

**APPLIED ELECTRONICS AND INSTRUMENTATION
DEPARTMENT B.TECH CURRICULUM STRUCTURE
UNDER AUTONOMY**



HALDIA INSTITUTE OF TECHNOLOGY

**HALDIA
EAST MEDINIPUR**

**AFFILIATED TO
MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY, WEST BENGAL**

Biology

Course Name: Biology	Category: Professional Core Courses
Course Code: BS-BIO 401	Semester: 4 TH
L-T-P: 3-0-0	Credit: 3
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Continuous Assessment: 25Marks
Tutorial: Nil	Attendance: 5 Marks
Total Lectures: 36	End Semester Exam.: 70 Marks
Pre-Requisites: No-prerequisite	

Objectives:

1. Convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.
2. To introduce modern biology with an emphasis on evolution of biology as a multidisciplinary field.
3. To make students aware of application of engineering principles in biology and engineering robust solution inspired by biological examples.
4. To make them aware about recent application of biology in engineering research and industry.

Course Outcomes (COs):

On completion of this course, the student will be able to

BS-BIO 401.1. Understand and explain the biological concepts from an engineering perspective.

BS-BIO 401.2. Understand and explain the concepts of hierarchy of life forms at phenomenological level, biological sensing and its challenges.

BS-BIO 401.3. Understand and explain the concept of genetics as well as how genetic material passes from parent to offspring.

BS-BIO 401.4. Understand, assess and explain the different bio-molecules as building blocks of life, macromolecular analysis, information transfer and metabolism as well as the basic concept of microbial system.

BS-BIO 401.5. Explain, assess and integrate biological principles for developing next generation technologies.

BS-BIO 401.6. Understand and explain the development of artificial systems mimicking human action.

Syllabus Details

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	<p>Module Name: Introduction</p> <p>Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.</p> <p>Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.</p>	2	1
Module: 2	<p>Module Name: Classification</p> <p>Purpose: To convey that classification per se is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted.</p> <p>Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitatacquatic or terrestrial (f) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D.Melanogaster, C.elegance,A.Thaliana, M.musculus</p>	3	2
Module: 3	<p>Module Name: Genetics</p> <p>Purpose: To convey that “Genetics is to biology what Newton’s laws are to Physical Sciences”.</p> <p>Mendel’s laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.</p>	5	1, 3, 5, 6
Module: 4	<p>Module Name: Bio molecules, Enzymes</p> <p>Purpose: To convey that all forms of life has the same building blocks and</p>	7	1, 4,

	<p>yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.</p> <p>Purpose: To convey that without catalysis life would not have existed on earth. Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.</p>		5, 6
Module: 5	<p>Module Name: Metabolism, Microbiology</p> <p>Purpose: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge.</p> <p>Purpose: Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.</p>	8	1, 4, 5, 6
Module: 6	<p>Module Name: Information Transfer, Techniques in Biophysics</p> <p>Purpose: The molecular basis of coding and decoding genetic information is universal. Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.</p> <p>Purpose: Biophysics is an interdisciplinary science that applies approaches and methods traditionally used in physics to study biological phenomena. The techniques including microscopy, spectroscopy, electrophysiology, single-molecule methods and molecular modelling.</p>	8	1, 4, 5, 6
Module: 7	<p>Module Name: Cancer Biology</p> <p>Purpose: A basic understanding of cancer biology and treatment. The course is not designed for patients seeking treatment guidance—but it can help to understand how cancer develops and provides a framework for understanding cancer diagnosis and treatment. Identification of the major types of cancer worldwide. Description of how genes contribute to the risk and growth of cancer. List and description of the ten cellular hallmarks of cancer. Definition of metastasis, and identification of the major steps in the metastatic process. Description of the role of imaging in the screening, diagnosis, staging, and treatments of cancer. Explanation of how cancer is</p>	3	1, 5, 6

	treated.		
	Total	36	

Text/Reference Books:

1. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach, Pearson Education Ltd, 2014.
2. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry, John Wiley and Sons, 2009.
3. D. L. Nelson and M. M. Cox, "Principles of Biochemistry, W.H. Freeman and Company, 2012.
4. G. S. Stent and R. Calendar, "Molecular Genetics, Freeman and company, 1978.
5. L. M. Prescott, J. P. Harley and C. A. Klein, "Microbiology, McGraw Hill Higher Education, 2005.
6. Lewis J. Kleinsmith. "Principles of cancer biology, Pearson, 2016

Data Structure & Algorithm

Course Name: Data Structure & Algorithm	Category: Engineering Science Course
Course Code: ES-CS 401	Semester: 4 TH
L-T-P: 3-0-0	Credit: 3
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Continuous Assessment: 25 Marks
Tutorial: Nil	Attendance: 5 Marks
Total Lectures: 36	End Semester Exam.: 70 Marks
Pre-Requisites: Concept of C-Language	

Objectives:

In view of the notable advancement of data structure in recent few years, it is essential for the students to be familiar with various algorithmic approaches to write program thereby solving problems. The objectives of the course are mentioned below:

1. To represent the significance of algorithms with its properties for solving problems in different engineering domains.
2. To provide the characteristics of various Abstract Data Type for creating the solution- strategies.
3. To demonstrate the significance of non-linear data structures with respect to the access and organization of records.
4. To clarify various sorting and searching algorithms.
5. To expose merits and demerits of altered algorithms in terms of time-complexity.
6. To enhance the ability of selecting appropriate data structure and algorithm for solving specific problems.

Course Outcomes (COs):

Upon successful completion of this course, a student will be able to:

- ES-CS 401.1.** Acquaint with the different properties of algorithm and recognize various types of data structure along with the relevance of their application for solving real world problems.
- ES-CS 401.2.** Comprehend the concept of linked list along with its difference from array and its many applications for solving different problems.
- ES-CS 401.3.** Know the concept of ADT (like stack, queue) and recognize its significance for mapping various real life problems to the programming ground to get the solutions of the corresponding problems.

- ES-CS 401.4.** Create the concept of non-linear data structure like graph, tree and their appliance in various problems in societal issues.
- ES-CS 401.5.** Know different traversal approaches and select proper data structure and algorithm by analyzing time complexity and space complexity for specific problems.
- ES-CS 401.6.** Know different searching and sorting approaches and select proper data structure and algorithm by analyzing time complexity and space complexity for specific problems.

Syllabus Details

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	<p>Introduction of Data Structure Necessity of data structure. Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type. Algorithms and properties of an Algorithm, Algorithm efficiency and analysis, time and space analysis of algorithms – order notations.</p>	3	1
Module: 2	<p>Array and Linked List Array: Different representations – row major, column major. Array representation of polynomials. LinkedList: Singly linked list, Insertion-Deletion-Display (also in reverse order) Operations of Linked List, circular linked list, doubly linked list, linked list representation of polynomial.</p>	5	2
Module: 3	<p>Linear DataStructure Stack and Queue: Stack and its implementations (using array, using linked list), applications. Queue, circular queue, dequeues. Implementation of queue- both linear and circular (using array, using linked list), applications. Recursion: Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.</p>	8	3
Module: 4	<p>Nonlinear Data structures: Trees Basic terminologies, forest, tree representation (using array, using linked list). Binary trees - binary tree traversal (pre-, in-, post- order), threaded binary tree (left, right, full) - non-recursive traversal, algorithms using threaded binary tree, expression tree. Binary search tree-operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree explanation with example</p>	9	4

Module: 5	Module Name: Nonlinear Data structures: Graphs Graph definitions and concepts (directed/undirected graph, weighted/un-weighted edges, sub-graph, degree, cut-vertex/articulation point, pendant node, clique, complete graph, connected components – strongly connected component, weakly connected component, path, shortest path).Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) . Minimal spanning tree – Prim’s algorithm.	5	5
Module: 6	Module Name: Searching, Sorting, Hashing Sorting Algorithms: Bubble sort, insertion sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue). Searching: Sequential search, binary search. Hashing: Hashing functions, collision resolution techniques	6	6
Total		36	

Learning Resources Text

Books:

1. “Data Structures And Program Design In C”, 2/E by Robert L. Kruse, Bruce P.Leung.
2. “Data Structures and Algorithms Using C”, R.S. Salaria, Khanna PublishingHouse.
3. “Fundamentals of Data Structures of C” by Ellis Horowitz, SartajSahni, Susan Anderson-freed.
4. “Data Structures in C” by Aaron M.Tenenbaum.
5. **“Data Structures” by S.Lipschutz.**

Reference Books:

1. “Expert Data Structures with C” by R.B. Patel, Khanna PublishingHouse
2. “Data Structures Using C” by ReemaThareja
3. “Data Structure Using C”, 2/e by A.K. Rath, A. K.Jagadev.
4. “IntroductiontoAlgorithms”byThomasH.Cormen,CharlesE.Leiserson,RonaldL. Rivest, CliffordStein

Indian Constitution and Culture

Course Name: Indian Constitution and Culture	Category: Mandatory Course
Course Code: MC-ES 401	Semester: 4 TH
L-T-P: 1-0-0	Credit: 0
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Continuous Assessment: 25Marks
Tutorial: Nil	Attendance: 5 Marks
Total Lectures: 36	End Semester Exam.: 70 Marks
Pre-Requisites: No-prerequisite	

Objectives:

1. To provide basic knowledge about the Indian Constitution.
2. To have working idea about the functioning of the Executive, Legislative and Judiciary bodies in our country.

Course Outcome:

After the completion of this course learners will be able to:

- MC-ES 401.1:** Identify the authority to redress the problems in their profession or society.
- MC-ES 401.2:** Describe: The features of Indian Constitution.
- MC-ES 401.3:** Workings of the various Legislative, Executive and Judicial bodies in the country appreciate the democratic workings at the grassroots level.
- MC-ES 401.4:** Understand the jurisdiction and procedures of our courts.

Syllabus details

Module No.	Description of Topic	Contact Hrs.
Module 1	Indian Constitution Sources of Constitutional history, Preamble and its Salient Features, Citizenship, Fundamental Rights and Duties, Directive Principles of State Policy	2
Module 2	Union Government and its administration. Structure of the Indian Union. Legislative bodies: Lok Sabha and the Rajya Sabha, The Speaker and the Chairperson of the Rajya Sabha. Executive Bodies. The President and the Vice-President - Role, Power and the method of Election and Amenities and Removal Procedure The Prime Minister and the Council of Ministers. Central Secretariat	5
Module 3	State Government/s and its administration. Federalism. Centre-State relationship The Governor – Role and Function The Chief Minister and the State Council of Ministers State Secretariat	2
Module 4	The Judiciary The Supreme Court – Organization, Procedure, Jurisdiction and Power Chief Justice and other Judges High Court/s - Organization, Procedure, Jurisdiction and Power Chief Justice and other Judges Subordinate Courts – Structure, Jurisdiction and Procedure Lok Adalats PIL – Scope, Principle and Features	5
Module 5	Local Administration – Urban Municipalities, Municipal Corporations, Town Area, Notified Area Mayor – Role and Function	3
Module 6	Local Administration – Rural Zilla Parishad, Aanchal Parishad and Gram Panchayats Powers, Functions and Key Functionaries Grassroot Empowerment	3
	Total	20

Learning resources

Text books:

1. Indian Polity, M Laxminath, Mcgraw Hill Publications, 5th Edition.

Reference books:

1. Introduction to the Constitution of India, D DBasu, Lexis Nexis Publications of India, 21st Edition.

Electrical & Electronic Measurements

Course Name: Electrical & Electronic Measurements	Category: Professional Core
Course Code: PC-EI 401	Semester: Fourth Semester
L-T-P: 3-1-0	Credit: 4
Teaching Scheme	Examination Scheme
Theory: 4 hrs./week	Continuous Assessment: 25Marks
Tutorial: 1 hr/week	Attendance: 5 Marks
Total Lectures: 48 hours	End Semester Exam.: 70 Marks
Pre-Requisites: Basic Electrical Engineering,Basic Electronics Engineering, Circuit Theory & Networks	

Objective : ---

1. To learn methods of measurement, errors in measurement and its classification.
2. To learn the principle of operation of analog and digital meters.
3. To learn the basic principle of operation of instrument transformers.
4. To learn the principle of operation of cathode ray oscilloscope and different sensors and transducers.
5. To learn the principle of measurement of power, energy and different electrical parameters
6. To acquire problem solving skills to solve problems on the topics studied.

