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

Computer Networks

Course Name: Computer Networks	Category: Engineering Science
Course Code: ES-CS 701	**Semester: Seventh**
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: To understand this course, the learner must have idea of basic knowledge in computer.	

Objectives: Resource sharing is the main objective of the computer network. The goal is to provide all the program, date and hardware is available to everyone on the network without regard to the physical location of the resource and the users.

Course Outcomes (COs):

CO.1. The incumbent would be able to determine the comparison between Data (Analog, Digital), Signal (Analog, Digital) and how to be transmitted (analog, digital) through different media and different networking related terms as simplex, duplex, internet, reference models etc.

CO.2. The incumbent would be able to describe the techniques to correct post-transmission error by ARQs, error detection methods and describe and determine different medium access sub layers like ALOHA, MA.

CO.3. The incumbent would be able to differentiate repeaters, hubs, bridges, switches, routers, gateways and describe different necessary routing protocols and tables.

CO.4. The incumbent would be able to describe different application layer protocols like DNS, SMTP, HTTP, FTP etc. and characterize different types of data representation techniques.

CO.5. The incumbent would be able to determine how to improve the quality of services, the security of the system by digital signature, firewalls.

CO.6. The incumbent would be able to demonstrate modern topics like ATM, cable modem, WLAN, Bluetooth etc. to design terminal to terminal data transmission through wired or wireless media.

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	**Module Name:** Overview of Data Communication and Networking: Details: Introduction, Data communications: components, data representation (ASCII, ISO etc.), direction of data flow (simplex,	**5**	**1**

	half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study		
Module: 2	**Module Name:** Physical Level: Details: Overview of data (analog & digital), signal (analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit Switching: time division & space division switch, TDM bus; Telephone Network.	**5**	**2,3**
Module: 3	**Module Name:** Data link Layer: Details: Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back-N ARQ, Selective repeat ARQ, HDLC;] Medium Access sub layer: Point to Point Protocol, LCP, NCP, Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet (in brief)	**9**	**2,3**
Module: 4	**Module Name:** Network layer: Details: Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing : IP addressing, sub netting; Routing : techniques, static vs. dynamic routing , Unicast Routing Protocols: RIP, OSPF, BGP; Other Procols: ARP, IP, ICMP, IPV6	**6**	**3,4**
Module: 5	**Module Name:** Transport layer: Details: Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS:Leaky bucket algorithm, Token bucket algorithm,	**5**	**5**
Module: 6	**Module Name:** Application Layer: Details: Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls. Modern topics: ISDN services & ATM, DSL technology, Cable Modem: Architecture and operation in brief. Wireless LAN: IEEE 802.11, Introduction to blue-tooth.	**6**	**4,6**

Text Books:

1. Data Communications and Networking (3rd Ed.), A. Forouzan , TMH
2. Computer Networks (4th Ed.), A. S. Tanenbaum, Pearson Education/PHI
3. Data and Computer Communications (5th Ed.), W. Stallings, PHI/ Pearson Education

Reference Books:

1. Computer Networking -A top down approach featuring the internet, Kurose and Rose Pearson Education
2. Communication Networks, Leon, Garica, Widjaja, TMH
3. Communication Networks, Walrand, TMH.

4. Internetworking with TCP/IP, vol. 1, 2, 3(4th Ed.), Comer, Pearson Education/PHI

Course Name: Non-Conventional Energy Sources	Category: Open Elective Courses IV
Course Code: OE-EI 702	**Semester: 7th**
L-T-P: 3-0-0	**Credit: 3**
Teaching Scheme	**Examination Scheme**
Theory:3hrs./week	**Continuous Assessment:** 25Marks
Total Lectures:36	**Attendance:** 5 Marks
	End Semester Exam.: 70 Marks
Pre-Requisites: Electrical and Electronics Engineering	

Objectives:

1. To understand the concept of renewable energy sources in replacing non-renewable energy sources.
2. To provide adequate knowledge in solar energy generation systems.
3. To accord basic knowledge in obtaining energy from wind energy systems.
4. To introduce with the bioenergy and biodiesel techniques, tidal energy, wave and geothermal energy.
5. To introduce the energy audit and energy conversion.

