

**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**

Course Code: HM-HU 801	Category: Humanities and social sciences including Management Courses
Course Name: Project Management and Entrepreneurship	Semester: Eighth
L-T-P: 3-0-0	Credit: 2
Total Lectures: 30	
Pre-Requisites:	

Module No.	Description of Topic	Contact Hrs.
1	Introduction Concept of Management, Management: Art and Science, Management Vs Administration, Levels of Management, Functions of management, Management as a Profession, Management skills, Qualities and characteristics of managers. Evolution of Management thought: Early contributions: Taylor and Scientific Management, Fayol's Administrative Management, Bureaucracy, Human Relations, and Modern Approach, Social responsibility of managers, Managerial Ethics.	6
2	Planning and Organizing Concept of planning, Significance of planning, Classification of planning: Strategic plan, Tactical plan and Operational plan, Process of planning, Barriers to effective planning. MBO, Management by Exception. Decision Making: Strategies of decision making, Steps in rational decision making process, Factors influencing decision making process, Psychological bias and decision support system. Organizing: Defining organizing, Principles of organizing, Process of organizing, Types of organizational structure, Span of control, Line and Staff Relationship, Centralization vs. Decentralization of authority, Informal organization.	10
3	Staffing, Directing and Motivation Staffing: Concept, Objective of staffing, System approach to staffing, Manpower planning. Directing: Concept, Techniques of directing and supervision, Types of supervision, Essential characteristics of supervisor. Motivation: Concept, Forms of employee motivation, Need for motivation. Theories of motivation: Maslow, Herzberg, McClelland, Vroom, Porter and Lawler, Job Satisfaction.	6
4	Leadership and Control Leadership vs Management, Process of Leadership, Importance of leadership, Characteristics of an effective leader, Communication Process, Channels and Barriers, Effective Communication, Controlling: Concept, Importance of controlling, Types of control, Steps in control process, Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness.	8

Course Outcomes (CO):

The students will be able to -

1. To understand the basic concept of management, diagnose the management issues in organizations, explain and analyze key principles of management planning, leading and controlling in business organizations

2. To explain the ethical standards and external environmental aspects of the organizations, list and exercise social responsibility and sustainability in the practical context and maintaining good governance for organization
3. To explain the basic concept, tools and environmental framework of marketing management and its importance on the organization in order to develop the effective marketing communications strategy
4. To explain the basic concept and functions of human resource management, human resource development and their applications in the organization, training and knowledge of human factors in engineering and various job designs
5. To evaluate various kinds of skills in inter-personal communication, team work, leading people, and handling conflict in organizations
6. To understand individual personalities and interpersonal skills needed for effective communications in a diverse business environment

Learning Resources:

Text Books:

1. Durai, P. (2015). Principles of Management, Text and Cases. New Delhi: Pearson Education.
2. Koontz, H. (2010). Essentials of Management. New Delhi: Tata McGraw-Hill Education.
3. Stoner, Freeman & Gilbert Jr. (2009). Management. New Delhi: Prentice Hall.
4. Premvir Kapoor (2018), Principles of Management, Khanna Publishing House, New Delhi

Reference book:

1. Wehrich, H. & Koontz, H. (2010). Management- A Global Perspective: New Delhi: Tata McGraw-Hill Education.
2. Robbins & Coulter (2013). Management. New Delhi: Prentice Hall.
3. Robbins, S.P. & Decenzo, D. A. (2014). Fundamentals of Management: Essential Concepts and Applications. New Delhi: Pearson Education.
4. Luthans, F. (2010). Organizational Behaviour. New York: McGraw-Hill

Course Name: Digital Image Processing	Category: Open Elective Course-V
Course Code: OE-EI 801	Semester: 8th
L-T-P: 3-0-0	Credit: 3
Teaching Scheme	Examination Scheme
Theory: 4 hrs./week	Continuous Assessment: 25Marks
Tutorial: Nil	Attendance: 5 Marks
Total Lectures: 43	End Semester Exam.: 70 Marks
Pre-Requisites: Digital Signal Processing, Signals and Systems	

Objectives:

- To understand the different representation of digital images.
- To understand the importance of adequate sampling frequencies and the appearance of artifacts.
- To study the image fundamentals and mathematical transforms necessary for image processing.

