Maulana Abul Kalam Azad University of Technology, West Bengal

(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Applied Electronics and Instrumentation Engineering (AEIE)

(Applicable from the academic session 2018-2019)

SECOND YEAR 4th SEMESTER PROPOSED SYLLABUS

Course Code : PC-EI401	**Category: Professional Core Course**
Course Name : Electrical and Electronic Measurement	**Semester : Fourth**
L-T-P :3-0-0	**Credit: 3**
Total Lectures: 45	
Pre-Requisites: No-prerequisite	

Objectives:

1. To provide students a brief knowledge of measurements and measuring instruments related to engineering.
2. To introduce students how different types of electrical and electronic meters work and their construction.
3. To provide students a knowledge to use modern tools necessary for instrumentation projects.

Course content:

Module No.	Description of Topic	Contact Hrs.
1	**Measurement and Electromechanical indicating Instruments:** Generalized block diagram of Measurement System, Industrial Standards of measurement. Measurement of current & Voltage using PMMC, MI and Electrodynamometer type instruments. Extension of range of instruments- shunts & multipliers-Current transformers- Potential Transformers.	**8**
2	**Power, Energy and Power Factor Measurements:** Definition of power, types, Measurement of power with different methods, construction and working of Electrodynamometer type Wattmeter, Errors in power measurements. Measurement of Energy using Induction type energy meter. Electrodynamometer type P.F. meter.	6
3	**DC and AC Bridges:** Concept of Bridges, Measurement of low resistance by Kelvin Double Bridge Method, A.C. bridges - Maxwell's inductance bridge, Anderson bridge, D-Sauty Bridge, Schering Bridge, Wien bridge- Circuit diagram, phasor diagram, derivations of equations for unknown parameter, Q-factor, dissipation factor, advantages and disadvantages for all the bridges.	6
4	**Analogue Electronic Instruments:** Q- Meter circuit and its operation, errors in Q- Meter circuits, Voltmeters with IC Operational Amplifiers, Peak Response and rectifying type AC Voltmeters, True rms Voltmeter, Electronic Ohmmeters, Current measurement with	11

	Analogue Electronic Instruments -Current-to-voltage converter type Electronic Ammeters. **Digital Instruments:** Introduction, Digital voltmeters, Digital Frequency Meter, Errors in frequency measurement – possible remedies, Time and Ratio measurement. Frequency Divider Generator, Signal Generator, Digital Multimeter.	
5	**Instrument for Generation and Analysis of Waveforms:** **Oscilloscopes and its applications:** Cathode Ray Tube, Oscilloscope Time Base, Delay line, Dual-Trace Oscilloscopes, Oscilloscope Probes, Delayed time base oscilloscope, Digital Storage Oscilloscope. **Signal Analysis**: Wave Analyzer, Spectrum Analyzer.	8
6	**Digital Data Acquisition System:** Interfacing transducers to Electronics Control and Measuring System. Voltage to frequency (V-F) converter, Frequency to voltage (F-V) converter. An Introduction to Virtual Instrumentation, Interference and Noises.	6

Course Outcomes:

At the end of the course, a student will be able to:

1. Identify various types of errors which may occur during measurement and take necessary steps to minimize them.
2. Demonstrate the working of various instruments used for measurement of different parameters like voltage, current, power, energy, resistance, capacitance, inductance, frequency, phase etc. in industry.
3. Select the appropriate analog and digital instruments for measurement of different electrical and electronic engineering parameters and select appropriate passive or active transducers for measurement of physical phenomenon.
4. Analyze and solve the varieties of problems and issues in the field of electrical and electronic measurements.
5. Calibrate and standardize various measuring instruments.
6. Believe about the improvement of existing technology in terms of accuracy, precision, resolution, cost, durability and user friendliness.

Learning Resources

Text Books:

1. A.K.Sawhney, Electrical & Electronics Measurements and Instrumentation; DhanpatRai.
2. E.W Golding, Electrical Measurement and Measuring Instruments; Wheeler Publication
3. Electronic Measurement & Instrumentation By J.G. Joshi – Khanna Publishing House
4. Electronic Measurement & Instrumentation By H. Cooper – PHI.

Reference Books:

1. Electronics Instruments & Measurement by David A. Bell – PHI.
2. J.B.Gupta, Electrical & Electronics Measurements and Instrumentation; S.K. Kataria and Sons.
3. Kalsi, G.C., Electronic Instrumentation, TMH.
4. Bouwens, A.J., Digital Instrumentation, McGraw Hill.