Course Outcomes (COs):

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

OE-EI 702.1. Understand the basic concept of Non-Conventional Energy source and application in real life.
OE-EI 702.2. Understand and explain Solar Energy generation and application.
OE-EI 702.3. Understand and apply Electricity Generation from Wind Energy
OE-EI 702.4. Understand and apply Electricity Generation from Bio Energy and Bio diesel techniques.
OE-EI 702.5. Understand and explain Electricity generation from Tidal, Wave and Thermal energy.
OE-EI 702.6. Understand the audit and energy conservation**.**

Course Details

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	Classification of Energy Sources Advantages of Non-Conventional Energy Sources over Conventional Sources Economics, Impact on Environment.	**3**	**1,2**
Module: 2	Thermal Energy Generation from Solar Energy: Solar radiation and its Characteristics. Solar Collector: flat Plate, evacuated tube, focusing, Solar Energy use for water heating, Solar thermal power generation. Principle of energy conversion in Solar Photovoltaic cells, Different types of PV Cells, Mono-poly crystalline and amorphous Silicon solar cells. Design of PV array. Efficiency and cost of PV systems	**7**	**1,2**

Module: 3	Electricity Generation from Wind Energy: Wind as energy source, Design of Wind turbine, Selection of site of Wind farm, characteristics of different types of wind generators used with wind turbines.	**8**	**3**
Module: 4	Electricity Generation from Bio Energy: Resources and conversion process: bio gas conversion, bio gas plant, bio mass gasifier, co-generation. Bio diesel: Sources, usability and advantages over mineral product	**8**	**4**
Module: 5	Electricity Generation from Tidal Energy: Principle, selection of site, Economics and future prospect. Electricity Generation from Wave Energy: Principle, selection of site and future prospect Electricity Generation from Geo Thermal Energy: Principle , location , economics and prospect Introduction to Energy Conservation & Audit	**5**	**5**
Module: 6	Introduction to Energy Conservation & Audit	**5**	**6**

Reference Books:

1. Bansal, Kleeman& Melisa - "Renewable Energy Sources & Conversion Technology" - TMH New Delhi.
2. S P Sukhatme - "Solar Energy"
3. Twidell& Weir - "Renewable Energy Resources"; ELBS
4. Non Conventional Energy Sources – G. D. Rai
5. Non-Conventional Energy Resources – Chandra & Chandra, Khanna Publishing House
6. Energy Technology, O.P. Gupta, Khanna Publishing House 8. Wells N T – Biomedical Ultrasonics, Academic Press,London 1977

Telemetry & Wireless Sensor Network

Course Name: Telemetry & Wireless Sensor Network	**Category:** Open Elective Course IV
Course Code: OE-EI 701	**Semester: 7th**
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: 50	End Semester Exam.: 70 Marks
Pre-Requisites: Basic knowledge of Laplace transformation &Fourier transformation analog and digital communication, sensor and transduces, computer networks.	

Objectives: Study of telemetry aims to make the students capable to apply different modulation and multiplexing techniques in the field of measurement system.Telemetry plays an important role in remote monitoring and control of industrial processes. Advancement of telemetry leads to more complex but efficient system called Wireless Sensor Network where large amount of measurement data from large number of sensors are efficiently and securely stored, transmitted and analyzed. This course aims to make students able to apply the knowledge of telemetry and WSN in solving different industrial, domestic and healthcare related problems.

Course Outcomes (COs):

After completing the course the student should be able to

OE-EI 701.1. Identify the elementary concepts and system functional blocks of telemetry system and**utilize** the various coding techniques for information exchange.
OE-EI 701.2. Describe utilities of various modulation and multiplexing processes in telemetry systems and their technicalities.
OE-EI 701.3. Understand the building blocks of different modern communication systems and **apply** this knowledge to **design** different telemetry systems.
OE-EI 701.4. Get acquainted to the concept of WSN and **list** its application areas.
OE-EI 701.5. Learnthe basics of WSN node Architecture and Network Architecture.
OE-EI 701.6. Design WSN based remote metering systems for industrial and biometric applications which will lead to betterment of mankind.

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	Purpose of telemetry, basic scheme, voltage, current and frequency telemetry. **Coding:** Concepts of Information transfer, bits, symbols, codes -source, line, channel, BCD, ASCII, BAUDOT, AMI, CMI, Manchester, HDBM, Block, Differential, Hamming, and Convolution.	**9**	**1,3,6**