Course Outcomes (COs):

OE-EI 801.1. Mathematically represent the various types of images and **formulate** them for further processing.

OE-EI 801.2. Evaluate images for enhancement of certain properties or for optimized use of the resources.

OE-EI 801.3. Analyze images in the frequency domain using various transforms.

OE-EI 801.4. Implement the algorithms related to morphological image processing.

OE-EI 801.5. Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).

OE-EI 801.6. Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	Introduction: Introduction to structure of human eye, Imageformation in the human eye, Brightness adaptation and discrimination, Image sensing and acquisition, storage, Processing, Communication, Display Image Sampling and quantization, Basicrelationships between pixels.	5	1
Module: 2	Image Transforms (implementation): Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamard transform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen- Loeve (Hotelling) transform.	8	CO 1, 2
Module: 3	Image Enhancement: Image Enhancements and Filtering- Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and	8	CO 1, 3

	order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.		
Module: 4	Image Compression: Fundamentals, Redundancies: Coding, Interpixel Psycho-visual, fidelity criteria, Image compression models, Error free compression, Lossy compression, Image compression standards: Binary image and Continuous tone Still Image compression standards, Video compression standards.	8	CO 5, 6
Module: 5	Morphological Image Processing: Introduction, Dilation, Erosion, Opening, closing, Hit-or-misses transformation, Morphological algorithm operations on binary Images, and Morphological algorithm operations on gray-scale Images.	6	CO 1, 4
Module: 6	Image Segmentation: Representation and Description: Detection of discontinuities, Edge linking and Boundary detection, Thresholding Region based segmentation, Image Representation schemes, Boundary descriptors, and Regional descriptors.	8	CO 5, 6

Text Books:

1. R.C Gonzalez and R. Woods :-Digital Image Processing, (Indian reprint: Pearson publication,2001)
2. Anil K. Jain :- Digital Image Processing (Prentice-Hall,India)

Reference Books:

1. W. K. Pratt :-Digital Image Processing, - 2nd Edition, (John Wiley & Sons).
2. B. Chanda & D. Dutta Majumder, Digital Image Processing and Analysis, (Prentice-Hall, India)
3. M. A. Sid-Ahmed :- Image Processing- Theory, Algorithms & Architecture, (McGraw-Hill)

Course Name: Big Data Analysis	Category: Professional Elective V
Course Code: OE-EI 802	Semester: VIII
L-T-P: 3-0-0	Credit: 3
Teaching Scheme	Examination Scheme
Theory: hrs./week	Continuous Assessment: 25Marks
Tutorial: Nil	Attendance: 5 Marks
Total Lectures:36	End Semester Exam.: 70 Marks
Pre-Requisites:	

Course Outcomes (CO):

The students will be able to -

- OE-EI 802.1:** Upon completion of this course, students will be able to do the following:
- OE-EI 802.2:** Students will to build and maintain reliable, scalable, distributed systems with Apache Hadoop.
- OE-EI 802.3:** Students will be able to write Map-Reduce based Applications Learning with MLlib.
- OE-EI 802.4:** Students will be able to design and build MongoDB based Big data Applications and learn MongoDB query language
- OE-EI 802.5:** Students will learn difference between conventional SQL query language and NoSQL basic concepts
- OE-EI 802.6:** Students will learn tips and tricks for Big Data use cases and solutions.

