomes:

1. At the end of the course the student will be able to analyze, design, and evaluate digital circuits.
2. Recognize and apply the number systems and Boolean algebra minimization and implement with Logic Gates.
3. Analyze, design and implement combinational and sequential circuits.

CO1	Implementation of Boolean algebra and verification of logic gates
CO2	Reduce Boolean expressions and implement them with Logic Gates and minimization techniques.
CO3	Analyze, design and implement combinational circuits like adder, subtractor and multiplier.
CO4	Analyze, design and implement sequential circuits like flip-flops.
CO5	Perform Logic Minimization for single/multiple output function(s) and evaluate the performance of a given Digital circuit/system.
CO6	Draw the timing diagrams for the identified signals in a digital circuit. Design and implement various types of Counters and registers circuit

Course Content:

Experiment No 1: Familiarization and Verification of logic functions of the TTL ICs.
Activity 1: Verification of AND gate using 7408 IC.
Activity 2: Verification of OR gate using 7432 IC.
Activity 3: Verification of NOT gate using 7404 IC.
Activity 4: Verification of NAND gate using 7400 IC.
Activity 5: Verification of NOR gate using 7402 IC.
Activity 6: Verification of XOR gate using 7486 IC.

Experiment No 2: Implementation of Combinational digital circuits using MSI Logic.
Activity 1: Combinational circuit-1
Activity 2: Combinational circuit-2

Experiment No 3: Implementation of Binary Adders and Subtractors.
Activity 1: Implementation of the Half-Adder.
Activity 2: Implementation of the Full-Adder using two Half-Adders.
Activity 3: Implementation of the Half-Subtractor.
Activity 4: Implementation of the Full-Subtractor using two Half-Subtractors.
Activity 5: Implementation of the 4-Bit Parallel Adder using ICs 7483.

Activity 6: Implementation of the 4-Bit Parallel Subtractor using IC 7483.

Experiment No 4: K-map and Boolean function simplification

Activity 1: Simplify the given digital circuit using K-map and Verify the simplified function by implementing the given circuit and its simplified one.

Activity 2: Simplify the given functions whose minterm canonical formula is given. Implement the two functions with identical inputs and only use NAND gate ICs. Verify your result from the truth table.

Activity 3: Simplify the given Boolean function using minterms and maxterms. Implement both the simplified functions and verify that the functions are complement to each other. Construct the truth table as per your input/output behavior of the circuit.

Experiment No 5: Implementation of code converters (Gray-to-Binary & Binary-to-Gray)

Activity 1: Design and Implement a Binary-to Gray code converter

Activity 2: Design and Implement a Gray-to-Binary code converter

Activity 3: Verify your code converter by converting a Binary-to-Gray and then Gray-to-Binary.

Experiment No 6: Implementation of Multiplexer

Activity 1: Implementation of 2-to-1 Multiplexer using gates.

Activity 2: Implementation of 2-to-1 Multiplexer with enable/disable control signal.

Activity 3: Implementation of 2-to-1 Multiplexer using IC 74157.

Activity 4: Implementation of 4-to-1 Multiplexer using IC 74153.

Activity 5: Implementation of 8-to-1 Multiplexer using 4-to-1 MUX (IC 74153)

Experiment No 7: Implementation of Demultiplexer.

Activity 1: Implementation of 1-to-2 Demultiplexer.

Activity 2: Implementation of 1-to-2 Demultiplexer with enable/disable control signal.

Activity 3: Implementation of 1-to-4 Demultiplexer using IC 74139.

Experiment No 8: Use of Flip-Flop TTL IC in digital system.

Activity 1: Design and Implement NAND gated SR Latch

Activity 2: Design and Implement clocked RS Flip-Flop

Activity 3: Design and Implement D Flip-Flop using IC 7474.

Activity 4: Design and Implement JK Flip-Flop using IC 7476.

Activity 5: Design and Implement Master-Slave JK Flip-Flop.

Experiment No 9: Implementation of 4-Bit Binary Counter.

Activity 1: Implementation of 4-Bit Binary counter using 7493 IC .The clock signal to be given through the pulsar and 1 Hz clock generator, and observe the output through LED.

Activity 2: Draw the waveform of the counter outputs Q_A, Q_B, Q_C and Q_D

Activity 3: Implementation of BCD counter using 7493 IC. Observe the output through seven-segment display.

Activity 4: Implementation of Mod-5 counter using 7493 IC.

Activity 5: Implementation of Mod-7 counter using 7493 IC.

Experiment No 10: Implementation of Shift Registers

Activity 1: Implementation of 4.bit Serial load parallel out (SIPO) shift register using 7474 IC.

Activity 2: Implementation of 4.bit parallel load serial out (PISO) shift register using 7474 IC.

Activity 3: Use of universal shift register IC 74194

Experiment No.11: Implementation of 2-bit Arithmetic Logic Unit (ALU).

Experiment No12: Implementation of BCD-to-Seven Segment Decoder/Driver
Activity 1: Design and Implement BCD-to-seven Segment Decoder
Activity 2: Implement BCD-to-Seven Segment Decoder using IC 7447
Activity 3: Generate the BCD code using binary counter (IC 7493) and display the code through a seven-segment display

Teaching Methodology:

In each experiment the practical is designed and analyzed on bread board with the help of physical devices by each student and further checked and validated by faculty and lab staff.

Evaluation Scheme:

Exams	**Marks**	**Coverage**	
P-1	15 Marks	Based on Lab Exercises: 1-5	
P-2	15 Marks	Based on Lab Exercises: 6-11	
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total	**100 Marks**		

Learning Resources:

Tutorials sheets, lecture slides and handwritten notes on Digital Circuit Design lab and viva-voce related digital content is also ensured to available on the JUET server for registered students

Text Books:

[1] Morris Mano, "Digital Design," Pearson Education, 3rd edition,

Reference Books:

[1] Morris Mano, Digital Logic and Computer Design, PHI
[2] 2. Taub and Schilling, Digital Integrated Electronics, McGraw Hill, Int. Ed.
[3] Zainalabdil Navabi, Analysis & Modeling of Digital System, TMH
[4] Charles H. Roth, Jr., Fundamental of Logic Design, Cengage Learning, 5th edition.

Web References:

[1] https://www.sanfoundry.com/digital-circuits-multiple-choice-questions-answers/
[2] https://www.examveda.com/electrical-engineering/practice-mcq-question-on-digital-electronics/

Journals References:

[1] Digital logic circuits, IEEE publisher
[2] Logic Circuits, Sciencedirect, Elsevier
[3] Digital Circuits, Sciencedirect, Elsevier

Title: Analog and Digital Communication lab **Code: EC208**

L-T-P scheme: 0-0-2 **Credit: 1**

Prerequisite: Students must have already studied courses, "*Signals and System Lab*".

Objective:

1. To learn the principles and techniques of analog communication system.
2. To analyze the performance of pulse and digital communication system.

Learning Outcomes: In reference to Analog & Digital Communication (18B11EC412), the students will be able to:

Course Outcome	**Description**
CO1	Understand basic communication system
CO2	Express the conversion of analog to digital communication system
CO3	Identify different types of pulse communication
CO4	Describe and analyze the various digital modulation techniques
CO5	Demonstrate the concept of multiplexing
CO6	Work as a team on a project.

Course Content:

Unit-1; Lab exercises based on amplitude modulation and frequency modulation
Unit-2; Lab exercises based on analog to digital conversion like as pulse code modulation and sigma delta modulation
Unit-3; Lab exercises based on various pulse modulations such as pulse width and pulse position
Unit-4; Lab exercises based on amplitude shift and frequency shift keying
Unit-5; Lab exercises based on framing and marking in time division multiplexing
Unit-6; Lab exercises based on pseudo noise generation

Teaching Methodology:
This lab course is introduced to help students for understanding the basic concept of communication systems. Initially an analog communication technique will be covered and followed by analog to digital conversion using sampling with pulse communication are explained in details. In the second part, digital modulation will be covered. At the end, framing and marking along in multiplexing and pn sequence generator has been discussed.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
P-1	15 Marks	Based on Lab Exercises: 1-7
P-2	15 Marks	Based on Lab Exercises: 8-14

Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:
Study material of Analog & Digital Communication Lab (will be added time to time): Digital copy will be available on the JUET server.

Text Book:
[1] "Modern Digital and Analog Communications Systems", Lathi B. P., 3rd Edi. , Oxford university press, 2005.
[2] "Principles of Communication Systems", Taub H., Schilling D.L. and Saha G., 3rd Edi., Tata McGraw Hill, 2008.

Reference Books:
[1] "Communications Systems", Haykin S., 4th Edi. , John Wiley and Sons, 2004.
[2] "Digital Communications", Proakis J. G., 4th Edi. , Tata McGraw Hill, 2000.

Web References:
1. https://www.wisdomjobs.com/e-university/analog-communication-tutorial-1677/
2. https://www.tutorialspoint.com/principles_of_communication/

Journals References:
[1] International Journal of Communication Systems Wiley publication
[2] International Journal of Digital Communication and Analog Signals

Title: Hardware Lab **Code: EC209**

L-T-P scheme: 0-0-2 **Credit: 1**

Prerequisite: Students must have already studied the courses, "*Electrical Science Lab*" and "*Digital Circuit Design Lab*".