	Inter symbol interference, Bit error rate, noise		
Module: 2	**Modulation**, multiplexing: FM-AM, FM-FM, PAM-AM, PAM-FM, PCM-AM, etc. **FDM systems:** IRIG standards in FDM systems. SCO's, Mux and Demux circuits, Detectors and Demodulators, Pulse averaging, Quadrature FM and PLL, Mixers	**8**	**2,3,6**
Module: 3	**TDM systems:** TDM- PAM, PAM- PM, TDM- PCM systems, synchronization. **Fiber optic Communication-** The Fibre as transmission medium, Interconnections, Repeaters,Sources, Detectors **Satellite Communication:** TT and C services, subsystems, The earth station	**8**	**2,3,6**
Module: 4	**Introduction to Wireless Sensor Networks** Motivation, Performance Requirement **Wireless Sensor Network Architecture:** Protocols and Standards, Sensing and Communication Range Hardware Platform, Motes, Sensor Devices, Types of Sensors, Sensor's Specification	**9**	**4,5,6**
Module: 5	**Fundamentals of MAC Protocols:** MAC and Routing Layer Design Issues: 802.15.4 for Wireless Sensor Networks, Routing Protocols for Wireless Sensor Networks: Geographic and Random Routing, Clustering Algorithms	**8**	**5,6**
Module: 6	**Transport Control Protocols for Wireless Sensor Networks:**Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, CODA (Congestion Detection and Avoidance), ESRT (Event-to-Sink Reliable Transport), RMST (Reliable Multi segment Transport), PSFQ (Pump Slowly, Fetch Quickly), GARUDA, ATP (Ad Hoc Transport Protocol), Problems with Transport Control Protocols, Performance of Transport Control Protocols, Congestion, Packet Loss Recovery.	**8**	**5,6**
	Total	**50**	

Text Books:

1. D. Patranabis, Telemetry principles, TMH, New Delhi
2. E. L. Gruenberg, Handbook of Telemetry and Remote control, McGraw Hill
3. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Ltd, 2005
4. KazemSohraby, Daniel Minoli and TaiebZnati, " Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007.

Reference Books:

1. Swobada G – Telecontrol Method and Application of Telemetering and Remote Control, Von Nostrand, 1971

2. A. Hac, *Wireless Sensor Network Designs*, John Wiley & Sons , 2009

Journals:

1. K. Akkaya and M. Younis, “A survey of routing protocols in wireless sensor networks”, Elsevier Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325--349
2. R.Swain and P.M.Khilar,”Heterogeneous Fault Diagnosis for Wireless Sensor Networks,” International Journal of Adhoc Networks, Elsevier Science, Vol. 69, Feb 2018, PP. 15-37.

Course Code: PE-EI701	**Category: Professional Elective Courses-IV**
Course Name: Advanced Process Control	**Semester: Seventh**
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 make the students understand the basic concepts of

a. Digital control and Fuzzy logic control
b. Distributed control system and SCADA
c. Different communication protocol
d. Different plant wise unit operations.

Module No.	Description of Topic	Contact Hrs.	CO's
1.	**Module I : Introduction to DigitalControl** Introduction to Digital control and controller, Advantage and limitation of digital control, Signal digitization - finite difference approximation of derivatives, rectangular rules for integration, trapezoidal techniques / bilinear transformation, Impulse invariance method, Step invariance method, Signal reconstruction – Zero and First Order Hold.	5	1
2.	**Module II:Digital modelling and Stability analysis** Digital Modeling using discrete approximation, ARMA, ARX Loop Design using Digital Modeling, Stability Studies - W - plane transforms, Jury Stability Criterion, Smoothingfilterrealizationusingdifferenceequations.	5	2
3.	**Module III: Fuzzy logic control** Crisp Set, Fuzzy Set, Fuzzy Operators, Overview of FLC	3	3
4.	**Module IV: Distributed control system** DCS – Basic Components and their Functions. HMI – Operator & Engineering Interface – Functions and Requirements, Redundancy – Processor, Bus and Input-Output level, Introduction to SCADA, Introduction to DDC.	6	4
5.	**Module V: Communication Protocol** ISO/OSI Reference Model : Data Highway and Fieldbus : Network Access protocols – TDMA, CSMA/CD, Token passing, Master – Slave; Network Transmission Media – Twisted Pair, Co-axial, FO : Network Topology – Mesh, Ring, Star, Bus : Management Information System (MIS) and Computer Integrated Processing (CIP). Basic of Fieldbus and Profibus, HART and MODBUS.	5	5
6.	**Module VI: Unit operations of Petrochemical & Petroleum Refinery** (a) Distillation column control (b) Reciprocating compressor control (c) Dryer control	6	6

	(d) Centrifuge control system (For pressure and Flow): Centrifugal compressor control, Centrifugal pump control.		