Course Outcomes (COs):

PC-EI 401.1 : To **describe** the methods of measurement, errors in measurement and its classification.

PC-EI 401.2 : To **state** the principle of operation of analog indicating instrument.

PC-EI 401.3 : To **understand and apply** various technique of resistance, capacitance and inductance measurement.

PC-EI 401.4 : To **understand and analyze** the operation of Instrument Transformer and power measurement.

PC-EI 401.5 : To **illustrate** the concept of Cathode Ray Oscilloscope.

PC-EI 401.6 : To **design** the various types of Digital Instruments.

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	Module Name:Introduction to measurement System Methods of measurement, Measurement system, Classification of instruments, Definition of accuracy, precision, resolution. Speed of response. Errors in measurement, classification of errors. Loading effect due to shunt and series connected instruments.	8	CO1
Module: 2	Module Name:Analog meter General features, Construction, principle of operation and torque equation of moving coil, moving iron,	6	CO2

	electrodynamometer, Induction, and Electrostatic type instruments. Principle of operation of the thermoelectric, rectifier type instruments. Extension of instrument ranges using shunt, multipliers.		
Module: 3	Module Name: Measurement of resistance Measurement of medium resistance, low, and high resistances. Megger. Potentiometers: Principle of operation and application of Crompton's DC potentiometer, Polar and coordinate type of AC potentiometers.	8	CO3
Module: 4	Module Name: Instrument transformer: Disadvantages of shunt & multipliers, Advantages of Instrument Transformers, Principle of operation of current & potential transformer, errors.	4	CO4
Module: 5	Module Name: Measurement of power: Principle of operation of Electrodynamic & induction type wattmeter, wattmeter errors. Measurement of energy: Construction, theory and operation of AC energy meter, testing of Energy meters.	6	CO4
Module: 6	Module Name: AC bridges: Measurement of inductances, capacitance and frequency by A.C bridges.	4	CO3
Module: 7	Module Name: Cathode Ray Oscilloscope: Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope. Double beam CRO	6	CO5
Module: 8	Module Name: Electronic instruments: Digital voltmeter, Digital multimeter, Digital frequency meter, LCR meter, Impedance analyzer, Vector Network Analyzer, Spectrum Analyzers	6	CO6

Text Books :

1. A course in Electrical & Electronic Measurements & Instrumentation; A.K. Sawhney, Dhanpat Rai and sons.
2. Electrical Measurements and Measuring Instruments; E.W Golding & F.C. Wides, Wheeler Publishing
3. Electronic Instrumentation; H.S.Kalsi, Tata McGraw hill, 2nd edition

Reference Books:

1. Digital Instrumentation; A.J. Bouwens, Tata McGraw Hill
2. Modern Electronic Instrumentation & Measuring Instruments; A.D. Heltrick & W.D. Cooper, Wheeler Publishing

Microprocessors & Microcontroller

Course Name: Microprocessors & Microcontroller	Category: Professional Core Courses
Course Code: PC EI 402	Semester: 4 TH
L-T-P: 3-1-0	Credit: 3
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Continuous Assessment: 25Marks
Tutorial: 1 hrs./week	Attendance: 5 Marks
Total Lectures: 45	End Semester Exam.: 70 Marks
Pre-Requisites: Digital Electronics	

Objectives:

1. To introduce the architecture and organization of typical microprocessors and microcontroller
2. To develop assembly language programming skill of microprocessor and microcontroller along with applications.
3. To familiarize the technique for interfacing memory and peripheral devices to microprocessor, including several specific standard I/O devices.
4. To understand the hardware/software trade-offs involved in the design of microprocessor based systems.

Course Outcomes (COs):

On completion of this course, the student will be able to

PC EI 402.1: Describe the architecture of Microprocessors (8085, 8086) and Microcontroller (8051).

PC EI 402.2: State the importance and function of different modules of Microprocessor and Microcontroller.