Objective:

1. Students will be able to understand the identification of different electronic components, use of bread board for testing the circuit.
2. Development of Layout from software, Etching, drilling and soldering process along with fault diagnosis.

Learning Outcomes:

Course Outcome	Description
CO1	Outline various electronic components like diode, transistors, FET's with respect to their needs for the design of various projects
CO2	Description of different type of power supply which will be used to design any hardware circuit.
CO3	Development of the various OP-AMP based circuits to design different type of hardware circuits.
CO4	Identification and use of various logic gate-based circuits to develop control circuit in the hardware circuit.
CO5	Application of various components on a given assignment/ project.
CO6	Demonstration and deployment of basic combinational & sequential circuits.

Course content

Unit 1: Physical identification of different Electronic Components like Diode, transistors, FET's
Unit 2: Different type of Power supply
Unit 3: OP-AMP based Circuits
Unit 4: Logic gate based Circuits
Unit 5: Combinational & sequential Circuits

List of Projects

1. A-stable multivibrator (IC type)
2. Differential Amplifier
3. Regulated power supply (+/-12V -> +/-5V Power unit)
4. Simple amplifier
5. High pass/ low pass Butterworth filter
6. Digital Logic design (Multiplexer, Encoder etc.)
7. Binary weighted register 4 bit D/A Converter
8. Stair-case Signal Generator
9. Water Level Indicator
10. Electronic Heart
11. Note-Pad Lamp for telephone
12. Panic Alarm
13. Traffic Light Controller

14. Single-Supply Sinusoidal Flasher
15. Fastest Finger First

Teaching Methodology:

This course is introduced to help students the basic components and how to develop simple hardware projects with the help of these components.

Evaluation Scheme:

Exams		**Marks**	**Coverage**
P-1		15 Marks	Based on projects: 1-7
P-2		15 Marks	Based on projects: 8-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:

Circuit diagram and component list will be given in the hardware Lab (will be added time to time): Digital copy will be available on the JUET server.

Text Books:

[1] Electronic project book, BPS publication.
[2] Electronics for you (Monthly Magazine).

Reference Books/Material:

[1] "Electronics project management and design", D. Joseph Stadtmiller, Pearson; 1 edition 2000.
[2] "50 Electronics Projects for Beginners", A.K.Maini, Pustak Mahal; First Edition 2007.

Web References:

[1] www.electronicshub.org
[2] https://nevonprojects.com

Journals References:

[1] Journal of Communications Technology and Electronics
[2] IEEE Transaction on communication

5th Semester

HSS Elective – 2

Title: Concept of Economics **Code: 21B14HS547**

L-T-P scheme: 2-1-0 **Credit: 3**

Prerequisite: None

Objectives:

1. The course is concerned with the application of economic principles and methodologies to key management decisions within organizations.
2. It provides principles to foster the goals of the organization, as well as a better understanding of the external business environment in which an organization operates.
3. It is fundamentally a unique way of thinking about problems, issues and decisions that managers face in each of the functional areas of the organization as well as the strategic ones faced by general managers.

Learning Outcomes:

Course Outcome	Description
CO1	Outline what economics is and how micro and macroeconomics differ from each other. Describe basic concepts of Demand and Supply & Elasticity's of demand
CO2	Develop an understanding of factors of production. And demand forecasting
CO3	Identify different types of cost and revenue. Deploy and be proficient in contribution and break-even analysis
CO4	Apply logic to understand different market structures viz Perfect Competition; Monopoly; Monopolistic Competition; and Oligopoly.
CO5	To understand the concept of national income, inflation, monetary policy and fiscal policy and business cycles
CO6	Develop an understanding Foreign Trade of India, Foreign Exchange and Balance of Payments

Course Content:

Unit-1: Introduction of Micro & Macro-economic Concepts: Scope, Micro and Macro economics, Fundamental concepts of Economics, Law of demand**,** Law of Supply Marginal Utility theory, Elasticity of demand – Price, Income, Cross, Advertising, Demand forecasting- Quantitative and Qualitative methods

Unit-2: Production and Cost Theory and Analysis: Production with one variable, optimal employment of a factor of production, Production with two variable inputs, Production Isoquants, Production Isocosts, **Cost Theory and Analysis :** Cost concepts – Opportunity, Explicit, Marginal, Incremental and Sunk, Relation between Production & Cost, Short run cost function, Long run cost function, Profit contribution analysis, Break Even analysis

Unit-3: Pricing under Different Market Structures: Perfect Competition - Determination of Price output relationship in short run, long run, Monopoly -Determination of Price output relationship in short run & long run , Price discrimination, Monopolistic Competition - Determination of Price output

relationship in short run & long run , Product Differentiation ,Oligopoly -Types ,Determination of Price output relationship , Price leadership model, Collusive and Non Collusive Oligopoly

Unit-4: National Income, -concepts, components, Methods and problems in measuring national income, Per capita income, Circular flow of income, Inflation, Monetary and fiscal policy, Business cycles

Unit-5: Foreign Trade of India, Foreign Exchange, Balance of Payments

Teaching Methodology:
Teaching methodology in this course involves classroom lectures as well tutorials. The tutorials allow a closer interaction between the students and the teacher as each student gets individual attention. In tutorials, the teacher will be keeping track of each student's progress and address her/his individual difficulties. Written assignments and projects submitted by students as part of the course will also discussed in tutorials.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1 & Unit-2
Test-2	25 Marks	Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Reference Books/Material:

[1] Osborne, M. (2004), An introduction to game theory. Oxford University Press.
[2] Snyder, C., Nicholson, W. (2010), Fundamentals of microeconomics. Cengage Learning.
[3] Varian, H. (2010), Intermediate microeconomics: A modern approach, 8th ed. W. W. Norton.
[4] Bergstrom, T., Varian, H. (2014),Workouts in intermediate microeconomics. W. W. Norton
[5] Bernheim, B., Whinston, M. (2009). Microeconomics. Tata McGraw-Hill.
[6] Mankiw, N. (2007). Economics: Principles and applications, 4th ed. Cengage Learning.
[7] Snyder, C., Nicholson, W. (2010). Fundamentals of microeconomics. Cengage Learning.

Title: Probability and Random Processes **Code: MA106**

L-T-P scheme: 3-1-0 **Credit: 4**

Prerequisite: Students must have already studied course, "Mathematics-I" and should have the Knowledge of Differential & Integral Calculus.

Objective:

Objective of this course is to provide a foundation in the theory and applications of probability and stochastic processes and an understanding of the mathematical techniques relating to random processes in the areas of signal processing, detection, estimation, and communication. Topics include the axioms of probability, random variables, and distribution functions; functions and sequences of random variables; stochastic processes; and representations of random processes.

Learning Outcomes:

Course Outcome	Description
CO1	Construct sample spaces of random experiments; identify and specify events, and perform set operations on events; compute probabilities by counting; evaluate conditional probability, and apply Bayes' theorem to simple situations.
CO2	Express random variables by using CDFs, PMFs; calculate moments related to random variables; understand the concept of inequalities and probabilistic limits. Understand the axiomatic approach of probability theory and intrinsic need of (functions of) random variables for the analysis of random phenomena.
CO3	Compute probability distributions and correlation measures of bivariate random variables; obtain marginal and conditional distributions of random variables; find probabilities for outcomes of various events related to an uncertain phenomenon using appropriate probability distributions as models.
CO4	Conduct hypotheses tests concerning population parameters based on sample data; perform and interpret chi-square test of goodness-of-fit and test of independence; find the equation of regression line and second degree curve, and to predict the value of one variable based on the value of the other variable.
CO5	Identify and classify random processes and determine covariance and spectral density of stationary and ergodic random processes; demonstrate specific applications to Gaussian process.
CO6	Students are able to provide the theories associated with the random variable and random process. The course particularly provides the student with an ability to apply to real-world problems in the communication and physical systems.

Course Contents:

Unit-1: Random experiments, sample space and events. Three basic approaches to probability, conditional probability, total probability theorem, Bayes' theorem of Probability of causes, Bayes' theorem of future events, total independence, mutual independence and pair wise independence.

Unit-2: One dimensional random variables(discrete and continuous) and their distributions, bivariate distributions, joint, marginal and conditional distributions, characteristic function.

Unit-3: Covariance and correlation of random variables. Some special probability distributions: Binomial, Poisson, probability distributions. Negative Binomial,Geometric and Normal probability distributions. Fitting of probability distributions.

Unit-4: Concept of reliability: Reliability function, Hazard rate function, Mean time to failure, cumulative and average failure rate, Conditional reliability and failure rates, residual MTTF, some special failure rate distributions- exponential distribution and the Weibull distribution, reliability of systems- series configuration and some deductions, parallel- series configuration, series -parallel configuration.

Unit-5: Introduction and description of random processes, average values of random processes, stationary processes and computation of their averages, autocorrelation function and its properties, Cross correlation and its properties. Power spectral density function and its properties. Ergodicity of a random process, Poisson processes.

Teaching Methodology:

The course will be covered through lectures supported by tutorials. Apart from the discussions on the topics covered in the lectures assignments/ quizzes in the form of questions will also be given.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	

Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:

Tutorials and lecture slides on Probability Theory and Random Processes (will be added from time to time): Digital copy will be available on the JUET server.