Course outcomes:

Afterthesuccessfulcompletionofthecoursethestudents willbeableto:

1. **Explain**theconceptofdigitalcontrolschemesusedinprocesscontrol.
2. **Describe**the concept of Digital modeling and Stability analysis.
3. **Demonstrate**the fundamental concepts of Fuzzy logic control.
4. **Analyze** the different functional blocks of Distributed control system.
5. **Explain** different communication protocol used in process control.
6. **Investigate** various plant wise unit operations.

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

Course Name: Mechatronics	**Category:** Professional Elective Course-IV
Course Code: PE-EI 702	**Semester: Seventh**
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: 30	End Semester Exam.: 70 Marks
Pre-Requisites: To understand this course, the learner must have idea of Sensor and Transducer, Measurement, Control System.	

Objectives: To acquaint the Mechatronics & Robotics with theory and working principles of different types of sensors and mechanical systems used in the manufacturing industry and their applications.

Course Outcomes (COs):

CO.1. Understand the basic concept of Mechatronics system. Engineering for designing the mechatronics system.

CO.2. Analyze the different mathematical modelling of the liquid level, pneumatic systems, hydraulic systems and thermal systems for actuation of mechatronics systems.

CO.3. Understand the working of robot design with coordinate system.

CO.4. Apply the knowledge of different parts of robots for real time application and robot design.

CO.5. Understand and apply the robot kinematics in real time problem.

CO.6. Apply the knowledge in different application for mankind.

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	**Module Name: General Concepts of Mechatronics** Details: Introduction, Definition of Mechatronics, Mechanical Systems: Introduction to various systems of units, mathematical modeling of mechanical systems, Newton's laws, moment of inertia, forced response and natural response, rotational systems, spring mass system, free vibration, spring mass damper system, mechanical systems with dry friction, work energy and power, passive elements and active elements an energy method for deriving equations of motion, energy and power transformers.	**5**	**1**
Module: 2	**Module Name: System Modelling** Details: Fluid and Thermal systems: **Mathematical modeling of liquid level system**: Resistance and capacitance of liquid level systems with interaction**. Mathematical modeling of pneumatic systems:** Resistance and capacitance of pneumatic systems, mathematical modeling of a pneumatic systems, liberalization of non-linear systems. **Mathematical modeling of hydraulic systems**: Hydraulic circuits, hydraulic servometer and mathematical model of hydraulic servo motor	**5**	**2**

	dashpots. **Mathematical modeling of thermal systems:** Thermal resistance and thermal capacitance mathematical modeling of thermal systems		
Module: 3	**Module Name: General Concepts of Robotics** Details: Introduction, Definition of robot, classification of robots according to coordinate system (Robot configurations: Polar, Cartesian, cylindrical and Jointed-arm configuration) and control method, Main components of robots – manipulator, sensors, controller etc, Robot characteristics –payload, reach, repeatability, accuracy, resolution.	**6**	**3**
Module: 4	**Module Name: Robot End effecters & Actuators**: Details: Types, mechanical grippers, other types of grippers, Tools as end effecters. Characteristics of actuating systems, Actuating System – Hydraulic devices, pneumatic devices, electric motors, other special actuators.	**6**	**4**
Module: 5	**Module Name: Transmission** Details: Kinematics of Robot: Homogenous coordinates, Homogeneous transformation matrices, Direct and Inverse Kinematics of robots, Trajectory Planning.	**4**	**5**
Module: 6	**Module Name: Application** Details: Application of Robots: Handling, loading and unloading, Welding, Spray painting, Assembly, Machining, Inspection, Rescue robots, Underwater robots, Parallel robot, and Medical robot.	**4**	**6**

Text Books:

1. Bolton, W, Mechatronics. 3rd edn, Addison-Wesley.
2. Robotics: Control, Sensing, Vision and Intelligence by Fu, Gonzalez and Lee
3. Introduction to Robotics: Mechanics and Control (3rdEdition) by John J. Craig
4. Robot Dynamics and Control: by Spong and Vidyasagar
5. Introduction to Robotics, S K Saha, McGrew Hill

Reference Books:

1. Fuller, J, Robotics: Introduction, Programming and Projects, 2nd edn, Prentice-Hall.
2. Schuler, C, & McNammee, W, Industrial Electronics & Robotics, McGraw-Hill.
3. Karnopp DC, Margolis DL & Rosenberg RC, System Dynamics: Modeling and Simulation of Mechatronics Systems. 3rd edn. Wiley Interscience.
4. Control of Robot Manipulations: F.I.Lewis, C.T.Abdallah, D.M.Dawson
5. Kinematic Analysis of Robot Manipulators: Carl D. Crane and Joseph Duffy
6. Robotics for Engineers: Koren Y.
7. Robot Modelling: Control and Application with software: by P.G.Ranky and C.Y.Ho

Course Name: Biomedical and Analytical Instrumentation	**Category: Professional Elective Course-V**
Course Code: PE-EI 703	**Semester: 7th**
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: 40	End Semester Exam.: 70 Marks
Pre-Requisites: Students should have knowledge in Biology, signal processing, and engineering communication.	