Course Code : PC-EI402	**Category: Professional Core Courses**
Course Name : Industrial Instrumentation	**Semester : Fourth**
L-T-P :3-0-0	**Credit: 3**
Total Lectures: 45	
Pre-Requisites: Sensors and Transducers	

Objectives:

The objective of this course is:

1. To familiar the students with industrial instruments used in various industries.
2. To acquire knowledge about various techniques used for measurement of process variables such as temperature, pressure, flow and level.
3. To equip the students with the basic knowledge of industrial processes.
4. To learn the construction and working of different types of temperature, pressure, flow and level transducers.
5. To provide the concept of possible sources of error and possible remedies when performing measurements.
6. To realize the basic concepts of hazardous area classification.

Course content:

Module No.	Description of Topic	Contact Hrs.
1	**Temperature Measurement:** Temperature and heating definitions, Standards, Temperature scales. **Filled in Systems Thermometer:** Liquid, gas and vapor pressure, construction details and comparison, ranges, sources of errors in filled in systems and their compensation, Bimetallic thermometer and thermostats. **Electrical Methods of Temperature Measurement:** Resistance Temperature Detector (RTD), Thermistor, Thermocouple, Thermo-well, Thermo-pile. **Radiation Methods of Temperature Measurement:** Radiation fundamentals, general form of radiation measurement system. Total radiation & selective radiation pyrometers, Optical pyrometer.	8
2	**Pressure Measurement:** Units of pressure, Classification of pressure gauges. **Manometer:** Various types, accuracy, range, errors. **Elastic Pressure Gauges:** Bourdon tube, diaphragm, Capsule gauge, Differential pressure gauge and its applications, Testing and Calibration of pressure gauges – Dead weight tester. **Electrical Type:** Capacitive, Piezo-electric, Piezo resistive and Resonator type. **Vacuum Gauges:** McLeod gauge, Knudsen gauge, Thermal conductivity gauges and Ionization gauges**.** Pneumatic instrumentation - Flapper nozzle system.	9
3	**Flow Measurement-I:** General consideration of fluid flow rate meters, classification of flow	8

	meters, units, Laminar flow, Reynolds number. Effect of temperature and pressure on flow rate measurement. **Fixed and variable head type flow meters:** Orifice plate- types, installation, pressure tapping and discharge coefficient variation, Venturi tube, Flow nozzle, Dall tube, Pitot tube – principle, installation, Annubar - analysis and calculation. Straight run requirements for flow meters. Rotameter - theory, types, installation.	
4	**Flow Measurement-II:** **Mass flow meters:** Coriolis, Thermal and Impeller type. **Electrical type:** Electromagnetic flow meter- principle, construction, different types of excitation schemes used, Ultrasonic flow meter – principle, types, Anemometers. Positive displacement flow meters, Vortex flow meter, Target flow meter and open channel flow measurement. Guidelines for selection and calibration of flow meters.	8
5	**Level Measurement:** Gauge glass, Float type, Displacers and torque tube- construction and working, errors and ranges. Air purge/ bubbler system, Hydrostatic pressure type, Boiler drum level measurement. D/P type sensors and their installation arrangement. **Electrical types:** Resistance tapes, Capacitance level sensor- principle, types, installation, Ultrasonic sensor, Optical level sensor, Laser level, Microwave type, Radiation type.	7
6	**Industrial Safety Measurement:** Introduction, Electrical hazards, Hazardous areas and classification, Non hazardous areas, Enclosures – NEMA and IP codes Methods of Protection – Explosion proof, intrinsic safety, Purging and Pressurization, Non-Incendiary; IEC, Equipment Protection Level (EPL). Electromagnetic Interference and earth loops	5

Course Outcomes:

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

1. Acquire the knowledge of use of temperature, pressure, flow and level sensors and transducers in the field of Instrumentation.
2. Explain the operation of transducers for temperature, pressure, fluid flow and level measurement.
3. Describe the specification of different process instruments and advantages and disadvantages.
4. Identify, formulate and solve engineering problems related to measurement of process parameters.
5. Select and design suitable instruments to meet the requirements of industrial applications.
6. Comprehend the methods of hazard identification and safety measures.

Learning Resources

Text Books:

1. Krishnaswamy. K & Vijayachitra. S, Industrial Instrumentation, New Age International

2. Patranabis. D, Principle of Industrial Instrumentation, 2nd edition, Tata McGraw Hill, New Delhi.
3. Singh S.K, Industrial Instrumentation and Control, Tata McGraw Hill, New Delhi.
4. Anand M.M.S., Electronic Instruments and Instrumentation Technology, Prentice Hall of India, New Delhi.