Text books:

1. T. Veerarajan ,Probability, Statistics and Random Processes, Tata McGraw Hill.
2. J.J. Aunon & V. Chandrasekhar, Introduction to Probability and Random Processes, Mc- Graw Hill International Ed.
3. A. Papoulis & S.U. Pillai, Probability, Random Varibles and Stochastic Processes, Mc-Graw Hill.
4. H. Stark, and J.M. Woods, Probability and Random Processes with Applications to Signal Processing, Pearson Education.

Title: Microprocessor and Interfacing **Code: EC111**

L-T-P Scheme: 3-0-0 **Credit: 3**

Prerequisite: Students must have studied "*Digital circuits design*".

Objective:

1. To introduce 8085 architecture and programming in assembly language.
2. To introduce basic concepts of interfacing memory and peripheral devices to a microprocessor.
3. To introduce serial and parallel bus standards. To introduce various interfacing devices such as 8255, 8254 and 8257.

Learning Outcomes:

Course Outcome	Description
CO1	Outline various basic concepts of microprocessors, evolution, embedded system, and semiconductor memory. Understand Standard Architecture of Intel Microprocessors
CO2	Describe the architecture of 8085, registers, pin configuration, timing and control unit and timing diagram. Learn control components of a microprocessor-based system though the use of interrupts
CO3	Develop the programming skills in assembly language, subroutines, knowledge of addressing modes and instruction set.
CO4	Identify the concepts associated with interfacing a microprocessor to memory and to I/O devices and to learn the programming of peripheral I/O devices.
CO5	Applications of microprocessor Measurement, learn the control components of a microprocessor-based system through the use of interrupts.
CO6	Acquaint with the background knowledge for understanding next-generation CPUs.

Course contents:

Unit-1: Introduction of microprocessor: Evolution of microprocessor, word length, input & output device, single chip microcomputers, embedded microprocessor, semiconductor memory, RAM, ROM, EPROM, cache memory, memory hierarchy.

Unit-2: Microprocessor architecture (Intel 8085): ALU, timing and control unit, registers, data and address bus, pin configuration, Intel 8085 instructions, op-code and operands, instruction word size, Instruction cycle, fetch and execute operation, machine cycle and state, instruction and data flow, timing diagram, Interrupts.

Unit-3: Programming of Microprocessor: Machine, assembly and high level language, Instruction and data format, Addressing modes, status flags, Stacks, Subroutines, Assembly language programs.

Unit-4: Peripheral devices and their Interfacing: Address space partitioning, memory mapped and I/O mapped I/O schemes, Data transfer schemes, I/O ports, Programmable Peripheral interface (8255), Programmable Counter/Interval Timer (8254), Programmable DMA controller (8257), Programmable Interrupt controller (8259), 8251.

Unit-5: Microprocessor-Based data acquisition system: Analog to digital converter (ADC- 0800, 0808/0809), Digital to analog converter (DAC-0800), Delay subroutine, 7-segment display, Display of alphanumeric characters.

Unit-6: Microprocessors Applications: Measurement, Microprocessor based speed control of Stepper motor, Water-level indicator, microprocessor based Traffic light control.

Teaching Methodology:
They can build a project based on the concepts of interfacing between processing machine and real-life application devices. Students will be able to write assembly language programs.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1&Unit-2
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-6 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:
Tutorials and lecture slides on Microprocessor and Interfacing (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

[1] Gaonkar, Ramesh, "Microprocessor Architecture Programmes and Applications 8085, 4th edition, Prentice Hall.
[2] D. V. Hall, "Microprocessors and Interfacing", Tata McGraw-Hill Education, 3rd Edition 2013.
[3] A.K Ray, K. M. Bhurchandani, "Advanced Microprocessors and Peripherals" Tata McGraw-Hill Education, 2nd Edition, 2006.

Reference Books:

[1] B. Ram, "Fundamentals of Microprocessors and Microcontrollers", 7th edition (2010), Dhanpat Rai Publication, India.

Web references:
[1] http://www.daenotes.com/electronics/digital-electronics/Intel-80858bitmicroprocessor#axzz2I9yUSe7I
[2] https://www.smartzworld.com/notes/microprocessors-and-microcontrollers-mpmc/
[3] http://www.iare.ac.in
[4] www.nptel.ac.in

Journals References:
[1] Elsevier Journal on Microprocessors and Microsystems
[2] IEEE Microprocessors and Controllers

Title: Digital Signal Processing **Code: EC112**

L-T-P Scheme: 3-0-0 **Credit: 3**

Prerequisite: Students must have already studied courses, "*Signals & Systems"*

Objective:

1. To enhance comprehension capabilities of students through understanding of designing procedure of digital filters both FIR and IIR using different approaches and their associated structures.
2. To study linear predictors for adaptive signal processing.
3. To learn different adaptive filtering algorithms and obtain results from multirate signal processing.

Learning Outcomes: The students will be able to:

Course Outcome	Description
CO1	Outline various discrete/digital signals and systems, their representation and processing
CO2	Describe concept of frequency domain analysis of discrete time signals
CO3	Develop the concept of basic filters and filtering process and their realization
CO4	Identify different approaches and their associated structures designed for both digital FIR and IIR filters.
CO5	Apply important algorithmic design paradigms and method of analysis.
CO6	Demonstrate the concept of multi-rate signal processing and sampling rate conversion & filtering algorithm for the real time application.

Course Content:

Unit 1: Discrete Signals: Review of Discrete time sequences and systems, Linearity, shift- invariance, causality and stability criterion. **Z-Transform:** Review of Z-transforms, Region of Convergence, Relationship between Z transform and Fourier Transform, Inverse Z-transform and its evaluation, System function and structures of a digital filter.

Unit 2: Discrete Fourier Transforms and FFT: Discrete Time Fourier Transform, Discrete Fourier Transform. Fast Fourier Transform (FFT) algorithms using Decimation in Time and Decimation in Frequency techniques, Chirp Z-transform.

Unit 3: IIR and FIR Filter Design: Basic Structures, Review of approximation of filter functions, Design of IIR filters based on Analog filter functions, Invariant & Modified Invariant Impulse Response techniques, Bilinear transformation method, Direct design approach, Linear phase description of FIR filters, Windowing and Frequency sampling techniques of design, Computer aided design techniques.

Unit 4: Some DSP Applications: Applications in speech processing and power spectrum estimation. Introduction to illustrate applications of DSP in image processing,

Unit 5: Adaptive and Multi-rate Systems: Introduction to Adaptive Filters, Design of Adaptive Filters using various techniques, Decimation & Interpolation, Filter design for Sampling Rate Conversation by a Rational Factor I/D.

Teaching Methodology:

This course is introduced to help the students to design various filters by using window functions. In this

course, the mixed technique of interactive lectures, tutorials, and regular assignments will be used. In the lectures the fundamental theoretical concepts will be introduced and demonstrated through examples. Discussion in lecture will be done using design problems which will be implemented in laboratory individually in Matlab.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1, Unit-2
Test-2	25 Marks	Based on Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 and Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:
Lecture and tutorial slides on Digital Signal Processing (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:
[1] Proakis & Manolakis, Digital *Signal Processing: Principles Algorithms and Applications*, PHI.

Reference Books/ Material:

[1] S.K. Mitra, Digital Signal Processing: A Computer Base Approach, TMH
[2] Andreas Antoniou, Digital Signal Processing: Signals, Systems and Filters, TMH
[3] Texas Instruments, Digital Signal Processing Applications with the TMS 320 Family, Prentice Hall

Web References
[1] www.dspguide.com
[2] www.byclb.com/totorials/dsp advanced

Journal References
[1] IET Signal Processing Journal
[2] Journal of Advanced Research in Signal Processing & Applications, ADR publications
[3] Signal & Image Processing : An International Journal(SIPIJ
[4] EURASIP Journal on Advances in Signal Processing
[5] International Journal of Wireless Personal Communications

Title: Microprocessor and Interfacing Lab **Code: EC210**

L-T-P Scheme: 0-0-2 **Credit: 1**

Prerequisite: Students must have adequate basics of digital electronics.

Objective:
1. To introduce 8085 architecture and programming in assembly language.
2. To introduce basic concepts of interfacing memory and peripheral devices to a microprocessor.
3. To introduce serial and parallel bus standards. To introduce various interfacing devices such as 8255, 8254 and 8257.

Learning Outcomes:

Course Outcome	Description
CO1	Outline based on introduction to 8085 microprocessor kit and practice of commands.
CO2	Describe the architecture of 8085, registers and memory.
CO3	Develop the programming skills in assembly language, subroutines, knowledge of addressing modes and instruction set.
CO4	Identify the concepts associated with interfacing a microprocessor to memory and to I/O devices and to learn the programming of peripheral I/O devices.
CO5	Applications of microprocessor Measurement, learn the control components of a microprocessor-based system though the use of interrupts.
CO6	Acquaint with the background knowledge for understanding next-generation CPUs.

Course contents:
Unit-I: Lab exercise based on familiarization with 8085 microprocessor kit and practice of different commands for Assembly language programming of 8085.

Unit-2: Lab exercise based on transfer of data in different registers and memory locations.

Unit-3: Lab exercise based on addition, subtraction and complement of two 8-bit and 16-bit numbers placed at different memory locations.

Unit-4: Lab exercise based on finding smaller and larger number from two numbers and arranging list of numbers in increasing and decreasing order.

Unit-5: Lab exercise based on finding even and odd numbers and to find square of number from lookup table.