Course Outcomes (COs):

CO.1. The incumbent would be able to outline the knowledge about human physiology system the principle operation and design and the background knowledge of biomedical instruments and specific applications of biomedical engineering

CO.2. The incumbent would be able to describe the operating principles of electrical and other transducers, analog and digital instrumentation, to apply signal acquisition and processing, electrical safety in the medical environment, electrical properties of nerve and muscle physiology

CO.3. The incumbent would be able to support by instrumentation used in cardiopulmonary, neurological, surgical, and rehabilitation areas of medicine, and imaging technique, signal transmission

CO.4. Understand the effects of different constituent in a process outcome and analysis the performance of various on-line or off-line instruments.

CO.5. Understand the principle of different spectroscopic techniques.

CO.6. Describe and differentiate between online and offline process and Identifies suitable instruments for analysis gaseous, liquid or solid substance.

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	**Human Systems and Electrodes and Transducers** Details: Introduction to physiology of cardiac, nervous, muscular and respiratory systems; Different types of transducers and their selection for biomedical applications, Electrode theory, different types of electrodes Hydrogen Calomel, Ag-AgCI, pH, PO2 Pco2 electrodes	**6**	**1, 2**
Module: 2	**Measurements of Important Human parameters** Details: Measurement of electrical activities of heart, brain and muscle: ECG measurement and instrumentation techniques; Measurement of Blood Pressure & Blood flow; Defibrillator	**6**	**2, 3**
Module: 3	**Signal Processing, transmission and Imaging** **Details:** Instrumentation in clinical laboratory Ultrasound	**6**	**2,3**

	imaging and IR Imaging. Biotelemetry: Transmission and Reception aspects of Biological signals via long distances.		
Module: 4	**Gas Analysis :** Thermal Conductivity Type, Heat of Reaction Method, Paramagnetic for O2, Dumbell and Servomax for O2, Thermomagnetic for O2, Zirconia Cell Type for O2, Cell for Continuous O2 analysis microelectrodes, Spectroscopic Techniques, IR Radiation Absorption Type, Dual-Channel IR Spectrometry, Single-Channel IR Spectrometry, IR Sources, Comparison of their performances, IR detectors.	**6**	**4,5,6**
Module: 5	**Liquid and Solid Analysis:** Dissolved Oxygen Analysis Cells, pH electrodes, circuits and applications, Spectroscopic Techniques: Absorption in Visible and UV-range, monochromators and detectors, Sources and their ranges, Colorimetry, Viscosity and Density Measurement. Atomic Spectral Methods: Emission and Absorption: Visible, UV and X-rays; sources, principles, detectors, sample preparation etc.	**6**	**4,5,6**
Module: 6	**Special Topics:** Chromatography, GC, GLC, LC, HPLC, Columns, Detectors; X-ray methods of analysis; Introduction to NMR and ESR.	**6**	**4,5,6**

Text Books:

1. Cromwell L – Biomedical Instrumentation and Measurement, Pearson
2. Khandpur R S – Handbook of Biomedical Instrumentation, TMH, N. Delhi 1991
3. Principles of Industrial Instrumentation- D.C. Patranabis, Publisher: Tata McGraw Hill
4. Principles of Instrumental Analysis- Skoog, Holler, Nieman, Publisher: Thomson Brooks/Cole
5. Handbook of Analytical Instruments- R.S. Khandpur, Publisher: Tata McGraw Hill

Reference Books:

1. Carr – Introduction to Biomedical Equipment Technology 4/e – Pearson
2. Introduction to Instrumental Analysis-Robert D. Braun, Publisher: Pharma Book Syndicate

Course Name: Non Destructive Testing	**Category:** Professional Elective Courses**- v**
Course Code: PE-EI 704	**Semester: 7th**
L-T-P: 3-0-0	**Credit: 3**
Teaching Scheme	**Examination Scheme**
Theory:3hrs./week	**Continuous Assessment:** 25Marks
Total Lectures:36	**Attendance:** 5 Marks
	End Semester Exam.: 70 Marks
Pre-Requisites: Engineering Physics	