PC EI 402.3: Understand and apply the fundamental of assembly level programming of Microprocessor and Microcontroller.

PC EI 402.4: Understand and analyze the use of timer/counter, interrupt and serial data communication process in microcontroller.

PC EI 402.5: Illustrate how the peripheral (8255 etc.) and memory devices are interfaced with Microprocessor.

PC EI 402.6: Design different real world interfacing circuit using microprocessor and microcontroller.

Syllabus Details

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	Module Name: Introduction to 8085 Microprocessor Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization and interfacing–I/O ports and data transfer concepts– Timing Diagram – Interrupts.	11	1, 2, 5
Module: 2	Module Name: Programming of 8085 Microprocessor Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing – Look up table – Subroutine instructions – stack.	11	3, 6
Module: 3	Module Name: Peripheral Interfacing: Architecture, configuration and interfacing, with 8255.	3	5
Module: 4	Module Name: 8051 Micro Controller: Schematic diagram of intel-8051, microcontroller- registers, oscillators, ports, memory, timers/counters, special function registers, Addressing modes. Instructions related to Data Transfer and Manipulation, Arithmetic, Logical and Branch operations. Explanation with examples of programming related to topic.	10	1, 2, 3
Module: 5	Module Name: 8051 Micro Controller Peripheral Interfacing: Introduction to the Timer/Counter, Serial Communication and Interrupts: operations, special function registers and programming on required. Interfacing with Peripheral Input/Output Devices: ADC, DAC, Display	10	4, 6
Module: 6	Module Name: Architecture of Typical 16-Bit Microprocessors (Intel 8086): Introduction to a 16 bit microprocessor, Architecture and Register Organization, Memory address space and data organization.	3	1
	Total	48	

Text Books:

1. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085A /8080A, WILEY EASTERN LIMITED.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson education, 2011.
3. A.H. Mukhopadhyay, Microprocessor, Microcomputer and Their Applications, 3rd Edition Alpha Science International, Ltd. Digital Fundamentals by T.L. Floyd & R.P. Jain (Pearson).

Reference Books:

1. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085, 8086, 8051, McGraw Hill Edu, 2013.

2. M. Rafiquzzman: Microprocessors: Theory & Applications (Intel & Motorola), PHI. 2. Berry.B. Bray INTEL 8086/88, 80186, 286, 386, 486, Pentium Pro & Pentium IV.
3. Berry .B. Bray INTEL 8086/88, 80186, 286, 386, 486, Pentium Pro & Pentium IV. Digital Circuit & Design by S. Aligahanan&S.Aribazhagan (Bikas Publishing)

Electromagnetic Theory

Course Name: Electromagnetic Theory	Category: Professional Core Courses
Course Code: PC-EI 403	Semester: 4 TH
L-T-P: 3-0-0	Credit: 3
Teaching Scheme	Examination Scheme
Theory: 3 hrs./week	Continuous Assessment: 25Marks
Tutorial: Nil	Attendance: 5 Marks
Total Lectures: 36	End Semester Exam.: 70 Marks
Pre-Requisites: Knowledge differential and integral calculus	

Objectives:

1. To introduce the basic mathematical concepts related to electromagnetic vectorfields
2. To impart knowledge on the concepts of Electrostatic fields, electrical potential, energy density and their applications. Magneto static fields, magnetic flux density, vector potential and its applications.
3. Different methods of emf generation and Maxwell's equations Electromagnetic waves and characterizing parameters.

Course Outcomes:

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

- PC-EI 403.1.** To understand the basic laws of electromagnetism.
- PC-EI 403.2.** To obtain the electric and magnetic fields for simple configurations under static conditions.
- PC-EI 403.3.** To analyze time varying electric and magnetic fields.
- PC-EI 403.4.** To understand Maxwell's equation in different forms and different media.
- PC-EI 403.5.** To understand the propagation of EM waves.
- PC-EI 403.6.** To impart knowledge on the concepts of Electrostatic fields, electrical potential, energy density and their applications. Magneto static fields, magnetic flux density, vector potential and its applications. Different methods of EMF generation and Maxwell's equations Electromagnetic waves and characterizing parameters