Unit-6: Lab exercise based on interfacing of 8255 PPI and 8253 Programmable timer with 8085.

Teaching Methodology:
They can build a project based on the concepts of interfacing between processing machine and real-life application devices. Students will be able to write assembly language programs.

Evaluation Scheme

Exams	Marks	Coverage

P-1		15 Marks	Based on Lab Exercises: 1-7
P-2		15 Marks	Based on Lab Exercises: 8-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:

Lab manual on Microprocessor and Interfacing lab (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

[4] Gaonkar, Ramesh, "Microprocessor Architecture Programmes and Applications 8085, 4th edition, Prentice Hall.

[5] D. V. Hall, "Microprocessors and Interfacing", Tata McGraw-Hill Education, 3rd Edition 2013.

[6] A.K Ray, K. M. Bhurchandani, "Advanced Microprocessors and Peripherals" Tata McGraw-Hill Education, 2nd Edition, 2006.

Reference Books:

[1] B. Ram, "Fundamentals of Microprocessors and Microcontrollers", 7th edition (2010), Dhanpat Rai Publication, India.

Web references:

[1] http://www.daenotes.com/electronics/digital-electronics/Intel-80858bitmicroprocessor#axzz2I9yUSe7I

[2] https://www.smartzworld.com/notes/microprocessors-and-microcontrollers-mpmc/

[3] http://www.iare.ac.in

[4] www.nptel.ac.in

Journals References:

[1] Elsevier Journal on Microprocessors and Microsystems

[2] IEEE Microprocessors and Controllers

Title: Digital Signal Processing Lab **Code: EC211**

L-T-P Scheme: 0-0-2 **Credit: 1**

Prerequisite: Students must have already studied courses, "*Signals & Systems"*

Objective:

1. To enhance comprehension capabilities of students through understanding of various functions of MATLAB
2. To study various transforms for signal analysis.
3. To learn different windowing techniques for filter design

Learning Outcomes: In reference to Digital Signal Processing (18B11EC413), the students will be able to:

Course Outcome	**Description**
CO1	Outline based on introduction to MATLAB and operation of its various functions, Discrete/digital signals and systems along with their representation.
CO2	Describe concept of linear & circular convolution with MATLAB.
CO3	Develop the concept of various methods such as overlap add and overlap save used for convolution.
CO4	Identify different approaches for implementation of Z-transform, Region of convergence, Inverse Z-transform.
CO5	Apply important approach for time and frequency analysis signal by using Discrete Time Fourier Transform, Discrete Fourier Transform. Fast Fourier Transform (FFT) algorithms by using Decimation in Time and Decimation in Frequency techniques.
CO6	Demonstrate the concept of various windows for FIR and IIR filters design with MATLAB

Course Content:

Unit 1: Lab exercise based on introduction to MATLAB and generation of various signals.
Unit 2: Lab exercise based on implementation of linear & circular convolution with MATLAB
Unit 3: Lab exercise based on implementation of linear convolution using overlap adds and overlaps save methods with MATLAB
Unit 4: Lab exercise based on implementation of Z-transform, region of Convergence, Inverse Z-transform and its evaluation MATLAB
Unit 5: Lab exercise based on Discrete Time Fourier Transform, Discrete Fourier Transform. Fast Fourier Transform (FFT) algorithms using Decimation in Time and Decimation in Frequency techniques
Unit 6: Lab exercise based on implementation of various windows and FIR and IIR filters with MATLAB

Teaching Methodology:
This course is introduced to help the students to design various filters by using window functions. In this course, the mixed technique of interactive discussion, regular assignments will be used. In the discussion the fundamental theoretical concepts will be introduced and demonstrated through examples. Discussion will be implemented in laboratory by using Matlab.

Evaluation Scheme:

Exams	Marks		Coverage
P-1	15 Marks		Based on Lab Exercises: 1-7
P-2	15 Marks		Based on Lab Exercises: 8-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total	**100 Marks**		

Learning Resources:
Study material of Digital Signal Processing Lab (will be added time to time): Digital copy will be available on the JUET server.

Text Books:
[1] "Digital Signal Processing: Principles Algorithms and Applications", Proakis & Manolakis, PHI 4e, 2015.

Reference Books/ Material:

[1]. "Digital Signal Processing: A Computer Base Approach", S.K. Mitra, TMH, 2e, 2005.
[2]. "Digital Signal Processing: Signals, Systems and Filters", Andreas Antoniou, TMH, 4e, 2015.
[3]. "Texas Instruments, Digital Signal Processing Applications with the TMS 320 Family", Prentice Hall,2e,1987

Web References
[1] www.dspguide.com
[2] www.byclb.com/totorials/dsp advanced

Journal References
[1] IET Signal Processing Journal
[2] Journal of Advanced Research in Signal Processing & Applications, ADR publications
[3] Signal & Image Processing: An International Journal (SIPIJ)
[4] EURASIP Journal on Advances in Signal Processing
[5] International Journal of Wireless Personal Communications

Title: Minor Project-1 **Code: EC212**

L-T-P Scheme: 0-0-4 **Credit: 2**

Prerequisite: Students must have already studied the courses**,** "*Hardware Lab*" and "*Digital Circuit Design Lab*".

Objective:

1. Students will be able to understand the identification of different electronic components, use of bread board for testing the circuit.
2. Development of Layout from software, Etching, drilling and soldering process along with fault diagnosis.

Learning Outcomes:

Course Outcome	**Description**
CO1	Outline the project topics with respect to their needs for the society.
CO2	Description of usefulness of the work in the context of present application
CO3	Development of the literature survey in chronological order
CO4	Identification of the problem and the solution of that problem by project.
CO5	Application of the project in the society.
CO6	Demonstration and deployment of basic block diagram/algoritham steps of proposed method

Course Content:

Unit 1: Motivation about Project Topic
Unit 2: Usefulness of the work in the context of present application
Unit 3: Literature survey in chronological order.
Unit 4: Problem Formulation
Unit 5: Study /Analysis of different existing methods based on adequate performance parameters.
Unit 6: Mathematical formulation of proposed method.
Unit 7: Block Diagram/Algorithm Steps of proposed method.

Teaching Methodology:
This course is introduced to help students the basic components and how to develop real time hardware projects which will be helpful to the society.

Evaluation Scheme:

Exams		**Marks**	**Coverage**
Presentation-1		15 Marks	Unit 1-Unit 3
Presentation-2		15 Marks	Unit 4-Unit 5
Presentation-3		20 Marks	Unit 6-Unit 7
Day to Day Work	Attendance	10 Marks	50 Marks
	Sincerity	10 Marks	
	Project report	15 Marks	
	Performance	15 Marks	

Total	**100 Marks**

Learning Resources:
Students with concern to the faculty develop some new idea for preparing the project and related information they will acquire from the faculty and internet.

Text Books:

[1] Electronic project book, BPS publication.
[2] Electronics for you (Monthly Magazine).

Reference Books/Material:

[1] "Electronics project management and design", D. Joseph Stadtmiller, Pearson; 1 edition 2000.
[2] "50 Electronics Projects for Beginners", A.K.Maini, Pustak Mahal; First Edition 2007.

Web References:

[1] www.electronicshub.org
[2] https://nevonprojects.com

Journals References:

[1] Journal of Communications Technology and Electronics

IEEE Transaction on communication

6th Semester

HSS Elective – 3

Title: Logical & Quantitative Technique **Code: 18B14HS650**

L-T-P scheme: 2-1-0 **Credit: 3**

Prerequisite: None

Objective:

1. To familiarize the students with the concept and pattern of aptitude tests.
2. To solve quantitative aptitude problems and questions applying logical reasoning, within a short time span given during the placement drives.
3. To acquaint them with types of questions asked in quantitative aptitude, logical reasoning and verbal ability.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the basic concepts of quantitative ability, logical reasoning skills, and verbal aptitude.
CO2	Explain and pratice the concepts and questions related to data interpretation, data sufficiency and verbal ability.
CO3	Describe the quick ways to solve quantitative aptitude problems and questions applying logical reasoning, within a short time span.
CO4	Develop a thorough understanding of the concepts of quantitative ability and verbal reasoning, enabling students to manage the placement challenges more effectively.
CO5	Identify and work out the frequently asked patterns in quantitative aptitude and logical reasoning.
CO6	Deployment and solve previous campus placements aptitude papers facilitating the students to compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

Course Content:

Unit-1: Numbers and Arithmetic: Number system, Percentages, Profit & Loss, Interest, Ratio, Proportion and Variation, Time and Work, Time, Speed and Distance. Trains, Boats and streams, Pipes and cisterns, Mixture and Allegations, Calendar.

Unit-2: Counting and Data Interpretation: Permutation & Combinations, Probability. Data Interpretation, Data Sufficiency, Set theory, Venn Diagrams.

Unit-3: Logical Reasoning: Important concept in logical reasoning, Logical reasoning based on arrangements, Logical reasoning based on rankings, Team formation, Quantitative reasoning, Puzzle test.

Unit-4: Verbal Reasoning: Syllogism, Logical deduction, Binary Logic, Critical Reasoning. Blood Relations.

Unit-5: Verbal Ability: Spotting Errors, Vocabulary and Reading Comprehension, Antonyms, Spellings, Ordering of Words, Sentence Improvement, Ordering of Sentences, Closet Test, One Word Substitutes,

Change of Voice, Verbal Analogies, Synonyms, Selecting Words, Sentence Formation, Sentence Correction, Completing Statements, Paragraph Formation, Comprehension, Idioms and Phrases, Change of Speech, Precis writing.