Reference Books:

1. Liptak B.G., Process Measurement and Analysis, 3rd edition, Chilton Book Company, Radnor, Pennsylvania, 1995.
2. Douglas M. Considine, Process/Industrial Instruments and Control Handbook, 4th edition, McGraw Hill, Singapore.
3. Doeblin E. O., Measurement Systems: Application and Design, 4th edition, McGraw Hill, New York.
4. Curtis D. Johnson, Process Control Instrumentation Technology, Prentice Hall, India.
5. M.P. Poonia & S.C. Sharma, Industrial Safety and Maintenance Management, Khanna Publishing House.

Course Code : PC-EI403	**Category: Professional Core Courses**
Course Name : Microprocessor and Microcontroller	**Semester : Fourth**
L-T-P :3-1-0	**Credit: 4**
Total Lectures: 60	
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 content:

Module No.	Description of Topic	Contact Hrs.
1	**8085 Processor:** Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization and interfacing –I/O ports and data transfer concepts– Timing Diagram – Interrupts.	14
2	**Programming of 8085 Processor:** 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.	14
3	**8051 Micro Controller:** Hardware Architecture, pintouts – Functional Building Blocks of Processor – Memory organization –I/O ports and data transfer concepts– Timing Diagram – Interrupts.	10
4	**Peripheral Interfacing:** Study on need, Architecture, configuration and interfacing, with ICs: 8255, 8254, 8251, A/D and D/A converters &Interfacing with 8085.	10
5	**Micro Controller Programming & Applications:** Data Transfer, Manipulation, Control Algorithms& I/O instructions – Simple programming exercises key board and display interface.	6
6	**Architecture of Typical 16-Bit Microprocessors (Intel 8086):** Introduction to a 16 bit microprocessor, Architecture and Register Organization, Memory address space and data organization.	6

Course Outcomes:

1. To construct and analyze assemble language program in 8085 and 8086 microprocessor to solve various complex engineering problem.
2. To evaluate processing time of program and devise technique to reduce execution time to improve microprocessor performance.
3. To design interfacing circuits to the microprocessor to communicate with external devices, which can be associated with public safety, health, security and other societal and environmental concerns.
4. To design memory devices using memory chips and utilize the knowledge in memory based devices used in academics and industry.
5. To study 8051 microcontroller for using it in real life applications.
6. To learn architecture and programming of programmable peripheral devices such as 8255, 8254 to use them in larger industrial and societal application.

Learning Resources

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.

References:

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.

Course Code : ES-CS401	**Category:** Engineering Science Courses
Course Name : Data Structure and Algorithm	**Semester : Fourth**
L-T-P :3-0-0	**Credit: 3**
Total Lectures: 45	
Pre-Requisites: No-prerequisite	

Course 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 content:

Module No.	Description of Topic	Contact Hrs.
1	**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 programs, basic idea of pseudo-code. Properties of an Algorithm, Algorithm efficiency and analysis, time and space analysis of algorithms – order notations.	3
2	**Array and Linked List :** **Array:** Different representations – row major, column major. Sparse matrix - its implementation and usage. Array representation of polynomials. **Linked List:** 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 and applications.	7
3	**Linear Data Structure:** **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.	10

	Recursion: Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle.	
4	**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 (insertion, deletion with examples only). B- Trees – operations (insertion, deletion with examples only), Brief overview of B++ tree, Red-Black tree.	11
5	**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, isomorphism).Graph representations/storage implementations – adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) – concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, and forward-edge), applications. Minimal spanning tree – Prim's algorithm (basic idea of greedy methods).	6
6	**Searching, Sorting, Hashing:** **Sorting Algorithms:** Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort, bucket sort. **Searching:** Sequential search, binary search, interpolation search. **Hashing:** Hashing functions, collision resolution techniques	8

Course Outcomes:

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

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.
2. Comprehend the concept of linked list along with its difference from array and its many applications for solving different problems.
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.
4. Create the concept of non-linear data structure like graph, tree and their appliance in various problems in societal issues.
5. Know different searching and sorting approaches and select proper data structure and algorithm by analyzing time complexity and space complexity for specific problems.

6. Apply hashing techniques for minimizing searching time and have the knowledge of file organization.

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 Publishing House.
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 Publishing House
2. "Data Structures Using C" by Reema Thareja
3. "Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.
4. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.