Objectives:

1. To understand the use of NDT methods in industry.

2. To provide adequate knowledge in NDT methods.

3. To accord basic of physics of ultrasonic.

4. To introduce with ultrasonic systems in industrial instrumentation.

5. To introduce ultrasonic systems in medical instrumentation.

Course Outcomes (COs):

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

CO.1. Understand why Non Destructive Testing (NDT) is useful for industry or clinical process.
CO.2. Understand and analyze different techniques of NDT General, Visual, Chemical and Mechanical system.
CO.3. Understand and analyze Ultrasonic wave used in NDT.
CO.4. Understand and analyze Ultrasonic method in Industry and Medical measurement techniques.
CO.5. Comprehend the methods of hazard identification and safety measures.

Module No.	Description of Topics	Contact Hrs.	CO
Module: 1	Introduction and importance of NDT. General Principles and Basic Elements of NDT.	**5**	**1,2**
Module: 2	Surface feature inspection and testing: General, Visual, Chemical, and Mechanical Magnetic-magnetization, flux, and Electro potential, Electrical resistivity, Electromagnetic-eddy current techniques.	**8**	**1,2**
Module: 3	Ultrasonic waves, principle of propagation, Ultrasonic Test methods: Echo, Transit time, Resonance, Direct contact and immersion types	**7**	**3,**
Module: 4	Ultrasonic methods of measuring thickness, depth, flow, level etc. Various parameters affecting ultrasonic testing and measurements, their remedy Ultrasonic in medical diagnosis and therapy	**10**	**4**
Module: 5	**Hazardous Area Instrumentation** Basic Concepts Classification based on site, material and temperature – IEC and North American system Methods of Protection – Explosion proof, Intrinsic safety, Purging and Pressurization, Non-Incendiary ; IEC Equipment Protection Level (EPL) NEMA and IP codes	**6**	**5**

Reference Books:

1. Mclutive p (Ed) – NDT Handbook, American Society for NDT, 1989.

2. Hull B and John V – Non Destructive Testing, FI BS/McMillan.

3. Krantkramer - Ultrasonic Testing of materials, Springer 2005

4. Handbook of Nondestructive Testing, McGraw Hill, 1998

5. U. Schnars, W. Jeuptner - Digital Holograpy, Springer, 2005

6. W. J. Price – Nuclear radiation Detection, McGraw Hill, New York, 1958

7. Krauthsamer J and Krauthsamer H – Ultrasonic Testing of Materials, Springer Verlag, Berlin, New York.

8. Wells N T – Biomedical Ultrasonics, Academic Press,London 1977

INTERNSHIP-I

Name of the Course: INTERNSHIP-I	**Category:** Internship
Course Code: PROJ-EI 783	**Semester: 7th**
Duration:	**Maximum Marks: 100**
Teaching Scheme	**Examination scheme: Maximum marks:**
Tutorial: Nil	External Assessment:60
Practical: Minimum of 12 weeks	Internal Assessment:40
Credit Points: 3	

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.

PROJECT-I

Name of the Course:PROJECT-I	Category:Project Stage-I
Course Code: PROJ-EI 781	Semester: 7th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	**Examination scheme: Maximum marks:**
Tutorial: Nil	External Assessment:60
Practical: 4 hrs./week	Internal Assessment:40
Credit Points: 2	

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	

Industrial Training Evaluation

Name of the Course: Industrial Training Evaluation	**Category:**Industrial Training
Course Code: PROJ-EI 782	**Semester: 7th**
Duration:	**Maximum Marks: 100**
Teaching Scheme	**Examination scheme: Maximum marks:**
Tutorial: Nil	External Assessment:60
Practical: hrs./week	Internal Assessment:40
Credit Points: 1	

Course Outcomes:	
CO. 1	Get the opportunity to **Apply** the knowledge and skills students have acquired on campus in a real-life work situation.
CO. 2	To provide students with opportunities for practical, hands-on learning from practitioners in the areas of specialization.
CO. 3	To expose students to a work environment, common practices, employment opportunities and work ethics in their relevant field.
CO. 4	To enhance the employability skills of the students.
CO. 5	Familiar with Modern tool usage, The engineer and society
CO. 6	Develop soft skills in management, team skill & leadership skill and responsibilities in the work environment.
Pre-Requisite:	
1	Knowledge and skills developed in previous courses.
2	
3	

Text and reference books:

Special Remarks (If any):

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, 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

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. 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