Teaching Methodology:
The course "Logical & Quantitative Technique" is introduced with an integral focus on campus placement. This course would train the students on a variety of question types used by the companies and improve their language skill. The course will train the students on the quick ways to solve quantitative aptitude problems and questions applying logical reasoning, within a short time span given during the placement drives. The course will also suit the need of the students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning. The course will be taught with the aid of lectures, handouts, case studies, task-based language learning, and comprehensive language learning through language lab.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 & Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:
Lecture handouts and e-books on Logical & Quantitative Technique (will be added from time to time): Digital copy will be available on the JUET server.

Text Book:
[1] "Verbal and Non-Verbal Reasoning"; R.S. Agarwal, S. Chand Publishing, New Delhi, 2013.

Reference Books/Material:
[1] "Quantitative Aptitude"; R.S. Agarwal, S. Chand Publishing, New Delhi, 2013.
[2] "English Grammar & Composition"; Wren and Martin, S. Chand Publishing, New Delhi, 2012.
[3] "Business Communication"; K.K. Sinha, Taxmann Publications, New Delhi, 4e, 2012.

Title: Telecommunication Networks **Code: EC113**

L-T-P scheme: 3-0-0 **Credits: 3**

Prerequisite: None

Objective: This course is aimed:

1. To build basic concepts of Telecommunication and Computer network established for the communication.
2. This course also aims to provide the fundamental concepts in the design and implementation of networks, their protocols and applications.

Learning Outcomes:

Course Outcome	Description
CO1	Outline basic and some advanced concepts and techniques of telecommunications networks.
CO2	Describe problem solving approaches as applied in telecommunications networking areas.
CO3	Analyse performance of basic communication networks using both analytical and simulation techniques.
CO4	Develop the telecommunication network design techniques and practical implementation issues.
CO5	Understand the basic properties of internet and telecommunications traffic properties.
CO6	Use of cryptography and network security.

Course Contents:

Unit I: Introduction: Introduction to computer network, classification of networks WAN, MAN, LAN), distributed systems, digital signals and data rates, bit stream, symbols and band rate, transmission media, modems, structure of computer network, circuit, packet, message switching, Network topological, Network model, ISO-OSI model, TCP/IP model, primitives and services.

Unit II: Physical Layer: Physical Layer Design Issues (Service provided to data link Layer) Introduction Transmission media, RS-232-C and RS-449, Line coding.

Unit III: Data Link Layer: Data Link Layer Design Issues (Service Provided to N/w Layer), Framing, error control, flow control, Link Management, Error Detection and Error Correction Coding, Data Link Protocols (Elementary and sliding Window), local and metropolitan area networks. The Medium Access sub layer, Static and Dynamic Channel Allocation in LANs and MANs, ALOHA Protocols (Pure and Slotted), Different Protocols of LAN, IEEE Standard 802 for LAN (802.2, 802.4, 802.5).

Unit IV: Network Layer: Network Layer Design Issues (Service Provided to Transport Layer). Routing, Congestion, Internetworking. Routing Algorithms, Congestion Control Algorithm Internetworking, congestion control. Design issues, buffer management, synchronization. Session and presentation layer synchronization issues, formatting, data compression, data security.

Unit V: Transport Layer: Transport Layer Design Issue. Connection Management, Buffer Management, Quality of Service. Session Layer Design Issues Synchronization issues. Introduction to Presentation Layer. Encryption and decryption. RSA algorithm.

Methodology:

This course will help the students to facilitate interaction and information transfer over large distances. With internet, computer and telephone networks, businesses can allocate their resources efficiently. The students will be able to learn basic concepts of computer network, its working principle & operation of Internet and Intranet. They will also learn the working principle of operation of LAN, WAN, MAN, congestion in the network and network management.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1, Unit-2
Test-2	25 Marks	Based on Unit-2, 3 & Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 and Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:

Tutorials and lecture slides on Telecommunication networks (will be added from time to time).

Text Books

1. A.S. Tennenbaum, Computer Networks, PHI
2. W. Stallings, Data & Computer Communication, PHI
3. Forouzen, Behrouz A.Fegan, Sophia Chung Data Communications and Networking, TMH

Reference Books

1. Carne, E. Bryan Professional's Guide to Data Communication in a TCP/IP World Artech House, London, 2004
2. Young, Margret Levine Internet: The Complete Reference, Tata McGraw Hill, New Delhi, 2002

Web References:

1. www.britannica.com
2. www.vssut.ac.in

Journals References:

1. International Journal on Advances in Telecommunications
2. Journal of Network and Computer applications- Elsevier
3. IEEE transactions on networking
4. ACM Journals on networking

Title: VLSI Design **Code: EC114**

L-T Scheme: 3-0-0 **Credits: 3**

Prerequisite: Students should be studied the course, *"Digital Circuit Desgn"*.

Objective:
1. To develop the concept of different types of MOSFET circuits.
2. To design the Digital Circuits by using the VHDL.

Course Outcomes:

Course Outcome	Description
CO1	Outline various VLSI circuit design techniques with respect to their needs of the digital Integrated Circuit (IC) fabrication and concepts of some circuit modelling.
CO2	Description of the digital circuit design issues using VHDL concepts.
CO3	Development of the design to meet market expectations using static dynamic CMOS logic.
CO4	Identification and use of various cost estimation techniques used in VLSI engineering.
CO5	Application of design techniques on a given assignment/ project.
CO6	Demonstration and deployment of basic VLSI circuits using VHDL.

Course Contents:

Unit I: Introduction to VHDL Basic Terminology, Entity Declaration, Architecture Declaration; Dataflow Modeling, Behavioral Modeling, Structural Modeling, Configuration Declaration, Package Declaration, Package Body, data objects and data types, Operators, Generics components, Function Declaration, Hardware simulation & synthesis in VHDL, VLSI Design Flow.

Unit II: Manufacturing process MOS process flow (Silicon wafer, photolithography, diffusion and ion implantation, deposition, etching, package materials, interconnect levels, thermal consideration in packaging etc), N-well, p-well and twin tub process, VLSI scaling-constant voltage, constant field scaling, limitation of scaling.

Unit III: MOS logic design MOS fundamentals, I-V characteristics, transfer characteristics, enhancement and depletion MOS, channel length modulation, body effect, biasing of MOSFETs, capacitances in MOS Design of MOS inverter with resistive load, static design of NMOS saturated load inverter, NMOS inverter with linear load, depletion mode load, Design of W/L, power dissipation, propagation delay, and noise margin analysis. CMOS inverter, static and dynamic characteristics of CMOS inverter, CMOS logic gates, Stick diagram, layout, λ-based design rule

Unit IV: Combinational and sequential circuits Combinational logic design (Logic gates), MOS Memory-RAM (static and dynamic), ROM, sense amplifier, address decoder, Reliability, Circuit simulation

Unit V: FPGA and ASIC FPGA basics, Different type of FPGA Architecture, logic design using FPGA, ASIC design, Logic design using ASIC's.

Methodology:

This course is introduced to help students to understand the basics of digital circuit design at transistor level. Starting from frontend development, the student will slowly progress to learn other aspects of design including static and dynamic CMOS logic. Circuit technologies that are helpful for a VLSI designer. The entire course is based on: Fundamental and Designing, brief idea of the Back End Tools & Technologies. Each section includes multiple circuit technologies to help a student gain design experience. This theory course is well complemented by a laboratory course under the name VLSI Design Lab in the same semester that helps a student to learn with hand-on experience.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1
Test-2	25 Marks	Based on Unit-2, Unit-3 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:

Tutorials and lecture notes/slides on VLSI Design (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:

1. S-M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, 3rd ed
2. Neil, H.E. Waste, Kamran Eshraghian, Principles of CMOS VLSI design, Pearson Education.
3. J. Bhasker, VHDL Primer, 3rd edition

Reference Books

1. J. Rabaey, A. Chandrakasan, and B. Nikolic, Digital Integrated Circuits: A Design Perspective, 2nd edition
2. R. C. Jaeger and T. N. Blalock, Microelectronic Circuit Design, 3rd edition
3. Peter. J. Ashenden, The student's guide to VHDL, 2nd edition

Web References:

[4] https://www.udemy.com/
[5] https://swayam.gov.in/nd1_noc20_ee29/preview

Journals References:

[1] VLSI Design— An Open Access Journal - Hindawi
[2] IEEE Transactions on Very Large Scale Integration

Title: Telecommunication Networks Lab **Code: EC213**

L-T-P Scheme: 0-0-2 **Credit: 1**

Objective:

The objective of this course is to build basic concepts of Telecommunication and Computer network established for the communication. This course also aims to provide the fundamental concepts in the design and implementation of networks, their protocols and applications.

Learning Outcomes:

Course Outcome	Description
CO1	Understand the hardware, software and different components of a network
CO2	Perform basic configurations on routers and Ethernet switches
CO3	Develop a basic knowledge of installing and configuring networking applications.
CO4	Analyze the telecommunication network design techniques and practical implementation issues.
CO5	Apply verification and validation techniques on a given software project.
CO6	Demonstrate deployment and basic maintenance skills.