Module No.	Description of Topic	Contact Hrs.	COs
1	INTRODUCTION TO BIG DATA Introduction– distributed file system–Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce	6	
2	INTRODUCTION TO HADOOP AND HADOOP ARCHITECTURE Big Data – Apache Hadoop & HadoopEcoSystem, Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce -, Data Serialization.	8	
3	HDFS, HIVE AND HIVEQL, HBASE HDFS-Overview, Installation and Shell, Java API; Hive Architecture and Installation, Comparison with Traditional Database, HiveQL Querying Data, Sorting And Aggregating, Map Reduce Scripts, Joins & Sub queries, HBase concepts, Advanced Usage, Schema Design, Advance Indexing, PIG, Zookeeper, how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.	6	
4	SPARK Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Machine Learning with MLlib.	8	
5	NoSQL What is it?, Where It is Used Types of NoSQL databases, Why NoSQL?., Advantages of NoSQL, Use of NoSQL in Industry, SQL vsNoSQL, NewSQL	5	
6	Data Base for the Modern Web Introduction to MongoDB key features, Core Server tools, Mongo DB through the JavaScript’s Shell, Creating and Querying through Indexes, Document-Oriented, principles of schema design, Constructing queries on Databases, collections and Documents, MongoDB Query Language.	7	

Learning Resources:

Reference Books:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirkderooset al., “Understanding Big data”, McGraw Hill, 2012.
3. BIG Data and Analytics, Sima Acharya, Subhashini Chhellappan, Willey
4. MongoDB in Action, Kyle Banker,PiterBakkum , Shaun Verch, Dream tech Press
5. Tom White, “HADOOP: The definitive Guide”, O Reilly 2012.
6. VigneshPrajapati, “Big Data Analyticswith R and Haoop”, Packet Publishing 2013.
7. Learning Spark: Lightning-Fast Big Data Analysis Paperback by Holden Karau
8. V.K. Jain, Big Data and Hadoop, Khanna Publishing House, 2017.

Course Name: Power Plant Instrumentation	Category: Professional Elective Course-VI
Course Code: PE-EI801	Semester: VIII
L-T-P: 3-0-0	Credit: 3
Teaching Scheme	Examination Scheme
Theory: hrs./week	Continuous Assessment: 25Marks
Tutorial: Nil	Attendance: 5 Marks
Total Lectures:30	End Semester Exam.: 70 Marks
Pre-Requisites: To understand this course, the learner must have idea of Sensor and Transducer, Industrial instrumentation and Process control.	

Objectives:To acquaint the Power Plant Professionals with theory and working principles of different types of instruments used in the power plant and their applications.

Course Outcomes (COs):

CO.1. Create an overall perception about different types of power plant like Thermal, Hydel and Nuclear along with the measuring instruments associated with these particular types of process.

CO.2. Evaluate instruments parameter to get overall control of a power plant by knowing the working principle of each block such as Turbine, Condensers, Generators, Coal handling, Water treatment, Feed water, combustion air and flue gases.

CO.3. Analyze the feedback signal for different control unit of power plant such as Boiler control, Furnace draft control, Steam temperature control and Feed water control etc. The supervisory control and monitoring is accompanying with different control loop for enhanced closed loop responses.

CO.4. Apply all type of safety interlocks to ensure zero accident by incorporating protective gears, emergency measures and Alarm systems. Moreover, the pollution due to the power plant is also measured, monitor and control for the environmental safety.

CO.5. Understand the data handling processing, logging, acquisition, accounting, display and storage of data from Power plant. The coupling between the turbine and generator along with transmission through three phases are considered as an output side of the power plant.

CO.6. Describes the modelling and simulation of power plant in HMI section using DCS and PLC for better closed loop control.