Syllabus Details

Module No.	Description of Topics	Contact Hrs	CO
Module 1	Introduction: Co-ordinate systems and transformation, Cartesian coordinates, Circular cylindrical coordinates, Spherical coordinates & their transformation. Differential length, area and volume in different coordinate systems. Solution of problems. Introduction to Vector calculus: DEL operator, Gradient of a scalar, Divergence of a vector & Divergence theorem, Curl of a vector & Strokes theorem, Laplacian of a scalar, Classification of vector fields, Helmholtz's theorem. Solution of problems.	9	
Module 2	Scalar and Vector fields, Coulomb's Law and concept of Electric Field, Divergence, the Divergence Theorem and Gauss' Law, Concept of Electrostatic Potential, Poisson's Equation, Energy in the Field, Capacitance, capacitance of common two-plate capacitors, including two-wire capacitors, Dielectrics, dielectric boundary conditions, Solution of Laplace's Equation and Poisson's Equation in 1-D Capacitance. Scalar and Vector fields, Coulomb's Law and concept of Electric Field, Divergence, the Divergence Theorem and Gauss' Law.	9	
Module 3	Concept of Electrostatic Potential, Poisson's Equation, Energy in the Field, Capacitance, capacitance of common two-plate capacitors, including two-wire capacitors, Dielectrics, dielectric boundary conditions, Solution of Laplace's Equation and Poisson's Equation in 1-D Capacitance.	6	
Module 4	Force due to a Magnetic field, Force due to combined Electric and Magnetic fields, Biot-Savart Law, calculation of Magnetic Field for simple coil configurations, Ampere's Law, Magnetic flux, Stokes theorem, Magnetic materials, magnetic boundary conditions, Solution of problems. Electromagnetic fields: Faraday's law, Transformer and motional emf, Displacement current, Maxwell's equations, Time varying Potential, Time harmonic fields. Solution of problems.	6	
Module 5	Electromagnetic wave propagation: Wave equation, Wave propagation in lossy dielectric, Plane waves in loss less dielectric, Plane wave in free space, Plane wave in good conductor, Skin effect, Skin depth, Power & Poynting vector, Reflection of a plane wave at normal incidence, reflection of a plane wave at oblique incidence, Polarization. Solution of problems. Electromagnetic wave propagation: Wave equation, Wave propagation in lossy dielectric, Plane waves in loss less dielectric, Plane wave in free space, Plane wave in good conductor, Skin effect, Skin depth, Power & Poynting vector, Reflection of a plane wave at normal incidence, reflection of a plane wave at oblique incidence, Polarization. Solution of problems	9	

Module 6.	Transmission line: Concept of lump & distributed parameters, Line parameters, Transmission line equation & solutions, Physical significance of solutions, Propagation constants, Characteristic impedance, Wavelength, Velocity of propagation. Solution of problems.	6	
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Text/References:

1. Principles and Applications of Electromagnetic Fields - Plonsey, R. and Collin, R.E., McGraw Hill. 1961.
2. Engineering Electromagnetics - William H. Hayt, Jr. Fifth Edition. TMH. 1999
3. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
4. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.
5. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.

Electrical & Electronic Measurement Lab

Name of the Course:Electrical & Electronic Measurement Lab.	Category:Professional Core Course
Course Code:PC-EI491	Semester:4th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination scheme: Maximum marks:
Tutorial: Nil	External Assessment:60
Practical: 2 hrs./week	Internal Assessment:40
Credit Points: 1.5	

Course Outcomes:	
CO. 1	Identify different analogue & digital instruments both AC and DC, source and sink devices, their specifications, constructions using basic knowledge of electrical measurement.
CO. 2	Perform the experiments, interpret measured data and compare the measured value with the true value of a quantity, calculate error in measurement, draw calibration & error curve using appropriate techniques.
CO. 3	Develop the concept of calibration and understand the limitations of the different measuring instruments.
CO. 4	Review and analyse different methods of measurement of frequency, self-inductance, Capacitance and resistance using AC and DC bridges and provide valid concluding remarks.
CO. 5	Learn the necessity of safety measures of using different instruments and handling of high voltage AC.
CO. 6	Work as a member in a team, communicate with each other, and share their independent thinking to perform the experiments successfully.
Pre-Requisite:	
1	No pre-requisites

Experiment No.	Laboratory Experiments	COs
1	Calibration of dynamometer type Ammeter and voltmeter by Potentiometer.	
2	Measurement of Low Resistance using Kelvin Double Bridge.	
3	Measurement of frequency by Wien Bridge.	
4	Measurement of inductance by Anderson Bridge.	
5	Measurement of capacitance by De Sauty Bridge.	
6	Study the Static Characteristics of a Measuring Instrument.	