Course Content:

Unit 1: Lab exercise based on the introduction to riverbed modeler and its working

Unit 2: Lab exercise on Ethernet and Switched LAN

Unit 3: Lab exercise on network model and token ring

Unit 4: Lab exercise on introduction to BOSON and routing protocols

Unit 5: Lab exercise on OSPF and RIP protocols.

Evaluation Scheme:

Exams	Marks	Coverage
P1	15 Marks	Based on Lab exercise 1-6
P2	15 Marks	Based on Lab exercise 7-12
Viva	20 Marks	
Demonstration	20 Marks	
Lab record	15 Marks	70 marks

Attendance $ Discipline	15 Marks	
Total	**100 Marks**	

Learning Resources:

Study material on Telecommunication networks Lab (will be added from time to time): Digital copy will be available on the JUET server

Text Books:

1. A.S. Tennenbaum, Computer Networks, PHI
2. W. Stallings, Data & Computer Communication, PHI
3. Forouzen, Behrouz A.Fegan, Sophia Chung Data Communications and Networking, TMH

Reference Books:

1. Carne, E. Bryan Professional's Guide to Data Communication in a TCP/IP World Artech House, London, 2004
2. Young, Margret Levine Internet: The Complete Reference, Tata McGraw Hill, New Delhi, 2002

Web References:

1. www.study.com
2. www.britanica.com

Journals References:

[1] IEEE transactions on Telecommunication networks

Title: VLSI Design Lab **Code: EC214**

L-T-P scheme: 0-0-2 **Credit: 1**

Prerequisite: Students must have already studied the courses, "*Digital Circuit Design Lab"*.

Objective:
1. To learn and be able to understand the basic operations of digital circuits by using the VHDL.
2. To develop the abilities to design the applications of digital systems based on the VLSI.

Learning Outcomes:

Course Outcome	**Description**
CO1	Outline various VLSI circuit design techniques with respect to their needs of the digital circuit designs and concepts of circuit modeling.
CO2	Described concept of Digital circuit design using VHDL.
CO3	Development of the design using sequential logic.
CO4	Identify various circuit simulations used in VLSI engineering.
CO5	Application of designs on a given assignment/ project.
CO6	Demonstration and deployment of basic VLSI circuits using VHDL.

Course Content:

Unit I: Lab exercise based on combinational circuit design using VHDL.

Unit II: Lab exercise based on Simulation to verify the input and output waveform and circuit delay.

Unit III: Lab exercise based on RCA and multiplier circuit design using VHDL.

Unit IV: Lab exercise based on sequentila circuit design using VHDL.

Unit V: Lab exercise based on logic design using FPGA, ASIC design, Logic design using ASIC's.

Teaching Methodology:
This course is introduced to help students to understand the basics of digital circuit design. Starting from

frontend development, the student will slowly progress to become to other aspects of design. Circuit technologies that are helpful for a VLSI designer. The entire course is based on: Fundamental and Designing, Front End EDA tools. Each section includes multiple circuit technologies to help a student gain design experience. This laboratory course helps a student learn with hand-on experience.

Evaluation Scheme:

Exams		**Marks**	**Coverage**
P-1		15 Marks	Based on Lab Exercises: 1-6
P-2		15 Marks	Based on Lab Exercises: 6-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:
Experiments on VLSI Design (will be added from time to time): Digital copy will be available on the JUET server.

Text Books:
1. S-M. Kang and Y. Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, 3rd ed
2. Neil, H.E. Waste, Kamran Eshraghian, Principles of CMOS VLSI design, Pearson Education.
3. J. Bhasker, VHDL Primer, 3rd edition

Reference Books and Materials:
1. J. Rabaey, A. Chandrakasan, and B. Nikolic, Digital Integrated Circuits: A Design Perspective, 2nd edition
2. R. C. Jaeger and T. N. Blalock, Microelectronic Circuit Design, 3rd edition
3. Peter. J. Ashenden, The student's guide to VHDL, 2nd edition

Web References:
[1] https://www.udemy.com/
[2] https://swayam.gov.in/nd1_noc20_ee29/preview

Journals References:
[1] VLSI Design— An Open Access Journal - Hindawi
[2] IEEE Transactions on Very Large Scale Integration

Title: Communication Lab-I **Code: EC215**

L-T-P scheme: 0-0-2 **Credit: 1**

Prerequisite: Students must have already studied courses, "*Analog and Digital Communication*".

Objective:

1. To gain advance knowledge on various fields of communication systems
2. To implement various project based on matlab and simulink design

Learning Outcomes:

Course Outcome	Description
CO1	Accomplish the behavior of digital modulation techniques
CO2	Set up the communication link in optical communication
CO3	Establish the microwave link to measure various parameters
CO4	Realize the antenna and wave propagation in a particular communication
CO5	Observe the location of object using global positioning system
CO6	Design and implement the matlab and simulink model.

Course Content:

Unit-1; Lab exercises based on generation and detection of Quadrature Phase Shift Keying QPSK) and Quadrature Amplitude Modulation (QAM)
Unit-2; Lab exercises based on communication link in optical fiber and measure numerical aperture and different losses.
Unit-3; Lab exercises based on measurements of frequency, guided wavelength, power, Voltage Standing Wave Ratio (VSWR) and attenuation in a microwave test bench.
Unit-4; Lab exercises based on directivity and gain of a dipole, micro-strip patch and yagi uda antenna.
Unit-5; Lab exercises based on Global Positioning System
Unit-6; Lab exercises based on matlab and simulink design of various communication system

Teaching Methodology:
The lab course will cover the different communication fields such as digital communication, microwave, optical fiber etc. Initially a board-based practical will be conducted on advance modulation techniques. In the first part, optical fiber link can be accomplished in lab session. Afterward, microwave is being set up with the help of test bench and generators. In the second part, antenna characteristics can be calculated through a particular communication link. Moreover, a global positioning system is elaborated by identifying the location of object. At the end, matlab and simulink software will improve the hands on simulation of advance communication systems

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Lab Exercises: 1-7
P-2		15 Marks	Based on Lab Exercises: 8-14
Day-to-Day Work	Viva	20 Marks	70 Marks
	Demonstration	20 Marks	
	Lab Record	15 Marks	
	Attendance & Discipline	15 Marks	
Total		**100 Marks**	

Learning Resources:
Study material of Advance Communication Lab (will be added time to time): Digital copy will be available on the JUET server.

Text Book:

[1] "*Microwave Devices & Circuits*", S.Y. Liao, Pearson Education.
[2] "*Contemporary communication system using MATLAB and Simulink*", J. G Proakis., M. Salehi and G. Bauch, 1st ed., Cengage learning, 2004.

Reference Books:

[1] "*Digital Communications, Fundamental and Applications*", B. Skalar, Pearson Education
[2] *"Optical fiber communications"* G. Keiser, McGraw-Hill, 2000

Web References:
[1] http://www.msec.ac.in/files/ece/lab

Journals References:
[1] Wireless personal communication Springer

Title: Minor Project-2 **Code: EC216**

L-T-P Scheme: 0-0-4 **Credit: 2**

Prerequisite: Students must have already studied the courses, "*Hardware Lab*" and "*Minor project-1*".

Objective:

Students will be able to understand the identification of different electronic components, projects used by the society, development of software.

Learning Outcomes:

Course Outcome	Description
CO1	Outline the project topics with respect to their needs for the society.
CO2	Description of usefulness of the work in the context of present application
CO3	Development of the literature survey in chronological order
CO4	Identification of the problem and the solution of that problem by project.
CO5	Application of the project in the society.
CO6	Demonstration and deployment of basic block diagram/algorithm steps of proposed method

Course Content:

Unit 1: Identify parameters for performance evaluation.

Unit 2: Theoretical comparison of proposed and existing method.

Unit 3: It is expected that student will formulate a model for simulation of the system or design to validate the theoretical finding.

Unit 4: Student must explain the simulation model clearly through block diagram or flowchart.

Unit 5: Mention the chosen platform for simulation with reason (if any).

Unit 6: Mention the coding styles clearly.

Unit 7: Simulation of design module. It is expected that student will simulate their own design and the existing design which they included in the comparison list to validate the theoretical result.

Unit 8: Proper comparison of the simulation result to verify performance.

Unit 9: Based on the theoretical and simulation results the project findings are to be highlighted.

Teaching Methodology:

This course is introduced to help students the basic components and how to develop real time hardware projects which will be helpful to the society.

Evaluation Scheme:

Exams		**Marks**	**Coverage**
Presentation-1		15 Marks	Unit 1-Unit 3
Presentation-2		15 Marks	Unit 4-Unit 6
Presentation-3		20 Marks	Unit 7-Unit 9
Day to Day Work	Attendance	10 Marks	50 Marks
	Sincerity	10 Marks	
	Project report	15 Marks	
	Performance	15 Marks	
Total		**100 Marks**	

Learning Resources:

Students with concern to the faculty develop some new idea for preparing the project and related information they will acquire from the faculty and internet.

Text Books:

[1] Electronic project book, BPS publication.
[2] Electronics for you (Monthly Magazine).

Reference Books/Material:

[1] “Electronics project management and design”, D. Joseph Stadtmiller, Pearson; 1 edition 2000.
[2] “50 Electronics Projects for Beginners”, A.K.Maini, Pustak Mahal; First Edition 2007.

