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)

FOURTH YEAR 8TH SEMESTER SYLLABUS

Course Code: PE-EI 801	**Category: Professional Elective Courses-V**
Course Name: Power Plant Instrumentation	**Semester: Eighth**
L-T-P: 3-0-0	**Credit: 3**
Total Lectures: 30	
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.

Module No.	Description of Topic	Contact Hrs.
1.	**General Concepts** 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
2.	**Instrumentation for** 1) Turbines 2) Condensers 3) Generators 4) Coal handling 5) Water treatment 6) Feed water, combustion air and flue gases	10
3.	**Control** 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
4.	**Safety** Instrumentation for safety interlocks - protective gears, emergency measures, Alarm systems and Analysis etc. Pollution measurement, monitoring and control.	3
5.	**Transmission** Data handling-processing, logging, acquisition, accounting, display and storage. Instrumentation for Generator and Busbar coupling.	4
6.	**Modelling and simulation** Introduction to power plant modelling/simulation, Understand the basic interface (HMI) of a typical power plant with all safety measures.	2

Course Outcomes (CO):

The students will be able to -

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

4. **Apply** all type of safety interlock 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.
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 phasesare considered as an output side of the power plant.
6. **Describes** the modelling and simulation of power plant in HMI section using DCS and PLC for better closed loop control.

Learning Resources:

Text Books:

1. Power Plant Instrumentation, K. Krishnaswamy, M. PonniBala, 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

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Course Code: PE-EI 802	**Category: Professional Elective Courses-V**
Course Name: NANO ELECTRONICS	**Semester: Eighth**
L-T-P: 3-0-0	**Credit: 3**
Total Lectures: 34	
Pre-Requisites: Basic Electronics	

Module No.	Description of Topic	Contact Hrs.
1	**Fundamentals on Nanoelectronics –** Concepts of ofNanoelectronics, 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**
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-tunneling diodes, nano Light-emitting diodes, nano lasers, nano solar cell, etc.	**6**
3	**Nano transistor & Nano Display systems** – nano transistor, nano Field-effect transistors, Single-electron-transfer devices, Potential-effect transistors, nano display system, etc.	**6**
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**
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**
6	**Nano Integrated Sensors and Actuators** – Nano Mechanical sensors, Nano MEMS, Nano Pressure Sensors, Acceleration Sensors, Nano Gas Sensors, Biosensors, Electrostatic, Electromagnetic and Piezoelectric Sensors,Nano Optical Fibers, Integrated Fiber Sensors for Industrial applications.	**6**

Course Outcomes (CO):

The students will be able to -

1. Identify the concept, advantages and challenges of Nanoelectronics
2. Describe the characteristics of carrier distribution and transport in nanoscale structures
3. Identify different types of nano diodes, nano transistors and their junction physics
4. Describe the construction and operation of various nano display, logic and memory devices
5. Compose different nano-photonics devices for optical fiber sensor systems
6. Design various nanofiber sensors for industrial applications like temperature, pressure, displacement, fluid flow, rotation, etc.

Learning Resources

Books:

1. Nanoelectronics - Materials,Devices,Applications – R. Puers, et al (Ed), Wiely 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), MaGraw-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

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Course Code: OE-EI 801	**Category: Open Elective course-V**
Course Name: Digital Image Processing	**Semester: Fourth**
L-T-P: 3-0-0	**Credit: 3**
Total Lecture: 40	
Pre-Requisites: Digital Signal Processing, Signals and Systems.	

Objectives:

1. To understand the different representation of digital images.
2. To understand the importance of adequate sampling frequencies and the appearance of artefacts.
3. To study the image fundamentals and mathematical transforms necessary for image processing.

Module No.	Description of Topic	Contact Hrs.
1.	Introduction to structure of human eye, Image formation in the human eye,Brightnessadaptationand discrimination, Image sensing and acquisition, storage, Processing, Communication, Display Image Sampling and quantization, Basic relationshipsbetweenpixels.	4
2.	Introduction to Fourier transform, DFT and 2-D DFT, Properties of 2-D DFT, FFT, IFFT, Walsh transform, Hadamardtransform, Discrete cosine transform, Slant transform, Optimum transform: Karhunen– Loeve(Hotelling)transform, Wavelet Transform.	10
3.	Gray level transformations, Histogram processing, Arithmetica n d logic operations, Spatial filtering: Introduction, Smoothingand sharpeningfilters. Frequency domain filters: Homomorphicfiltering.	6
4.	Fundamental s, Redundancies: Coding, InterpixelPsycho-visual,fidelity criteria, Image compression models, Error free compression, Lossycompression, Image compression standards: Binary image and Continuous tone Still Image compression standards, V ideocompression standards.	7
5.	Introduction, Dilation, Erosion, Opening, closing, Hit -or-misstransformation, Morphological algorithm operations on binary Images, Morphologicalalgorithm, operations on gray-scaleImages.	6
6.	Image Segmentation, Representation and Description: Detection of discontinuities, Edge linking and Boundary detection, ThresholdingRegion based segmentation, Image Representation schemes, Boundary descriptors, and Regionaldescriptors.	7

<u>Course Outcomes (CO)</u>:

The students will be able to -

1. Mathematically represent the various types of images and analyze them.
2. Process these images for the enhancement of certain properties or for optimized use of the resources.
3. Analyze images in the frequency domain using various transforms.
4. Design and implement the algorithms related to morphological image processing.
5. Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
6. Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).

Learning Resources:

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 andAnalysis, (Prentice-Hall, India)
3. M. A. Sid-Ahmed :- Image Processing- Theory, Algorithms &Architecture, (McGraw-Hill)

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Course Code: OE-EI 802	**Category: Open Elective course-V**
Course Name: Big Data Analysis	**Semester: Eighth**
L-T-P: 3-0-0	**Credit: 3**
Total Lecture: 40	
Pre-Requisites:	

Module No.	Description of Topic	Contact Hrs.
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, MongoDB 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**

Course Outcomes (CO):

The students will be able to -

1. Upon completion of this course, students will be able to do the following:
2. Students will to build and maintain reliable, scalable, distributed systems with Apache Hadoop.
3. Students will be able to write Map-Reduce based Applications Learning with MLlib. 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 05 12 6 Data Base for the Modern Web Introduction to MongoDB key features, Core Server tools, MongoDB 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. 08 15
4. Students will be able to design and build MongoDB based Big data Applications and learn MongoDB query language
5. Students will learn difference between conventional SQL query language and NoSQL basic concepts
6. Students will learn tips and tricks for Big Data use cases and solutions.

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.

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Course Code: HM-HU 801	**Category: Humanities and social sciences including Management Courses**
Course Name: Project Management and Entrepreneurship	**Semester: Eighth**
L-T-P: 2-0-0	**Credit: 2**
Total Lecture: 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, Mc-Clelland, 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**

<u>Course Outcomes (CO)</u>:

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. Weihrich, 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