7	Study the Dynamic Characteristics of a Measurement System.	
8	Acquaintance with basic Structure of Digital Multi Muter and Measurement of Different Electrical Parameters.	
9	Wave and Spectrum Analysis using Q – Meter.	
10	Study the static and dynamic characteristics of VCO.	
11	Mandatory Design and Implementation of Mini Project.	

Microprocessor and Microcontroller Lab

Name of the Course:Microprocessor and Microcontroller Lab	Category:Professional Core Courses
Course Code: PC EI 492	Semester:4th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination scheme: Maximum marks:
Tutorial: Nil	External Assessment:60
Practical: 2 hrs./week	Internal Assessment:40
Credit Points: 1.5	

Course Outcomes:	
CO. 1	To construct and apply the assembly level programming of microprocessor and microcontroller.
CO. 2	To develop the programming logic and concept with the help of algorithm or flowchart.
CO. 3	To troubleshoot assembly language program along with interactions between software and hardware.
CO. 4	To practice the interfacing of microprocessor and microcontroller with peripheral devices for various applications.
CO. 5	To develop the ability to communicate effectively with fellow group members for dividing and sharing the assignments among themselves.
Pre-Requisite:	
1	Digital Electronics

Experiment No.	Laboratory Experiments	COs
1	a) Familiarization with 8085 trainer kit components. b) Familiarization with 8085 simulator on PC.	1 - 5
2	Study of prewritten programs using 8085 Kit / Simulator for i. Arithmetic operation (Addition, Subtraction, Multiplication, Division) ii. Logical operation (AND, OR, NOT, NAND, NOR, XOR, XNOR) iii. Copying a block of memory iv. Shifting a block of memory v. Packing and unpacking of BCD numbers vi. Addition of BCD numbers vii. Binary to ASCII conversion viii. String Matching etc	1 - 5
3	a) Familiarization with 8051 trainer kit components. b) Familiarization with 8051 simulator on PC.	1 - 5
4	Study of prewritten programs using 8051 Kit / Simulator for i. Arithmetic operation (Addition, Subtraction, Multiplication, Division) ii. Logical operation (AND, OR, NOT, NAND, NOR, XOR, XNOR) iii. Any other on need	1 - 5
5	Interfacing withPeripherals and I/O modules: i. 8255 PPI ii. Stepper Motor	1 - 5

	iii. ADC iv. Temperature sensor v. Relay vi. Any other on need	
6	Mandatory Design and Implementation of Mini Project	1 - 5

Data Structure & Algorithm Lab

Name of the Course: Data Structure & Algorithm Lab	Category: Engineering Science Courses
Course Code: ES-CS 491	Semester: 4 th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme:	Examination scheme: Maximum marks:
Tutorial: Nil	External Assessment:60
Practical: 2 hrs./week	Internal Assessment:40
Credit Points: 1.0	

Course Outcomes:	
ES-CS 491.1.	To know the concept of linear data structure like array along with its applications for solving various mathematical problems concerned with different topics like the operations of matrices.
ES-CS 491.2.	To recognize the various types of ADT like stack & queue with their operations and also their applications in the conversion among infix, prefix & postfix notations.
ES-CS 491.3.	To comprehend the significance of recursion for solving problems like Tower of Hanoi.
ES-CS 491.4.	To be acquainted with the concept of linked list with its classification and the relevance of the usage of such concepts according to the nature of the problems.
ES-CS 491.5.	To be aware with various algorithms applied for searching and sorting purposes with the differences regarding their working principles.
ES-CS 491.6.	To understand the significance of non-linear data structures by the implementations of operations done by Binary Search Tree (BST) etc. and also find the importance of hashing in case of any searching problems.
Pre-Requisite:	
1	C-Programming