Web References:

[1] www.electronicshub.org
[2] https://nevonprojects.com

Journals References:

[1] Journal of Communications Technology and Electronics
[2] IEEE Transaction on communication

7th Semester

Open Elective - 1

Title: Sensors and Transducers **Code: 18B14EC761**

L-T-P scheme: 3-0-0 **Credit: 3**

Objectives: To develop the understanding on characteristics of Sensor & Transducers used in industry. Recent developments in the field of Sensor & Transducers. To understand the selection, installation of suitable sensing elements to design the appropriate signal conditioning circuit for their specific measurement applications.

Learning Outcomes:

Course Outcome	Description
CO1	Outline various types of sensors and transducers with respect to their application in the industry.
CO2	Describe the operating principle of various types of sensors.
CO3	Develop skills to select sensors& transducer for a specific measurement requirement.
CO4	Use of various transducers and signal conditioning circuits in the measurement process.
CO5	Analyze the performance of digital transducers.
CO6	Demonstrate the application of various transducers.

Learning Outcomes: After successful completion of this course, students should

1. Understand the fundamental principles of various types of sensors including thermal, mechanical, electrical, electromechanical and optical sensors.
2. Understand their general characteristics, terminologies, sensing and transduction principles;
3. Be familiar with criteria for sensors and transducers selection and choose appropriate measurement methods for engineering tasks and scientific researches.

COURSE CONTENTS

Unit 1: Fundamentals of Measurement

Measurement Methods, Classification, Generalized measurement System, Characteristics of measurement: Accuracy, Precision, Resolution, Sensitivity, Linearity; Errors & Uncertainty measurement of system, Linear & Non-linear Systems.

Unit 2: Transducers
Basic concept of sensors and transducer, their comparisons, Primary and secondary transducer, Active & passive transducers, Resistive, Inductive and Capacitive Sensors; Peizo-resistive, Peizo-electric, Thermal, Optical Transducers; Signal conditioning circuits.

Unit 3: Temperature Sensors
Sensors for Temperature Measurement- non- electrical and electrical method, Bimetallic Thermometer, Resistance temperature detector(RTD): working principle, construction, measurement setup, materials, Thermistor: operating principle, construction, Bridge circuit ,Thermocouple: construction, operation, lead and reference junction compensation, Radiation and Optical Pyrometer.

Unit 4: Pressure and Force Sensors
Strain Gauges- measurement technique, resistance strain gauge and its types, Dummy strain gauges, Quarter, half and full bridge configuration,
Transducers for Measurement of Pressure: - Manometers types (like Single column, inclined, U-tube), Mechanical Types (Bourdon, bellows and diaphragm), Elastic Types transducers, Low Pressure measurement gauges (Ionization, McLeod etc.).

Unit 5: Flow Sensors
Transducers for Measurement of Flow: - Types of flow meters, Theory of variable head constant area meter and its types, theory of constant head variable area meter and its types, theory of variable head variable area meter and its types, Special flow meters- Electromagnetic, Hot wire Anemometer, Turbine meter and Ultrasonic flow meter.

Unit 6: Miscellaneous Sensor
Level sensors, Ultrasonic, Capacitive and Gamma Ray level Gauges. Measurement of Humidity and Moisture- basic definitions, psychometric method, Smart sensors - Fibre optic sensors, MEMS – Nano sensors, proximity sensor.

Teaching Methodology:

This course is introduced to familiarize the student with the various transducers used in the automation industry. Starting from the basic concepts, the student will gradually develop an understanding of practical setups used in the industry. The entire course is broken down into six units, such that each unit covers the use of sensors for a particular application.

Evaluation Scheme:

Component & Nature	Duration	Marks / Weightage
T1	1 hr	15
T2	1hr 30 minutes	25
T3	2 hrs	35
Tutorials		05
Attendance		05
Quiz		05
Assignments		10
Total	**100**	

Learning Resources:
Tutorials and lecture slides will be assigned to the student.: Digital copy will be available on the JUET server.

Text Books:

[1] A.K.Sawhney & Puneet Sawhney, A Course in Mechanical Measurements and Instrumentation, 12/e, , Dhanpat Rai & Co. (P) Ltd.,2004
[2] B.C.Nakra & K.K.Chaudhary,Instrumentation Measurement And Analysis, Tata McGraw-Hill Publishing Company Ltd, New Delhi.,1996
[3] D.Patranabis, Principles of Industrial Instrumentation, 2/e, Tata McGraw-Hill Publishing Company Ltd, New Delhi.,1998
[4] James W. Dally, William F. Riley & Kenneth G.McConnell, Instrumentation for Engineering Measurements,2/e,Wiley Student Edition, John Wiley & Sons,INC,2003.
[5] John P.Bentley, Principles of Measurement Systems, Low Price Edition, Pearson Education Asia,2000
[6] Dr.D.S.Kumar, Mechanical Measurements and Control, 3/e, Reprint-2004, Metropolitan Book Co. Private Ltd.,2004
[7] Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005.

Refernce Books:

1. James W. Dally, William F. Riley & Kenneth G.McConnell, Instrumentation for Engineering Measurements,2/e,Wiley Student Edition, John Wiley & Sons,INC,2003.
2. John P.Bentley, Principles of Measurement Systems, Low Price Edition, Pearson Education Asia,2000
3. Dr.D.S.Kumar, Mechanical Measurements and Control, 3/e, Reprint-2004, Metropolitan Book Co. Private Ltd.,2004
4. Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005.

Web References:

[1] https://nptel.ac.in/courses/108/108/108108147/
[2] https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/112104250/lec21.pdf
[3] https://www.electronics-tutorials.ws/io/io_1.html

Journals References:

[1] Sensors and Actuators A: Physical (Elsevier)
[2] Journal of Sensors (Hindawi)

Title: Introduction to Microprocessors and Microcontrollers **Code:18B14EC762**

L-T-P Scheme: 3-0-0 **Credits:3**

Prerequisite: Students must have already studied "*Digital Electronics*" course.

Course Objective:

1. Students should learn a microprocessor's programming model at a level that enables them to write assembly language programs for the processor that meets given specifications, learn concepts associated with interfacing a microprocessor to memory
2. Learn how to control components of a microprocessor-based system through the use of interrupts.
3. Students understand the basic operation of a microcontroller system and who have learned fundamental programming skills in assembly language.

Learning Outcomes:

Course Outcome	Description
CO1	Outline various microprocessor and microcontroller with respect to their needs for the development of digital systems
CO2	Description of the characteristic parameters of 8085 microprocessor.
CO3	Development of the input output interfacing circuits.
CO4	Identification and use of various microcontrollers and their hardware description.
CO5	Application of microprocessor and microcontroller on a given assignment/ project.
CO6	Demonstration and deployment of basic design of microprocessor and microcontroller-based computer systems.

Course Content:

Unit I: Introduction to Microprocessor: Review of digital electronics , historical background, Microprocessor and microcontroller based computer systems.

Unit-2: 8085 Microprocessor: Introduction, 8085: pin-outs and the pin function, instruction set, bus timings, addressing mode, programming in 8085, programming example, counter and delay, stack and subroutine, basic Interrupt processing, hardware interrupts.

Unit-3: I/O Interfacing: Memory organization & Interfacing, I/O interfacing.

Unit-4: 8086 microprocessor: Pin-outs and the pin function, clock generators, bus buffering & latching, ready and wait states, minimum mode versus maximum mode, memory segmentation. Programming in 8086, programming example.

Unit-5: Introduction of microcontrollers: A microcontroller's survey, Development system for microcontrollers and case studies. 8051: microcontrollers Hardware, Input/output pins, ports & circuits, External memory, counters & timers, Serial Data input/output, interrupts. 8051 addressing mode: Programming the 8051.

Teaching Methodology:
This course is introduced to help student to understand basics of microprocessor and microcontroller. He will be able to understand and perform various programming of microprocessor and its interfacing. Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1 and Unit-2
Test-2	25 Marks	Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources:
Lecture slides on Microprocessor and microcontroller (will be added from time to time): Digital copy will be available on the JUET server.

Text Books :

[1] Fundamentals of Microprocessors and Microcontrollers, 7th edition, Dhanpat Rai Publication, India, 2010 by B. Ram.
[2] Introduction to Microprocessors, Wiley Eastern (Latest Edition) R.S. Gaonkar.

References

[1] Advanced microprocessors and peripherals by AK Ray.
[2] The 8051 microcontrollers Architecture, Programming & application ,2nd edition by Kenneth.J. Ayala

Web References:

[1] https://www.tutorialspoint.com/
[2] https://www.lecturenotes.in

Journals References:

[1] Microprocessors and Microsystems journal Elsevier.
[2] Microprocessors and Microsystems journal Science direct.
[3] Journal of Microcontroller engineering and applications.

Title: Major Project Part-I **Code: EC217**

L-T-P scheme: 0-0-8 **Credit: 4**

Prerequisite: Students must have basic knowledge of project topic.

Objective:

1. To learn and be able to implement either hardware or software project based on the topic.
2. To develop the abilities to complete the project in time and have the practical knowledge.

Learning Outcomes:

Course Outcome	Description
CO1	Outline of the problem related to various electronics and communication field.
CO2	Identify the problem in real world or related to previous work.
CO3	Develop the system or algorithm related to the problem either software or hardware based.
CO4	Describe the various cost-effective solutions or techniques to the problem.
CO5	Analyze the different algorithms and report writing.