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	Module Name:General Concepts Details: Power Plants of different types: Setups, energy conversions and measurement requirements, examples of Thermal, Hydel, and Nuclear plants. Thermal power plant and system instrumentation.	6	1
Module: 2	Module Name:Instrumentation for Details: 1) Turbines 2) Condensers 3) Generators 4) Coal handling 5) Water treatment 6) Feed water, combustion air and flue gases	10	1,2
Module: 3	Module Name:Control Details: Boiler Control - Steam pressure control, combustion control, Furnace Draft control, Steam temperature Control, Feed water control, Data logger and computer control, supervisory control and monitoring system.	5	1,3
Module: 4	Module Name:Safety Details: Instrumentation for safety interlocks - protective gears, emergency measures, Alarm systems and Analysis etc. Pollution measurement, monitoring and control.	3	1,2,4
Module: 5	Module Name:Transmission Details: Data handling-processing, logging, acquisition, accounting, display and storage. Instrumentation for Generator and Bus bar coupling.	4	1,3,4,5
Module: 6	Module Name:Modelling and simulation Details: Introduction to power plant modelling/simulation, Understand the basic interface (HMI) of a typical power plant with all safety measures.	2	5,6

Text Books:

1. Power Plant Instrumentation, K. Krishnaswamy, M. Ponni Bala, PHI Learning Private Limited.
2. Principles of Industrial Instrumentation, D. Patranabis, TMH New Delhi.

Reference Books:

1. Electric Power Engineering Handbook – Edited by L. L. Grigsby.
2. Instrument Engineers Handbook, B. G. Liptak, Chilton Book Co., Philadelphia

Course Code: PE-EI802	Category: Professional Elective Courses-VI
Course Name: NANO ELECTRONICS	Semester: Eighth
L-T-P: 3-0-0	Credit: 3
Total Lectures: 34	
Pre-Requisites: Basic Electronics	

COURSE OUTCOME (CO):

PE-EI802.1: To identify the concept, advantages and challenges of Nano electronics

PE-EI802.2: To describe the characteristics of carrier distribution and transport in nanoscale structures

PE-EI802.3: To apply the concept of different types of nano diodes, nano transistors and their junction physics

PE-EI802.4: To analyze the construction and operation of various nano display, logic and memory devices

PE-EI802.5: To evaluate different nano-photonics devices for optical fiber sensor systems

PE-EI802.6: To design various nano fiber sensors for industrial applications like temperature, pressure, displacement, fluid flow, rotation, etc.

Module No.	Description of Topic	Contact Hrs.	COs
1	Fundamentals on Nanoelectronics – Concepts of Nanoelectronics, Technological revolution from Microelectronics to Nanoelectronics and beyond, Moore’s Law Trends and Limits, Technological advantages in various applications like - Automotive, Health Care, Biochips, Lab-on-Chips , Safety and Security, Industrial Applications, etc.	4	1, 2
2	Nano diode – classification of nanostructure (1D or quantum well, 2D or quantum wire, 3D or quantum dot), band structure and energy level modification in various nanostructures, electron transport in nanostructures, design of nano diodes, Resonant-tunnelling diodes, nano-Light emitting diodes, nano lasers, nano solar cell, etc.	6	3
3	Nano transistor & Nano Display systems – nano transistor, nano Field-effect transistors, Single-electron-transfer devices, Potential-effect transistors, nano display system, etc.	6	3, 4
4	Nano Logic Devices – Nano MOSFET & CMOS Devices, Device structure and Speed Performance of nano FETs, Switching Delay Formulation, Power dissipation, Parasitic Capacitance in Logic Devices, FinFET and Double-Gate Devices, Choice of Materials for Advanced CMOS	6	4
5	Nano Memory Devices - Mainstream Memories (DRAM and NAND), Evolution and Scaling Limits, Various Memories Technologies like Ferroelectric Memories, Magnetic Memories, Phase Change Memories, Resistive RAMs, OxRAM and CBRAM, Emerging Memories Architectures, From Cell to Arrays, 3D RRAM Architectures, Opportunities for Emerging Memories etc.	6	5
6	Nano Integrated Sensors and Actuators – Nano Mechanical sensors, Nano MEMS, Nano Pressure Sensors, Acceleration Sensors, Nano Gas Sensors, Biosensors, Electrostatic,	6	6

	Electromagnetic and Piezoelectric Sensors, Nano Optical Fibers, Integrated Fiber Sensors for Industrial applications.		
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Books:

1. Nanoelectronics - Materials, Devices, Applications – R. Pueres, et al (Ed), Wiley VCH, 2016
2. Introduction to Nanoelectronics Science, Nanotechnology, Engineering, and Applications – V. V. Mitin, V.A. Kochelap and M. A. Stroscio, Cambridge University Press, 2008
3. Fundamentals of Nanoelectronics - G. W. Hanson, Pearson/Prentice Hall, 2008
4. Intersubband Transitions in Quantum Structures – R. Paiella (Ed), McGraw-Hill, 2006
5. Nanophotonics and Nanostructured Fiber Sensors – A. B. Maity, Narosa, 2019
6. Sensors Based on Nanostructured Materials - F. J. Arregui (Ed), Springer, 2009

INTERNSHIP-II

Name of the Course: INTERNSHIP-II	Category: Internship
Course Code: PROJ-EI 882	Semester: 8th
Duration:	Maximum Marks: 100
Teaching Scheme	Examination scheme: Maximum marks:
Tutorial: Nil	External Assessment:60
Practical: Minimum of 8 weeks	Internal Assessment:40
Credit Points: 2	

OBJECTIVES

Internships are educational and career envelopment opportunities, providing practical experience in a field or discipline. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the ‘Industrial Internship’ in classroom will be used in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job.

Course Outcomes:	
CO. 1	Learn to apply the Technical knowledge in real industrial situations.
CO. 2	Gain experience in writing Technical reports/projects
CO. 3	Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
CO. 4	Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
CO. 5	Understand the psychology of the workers and their habits, attitudes and approach to problem solving
CO. 6	Develop soft skills in management, team skill & leadership skill and responsibilities in the work environment.

Benefits to Students:

- An opportunity to get hired by the Industry/ organization.
- Practical experience in an organizational setting.
- Excellent opportunity to see how the theoretical aspects learned in classes are integrated into the practical world. On-floor experience provides much more professional experience which is often worth more than classroom teaching.
- Helps them decide if the industry and the profession is the best career option to pursue.
- Opportunity to learn new skills and supplement knowledge.

- Opportunity to practice communication and teamwork skills.
- Opportunity to learn strategies like time management, multi-tasking etc in an industrial setup.
- Opportunity to meet new people and learn networking skills.
- Makes a valuable addition to their resume.
- Enhances their candidacy for higher education.
- Creating network and social circle and developing relationships with industry people.
- Provides opportunity to evaluate the organization before committing to a full time position.

Name of the Course:PROJECT-II	Category:Project Stage-II
Course Code: PROJ-EI 881	Semester:8th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination scheme: Maximum marks:
Tutorial: Nil	External Assessment:60
Practical: 8 hrs./week	Internal Assessment:40
Credit Points: 4	

Objective:

Final Year Projects represent the culmination of study towards the Bachelor of Engineering degree. Projects offer the opportunity to apply and extend material learned throughout the program. Assessment is by means of a seminar presentation, submission of a thesis, and a public demonstration of work undertaken.

Course Outcomes:	
CO. 1	Identify a particular domain for their project work and engage themselves in independent study to research literature in the identified domain.
CO. 2	Recognize and formulate the engineering problems in selected domain by consolidating the literature search, fundamental knowledge and skills in engineering to solve the identified engineering problem.
CO. 3	Select the engineering tools/components for solving the identified engineering problem and accomplish the budget analysis of the project through the utilization of resources (finance, power, area, bandwidth, weight, and size, any other).
CO. 4	Sketch the project planning, scheduling and execution control and Perform in the team, contribute to the team and mentor/lead the team.
CO. 5	Design and develop a functional product prototype by considering the prescribed standards/ safety norms.
CO. 6	Demonstrate the project in effective written and oral communication through the project report, four-page IEEE paper format, and presentation of the project work and identify the community that shall benefit through the solution to the identified engineering problem and also demonstrate concern for environment.
Pre-Requisite:	
Knowledge and skills developed in previous courses and current study	