Experiment No.	Laboratory Experiments	COs
1	Array Addition & Multiplication of Arrays Implementation of Sparse Matrices	1 - 6
2	Abstract Data Type Stacks and Queues: Implementation of Stack using Array, Conversion of infix notation into its corresponding prefix & postfix forms along with the evaluation of postfix expression Addition, Deletion of elements of Linear Queue & Circular Queue Implementation of Stack using Queue and vice-versa	1 - 6
3	Recursion Tail-Recursion, Tower of Hanoi	1 - 6
4	Linked List Implementation of linked lists: inserting, deleting, and inverting a linked list. Implementation of stacks & queues using linked list, Polynomial addition, Polynomial multiplication	1 - 6
5	Searching & Sorting Operations Searching: Linear Search, Binary Search	1 - 6

	Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort & Heap Sort.	
6	Nonlinear Data structures Tree Traversal of Binary Search Tree, Threaded binary tree traversal Height balanced binary tree – AVL tree (insertion, deletion) & B- Trees – operations (insertion, deletion).	1 – 6
7	Hashing Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.	1-6
8	Mandatory Design and Implementation of Mini Project.	6

Advanced Language Lab

Name of the Course: Advanced Language Lab	Category: Humanities and Social Sciences including management courses
Course Code: HM-HU 481	Semester: 4 th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination scheme: Maximum marks:
Tutorial: Nil	External Assessment:60
Practical: 2 hrs./week	Internal Assessment:40
Credit Points: 1.5	

Course Outcomes:	
CO. 1	To distinguish between various contexts of human communication, e.g., one-to-one, small group, organizational, formal, informal, media, family, intercultural communication, technologically mediated communication, etc.
CO. 2	To use knowledge of interview processes in answering typical HR questions and to demonstrate proper interview etiquette.
CO. 3	To analyze a given topic, enumerate main points and deliver a structured speech with proper introduction and conclusion.
CO. 4	To utilize the key skills like active listening, managing conflict, collaborative communication, and proper body language successfully while discussing any given topic in a group.
CO. 5	To defend opinions with evidence and argument while speaking to an audience or discussing a topic in a group.
CO. 6	To employ effective presentation skills to speak about general and academic topics in front of an audience and transfer this skill successfully to higher semester seminars and future career.
Pre-Requisite:	
1	No pre-requisites

Objective:

The overall aim of this course is to inculcate a sense of confidence in the students and help them to become good communicators in their social as well as professional lives.

Detailed Course Outlines

Introductory lecture is to be given to the students so that they get a clear idea of the syllabus and understand the need for having such a practice lab in the first place (3 hours).

Listening Skills:

Audios & Videos related to current affairs will be shown from sources like British Council, BBC, NDTV, TOEFL, IELTS etc to hone the listening skills of students so that they may identify important points and effective strategies in preparation for their speaking skills.

Speaking Skills:

1. Prerequisite for Speaking Activities: Mastering Linguistic, Paralinguistic features, Pronunciation, Body Language Voice modulation Stress, Intonation, Pitch & Accent of connected speech.

2. One Minute Speech: Students will be taught to organize their thoughts and ideas and present them in a coherent manner in front of an audience on any given topic. While giving the speech they will be taught to demonstrate correct body language, voice modulation and appropriate pronunciation

3. Group Discussion: The students are made to understand proper language, etiquette and strategies for group discussion. Audio -Visual aids as pre-requisite for group discussion will be used to hone listening skills. After wards the class is divided into groups and the students have to discuss on given topic.

4. Mock Interview: Students are taught the strategies of a successful interview. They then have to face rigorous practices of mock-interviews.

Reading Skills:

News Paper Reading: Students are advised to how to read current affairs from leading newspapers, comprehend and summaries the news articles and express their opinion in their own words. This activity will help the students immensely to speak during one minute speech and group discussion.

Writing Skills:

Resume Writing: Students will be taught how to write a professional resume for campus placement & future career.