Teaching Methodology:

This course is introduced to develop the ability to complete the project in time. Student will be able to learn the practical application of the project topic. Will have the basic knowledge of the various components and benefits in the real life and learn to do coding in case the project is hardware based. If the project is software based then student will be able to develop its programming skills and its implications and benefits in practical life.

Evaluation Scheme:

Exams		Marks	Coverage
P-1		15 Marks	Based on Guidelines provided for Project
P-2		15 Marks	Based on Guidelines provided for Project
P-3		20 Marks	Based on Guidelines provided for Project
Day-to-Day Work	Attendance	10 Marks	70 Marks
	Sincerity	10 Marks	

	Project Report	15 Marks	
	Performance	15 Marks	
Total		**100 Marks**	

Learning Resources:
Students with concern to the faculty develop some new idea for preparing the project and related information they will acquire from the faculty and internet.

Text Books:

[1] Electronic project book, BPS publication.
[2] Electronics for you (Monthly Magazine).

Reference Books/Material:
[1] "Electronics project management and design", D. Joseph Stadtmiller, Pearson; 1 edition 2000.
[2] "50 Electronics Projects for Beginners", A.K.Maini, Pustak Mahal; First Edition 2007.

Web References:
[1] www.electronicshub.org
[2] https://nevonprojects.com

Journals References:
[1] Journal of Communications Technology and Electronics
[2] IEEE Transaction on communication

Title: Summer Training **Code: EC001**

Duration: 4-6 Weeks **Credits: 0**

Course Objective:

It is important that students should be motivated about the summer training and know what is expected from it. They are also required to get familiar with the work environment, modern tools and systems, participating in teamwork, preferably as part of a multi-disciplinary team. The student should be able to about the project development cycle: requirement analysis, design, development, and test. They are required to apply the knowledge and skills gained in engineering curriculum to real-life issues and problems, contemporary issues. They are supposed to understand the professional and ethical responsibilities of an engineer and also to make contacts for future employment with the industries where they have been allotted.

Learning Outcomes:

Course Outcome	Description
CO1	Able to learn that clearly define what student intend to learn during the summer training. Able to Express what student plan to achieve throughout the internship and how it will be accomplished.
CO2	Able to conclude the experience of the industry whether it is academic or core.
CO3	Able to focus on selected areas that student will be exposed to throughout the training.
CO4	Able to involve new learning, expanded growth, or improvement on the job based on his curriculum studies.
CO5	Able to effectively relating academic learning to the internship experience.
CO6	Able to complete the tasks provided by the industry within stipulated time duration.

Criteria for selecting a place for summer training

Students should consider the following when selecting the company (or an institution) for summer training.

Required:

The company must work on Electronics/computer engineering applications and/or systems such as hardware/software design, development or testing.

Strongly Recommended:

The company should use contemporary tools and techniques. The company should follow engineering standards and methods. The company should work on projects that have local or global impact. The student should be given opportunity to work on real-world problems. The student should be able to observe the organization of the company. The student should work in a team, and if possible a multidisciplinary team.

Recommendations to students

Listed below are some recommendations for students who will do summer training.

Before Training:

1. Verify that the company will satisfy all the Required Criteria from Section stated above, and as many as possible of the Strongly Recommended Criteria.
2. If needed, do not hesitate to contact your Summer Training Coordinator.

During Training:

1. Be active, enthusiastic, motivated, and energetic.
2. Work hard. • Be pro-active. Do not wait for somebody to tell you what to do.
3. Try to plan your time and what you expect from summer training week by week.
4. Keep a daily/weekly record of the progress of your training.

Evaluation Scheme:

Exams	**Marks**
Training Report	35 Marks
Training Diary	35 Marks
Presentation	20 Marks
Viva	10 Marks
Total	**100 Marks**

Grading Scheme:

Students scoring 60% (and above) marks may be awarded Satisfactory Grade and performance below 60% will have to repeat the summer training in next year.

8th Semester

Open Elective – 2

Title: Introduction to Neural Network **Code: 18B14EC861**

L-T-P: 3-0-0 **Credits: 3**

Prerequisite: Students must have knowledge on "Linear Algebra".

Objectives: To provide the knowledge of different methodologies used to design a neural network that can handle the raw data and get trained according to the input output mapping.

Learning Outcomes: The students should get the idea about the problems that can be effectively solved by neural network like pattern classification, character recognition, image processing, medical diagnostic etc. and shall acquire the generic skills to design and implement neural structures and related algorithms.

Course Outcome	Description
CO1	Understand the differences between ANN and BNN
CO2	understand the differences between networks for supervised and unsupervised learning;
CO3	design single and multi-layer feed-forward neural networks;
CO4	Analyse the performance of neural networks.
CO5	Design the neural network based on back propagation algorithm
CO6	Design and analyze the unsupervised learning based networks

Course Content:

Unit-1: Biological Neuron: Introduction, soft computing, history, human brain, biological neuron, artificial neuron, comparison, McCulloch-Pitts model.

Unit-2: Artificial neuron: Neuron model, transfer function, network architectures, learning strategy: supervised, unsupervised, and reinforcement, vector spaces, inner product, norm, orthogonality, reciprocal basis vectors, Eigen value and Eigen vectors.

Unit-3: Single-layer feed forward networks: Perceptron architecture, pattern classification, single and multiple inputs, learning rule, unified learning rule, hebb & pseudo inverse rule, widrow-hoff, adaptive linear neuron (ADALINE) network, least mean square algorithm adaptive filtering.

Unit-4: Performance Surfaces & Optimization: Taylor series, directional derivatives minima, necessary conditions, Eigen system of the hessian, steepest descent, stable learning Rates, minimizing along a Line, Newton's method, conjugate gradient.

Unit-5: Multi-layer feed forward networks: Multilayer perceptron, back propagation algorithm, chain rule, sensitivities, batch, incremental training, advantages and drawbacks.

Unit-6: Associative learning, competitive learning, self-organizing feature maps, radial basis networks, adaptive resonance theory, hopfield network.

Teaching Methodology: The students will be able to learn basic concepts of neural network, its working principle & operation of single layer and multilayer neural networks. They will also learn the performance learning and optimization for training of neural networks.

Evaluation Scheme:

Exams	**Marks**	**Coverage**
Test-1	15 Marks	Based on Unit-1, Unit-2
Test-2	25 Marks	Based on Unit-2, 3 & Unit-4 and around 30% from coverage of Test-1
Test-3	35 Marks	Based on Unit-4 and Unit-5 and around 30% from coverage of Test-2
Assignment	10 Marks	
Tutorials	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Learning Resources: Tutorials and lecture slides on Neural networks (will be added from time to time): Digital copy will be available on the JUET server

Text Books:

1 Hagan M. T., Demuth H. B., Beale M. and Jesús O. D. "Neural network design", 4th ed., Cengage learning.
2 Simon Haykin, "Neural Networks: A comprehensive Foundation", 2nd ed.,

Reference Books:

1 Kumar S., "Neural network: a classroom approach", 1st ed., Tata McGraw hill, 2004.
2 Sivanandam S. N., Sumathi S. and Deepa S. N. , "Introduction to Neural Networks using Matlab 6.0", 1st ed., Tata McGraw hill, 2006.

Web References:

1 www.tutorialspoint.com
2 www.towarsdatascience.com

Journal References:

1 IEEE Transactions on Neural Networks
2 IEEE Transactions on Neural Networks and Learning systems

Title: Major Project Part-II **Code: EC218**

L-T-P scheme: 0-0-16 **Credit: 8**

Prerequisite: Students must have basic knowledge of project topic.

Objective:

1. To learn and be able to implement either hardware or software project based on the topic.
2. To develop the abilities to complete the project in time and have the practical knowledge.

Learning Outcomes:

Course Outcome	**Description**
CO1	Test the given problem with different algorithms.
CO2	Simulation and comparison of existing techniques for a chosen problem
CO3	Develop the modified or new algorithm or solution of the problem
CO4	Comparison of the developed algorithm with the existing ones.
CO5	Demonstrate the final work and report writing.

Teaching Methodology:

This course is introduced to develop the ability to complete the project in time. Student will be able to learn the practical application of the project topic. Will have the basic knowledge of the various components and benefits in the real life and learn to do coding in case the project is hardware based. If the project is software based then student will be able to develop its programming skills and its implications and benefits in practical life.

Evaluation Scheme:

Exams		**Marks**	**Coverage**
P-1		15 Marks	Based on Guidelines provided for Project
P-2		15 Marks	Based on Guidelines provided for Project
P-3		20 Marks	Based on Guidelines provided for Project
Day-to-Day Work	Attendance	10 Marks	70 Marks
	Sincerity	10 Marks	

	Project Report	15 Marks	
	Performance	15 Marks	
Total		**100 Marks**	

Learning Resources: Students with concern to the faculty develop some new idea for preparing the project and related information they will acquire from the faculty and internet.

Text Books:

[1] Electronic project book, BPS publication.

[2] Electronics for you (Monthly Magazine).

Reference Books/Material:

[1] "Electronics project management and design", D. Joseph Stadtmiller, Pearson; 1 edition 2000.
[2] "50 Electronics Projects for Beginners", A.K.Maini, Pustak Mahal; First Edition 2007.

Web References:

[1] www.electronicshub.org
[2] https://nevonprojects.com

Journals References:

[1] Journal of Communications Technology and Electronics
[2] IEEE Transaction on communication