Course Code : BS-BIO401	**Category: Basic Science course**
Course Name : Biology	**Semester : Fourth**
L-T-P :3-0-0	**Credit: 3**
Total lectures: 45	
Pre-Requisites: No-prerequisite	

Objectives:

The syllabus of Environmental Engineering has been formulated for B.Tech. students by MAKAUT with an eye to

1. Convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry.
2. Provide basic knowledge about our environment and importance of different types of ecosystem and biodiversity on existence of life on Earth.
3. Convey that classification per se is not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted.
4. Convey that "Genetics is to biology what Newton's laws are to Physical Sciences"
5. Convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine.
6. Convey that without catalysis life would not have existed on earth.
7. Understand the molecular basis of coding and decoding genetic information and information transfer from parent to offspring.
8. Analyze different biological processes.
9. Convey that the fundamental principles of energy transactions are the same in the physical and biological world.

Course content:

Module No.	Description of Topic	Contact Hrs.
1	**Introduction:** Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry. 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 18^{th} 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 scientificinquiry.	4

2	**Classification** 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. 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, uricoteliec, ureotelic (e) Habitataacquatic 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	5
3	**Genetics** Purpose: To convey that "Genetics is to biology what Newton's laws are to Physical Sciences". 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 humangenetics.	6
4	**Bio molecules** Purpose: To convey that all forms of life has the same building blocks and 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. **Enzymes** 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.	11
6	**Metabolism** Purpose:Thefundamentalprinciplesofenergytransactionsarethesamein physical and biologicalworld. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq 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 (GlycolysisandKrebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis).Energy yielding and energy consuming reactions. Concept of Energy charge.	7

	Microbiology 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.	

Course Outcomes:

After studying the course, the student will be able to:

1. Describe how biological observations of 18th Century that lead to major discoveries.
2. Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological.
3. Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring.
4. Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one canimagine.
5. Classify enzymes and distinguish between different mechanisms of enzyme action.
6. Identify DNA as a genetic material in the molecular basis of information transfer.
7. Analyse biological processes at the reductionistic level.
8. Apply thermodynamic principles to biological systems.
9. Identify and classify microorganisms.

Learning Resources

1. Biology:Aglobalapproach:Campbell,N.A.;Reece,J.B.;Urry,Lisa;Cain,M,L.;Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. OutlinesofBiochemistry,Conn,E.E;Stumpf,P.K;Bruening,G;Doi,R.H.JohnWileyandSons
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers.

Course Code : HM-HU401	**Category:** Humanities and Social Sciences including Management Courses
Course Name : Values and Ethics in Profession	**Semester : Fourth**
L-T-P :2-0-0	**Credit: 2**
Total Lectures: 30	
Pre-Requisites: No-prerequisite	

Objectives: To understand the ethical and moral problems faced in the corporate and wider philosophical settings along with social importance and their intellectual challenges are given its due placement.

Course content:

Module No.	Description of Topic	Contact Hrs.
1	**Being good and responsible** Gandhian values such as truth and non-violence – comparative analysis on leaders of past and present – society's interests versus self interests – Prevention of harassment, violence and terrorism - Personal Social Responsibility: Helping the needy, charity and serving the society	4
2	**Profession and Human Values** Values Crisis in contemporary society, Nature of values: Value Spectrum of a good life, Psychological values: Integrated personality; mental health, Dishonesty - Stealing - Malpractices in Examinations - Plagiarism – Abuse of technologies: Hacking and other Cyber Crimes, addiction to mobile phone usage, video games and social networking websites.	6
3	**Corruption** Corruption: ethical values, causes, impact, laws, prevention – electoral malpractices – white collar crimes - tax evasions – unfair trade practices.	2
4	**Addiction and Health Peer pressure, Drug Abuse** Alcoholism: ethical values, causes, impact, laws, prevention-ill effects of smoking-Prevention of suicides-Sexual Health: Prevention and impact of pre- marital pregnancy and Sexually Transmitted Diseases. Abuse of different types of legal and illegal drugs: ethical values, causes, impact, laws and prevention	4
5	**Ethics of Profession** Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.	6
6	**Effects of Technological Growth** Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development, Energy Crisis: Renewable Energy Resources, Environmental	8

	degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics, Appropriate, Technology Movement of Schumacher; later developments, Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis. Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centred Technology.	

Course Outcomes:

On completion of the course, the students will be able to solve the day-to-day problems and their allied alternative decision making towards social impact.
Analyse and give solution to business environment.
Expected this course meets the following student outcomes:

Outcomes:

1. An understanding of professional, ethical, legal, security and social issues and responsibilities g) An ability to communicate effectively with a range of audiences.
2. An ability to address contemporary issues and analyze the local and global impact of computing and engineering solutions on individuals, organizations and society
3. Recognition of the need for and an ability to engage in continuing professional learning (lifelong learning)

Learning Resources

Textbook:

1 Human Values- A.N Tripathi.
2 Professional Ethics and Human Values – Premvir Kapoor, Khanna Publishing House
3 Christine E. Gudorf, James Edward Huchingson, 'Boundaries: A Casebook in Environmental Ethics', Georgetown University Press, 2010

References:

1 Ethics- S. Balachandran, K.C.R.Raja & B.K Neir
2 Values and Ethics in Profession-Sisir Mazumder (Everest)
3 Ethics in Engineering- Martin Schinzinge
4 Mike W Martin & Ronald Schnizinger, Engineering Ethics, New Delhi: Tata Reference McGraw Hill, Latest Edition
5 OC Ferrell, John Paul Frederich, Linda Ferrell; Business Ethics – Ethical Books Decision making and Cases- 2007 Edition, Biz Tantra, New Delhi
6 L.H. Newton & Catherine K.D., "Classic cases in Environmental Ethics", Belmont: California Wadsworth, 2006

Course Code : PC-EI491	**Category: Professional Core Course**
Corse Name : Electrical & Electronic Measurement Lab	**Semester : 4th**
L-T-P :0-0-3	**Credit: 1.5**
Pre-Requisites: No pre-requisites	

Laboratory Experiments :	
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

Course Outcomes:
At the end of the course a student will be able to –

1 Identify different analogue & digital instruments both AC and DC, source and sink devices, their specifications, constructions using basic knowledge of electrical measurement.
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.
3 Develop the concept of calibration and understand the limitations of the different measuring instruments.
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.
5 Learn the necessity of safety measures of using different instruments and handling of high voltage AC.
6 Work as a member in a team, communicate with each other, and share their independent thinking to perform the experiment successfully.

Course Code : PC-EI492	**Category: Professional Core Course**
Corse Name : Microprocessor and Microcontroller Lab	**Semester : 4th**
L-T-P :0-0-3	**Credit: 1.5**
Pre-Requisites: Digital Electronics	

Laboratory Experiments :	
1	a) Familiarization with 8085 trainer kit components. b) Familiarization with 8085 simulator on PC.
2	a) Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator. b) Assignments based on above
3	PROGRAMMING USING KIT/SIMULATOR FOR i)Table look up ii) Copying a block of memory iii) Shifting a block of memory iv) Packing and unpacking of BCD numbers v) Addition of BCD numbers vi) Binary to ASCII conversion vii) String Matching etc
4	Study of 8051 Micro controller kit and writing programs for the following tasks using the kit a) Table look up b) Basic arithmetic and logical operations c) Interfacing of Keyboard and stepper motor through 8255.
5	INTERFACING WITH I/O MODULES: a) ADC b) Speed control of mini DC motor using DAC c) Stepper motor d) Temperature sensor and display temperature e) Relay
6	Mandatory Design and Implementation of Mini Project

Course Outcomes:

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

Course Code : ES-CS491	**Category: Engineering Science Courses**
Corse Name : Data Structure and Algorithm Lab	**Semester : 4th**
L-T-P :0-0-3	**Credit: 1.5**
Pre-Requisites: No pre-requisites	

Laboratory Experiments :	
1	**Array** Addition & Multiplication of Arrays Implementation of Sparse Matrices
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
3	**Recursion** Tail-Recursion, Tower of Hanoii
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
5	**Searching & Sorting Operations** **Searching:** Linear Search, Binary Search **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)
7	**Hashing** Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.
8	Mandatory Design and Implementation of Mini Project

Course Outcomes:

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.
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.
3. To comprehend the significance of recursion for solving problems like Tower of Hanoi.
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.
5. To be aware with various algorithms applied for searching and sorting purposes with the differences regarding their working principles.
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.

Course Code : HM-HU481	**Category: Humanities and Social Sciences including Management Courses**
Corse Name : Advanced Language Lab	**Semester : 4th**
L-T-P :0-0-2	**Credit: 1**
Pre-Requisites: 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.

Course Outcomes:

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.
2. To use knowledge of interview processes in answering typical HR questions and to demonstrate proper interview etiquette.
3. To analyze a given topic, enumerate main points and deliver a structured speech with proper introduction and conclusion.
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.
5. To defend opinions with evidence and argument while speaking to an audience or discussing a topic in a group.
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.