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| **REFERENCE BOOKS**   1. M. A. Cayless, A. M. Marsden, Lamps and Lighting, Publisher-Butterworth-Heinemann(ISBN978-0-415- 50308-2) 2. Designing with light: Lighting Handbook., Anil Valia; Lighting System 2002 |

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| **20EE5906** | **SENSORS AND TRANSDUCERS** | **L** | **T** | **P** | **S** | **C** |
| **ASSESSMENT TYPE** | **TYPE - 1** | **3** | **0** | **0** | **1** | **3** |
| **OBJECTIVES**  To learn the various sensors used to measure various physical parameters. | | | | | | |
| **COURSE OUTCOMES**  Upon completion of the course, students shall have ability to,   1. Understand the working of commonly used sensors in industry for measurement of displacement, force, and pressure. 2. Recognize the working of commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow, and level. 3. Identify the application of machine vision 4. Comprehend smart sensors and their applications in automation systems. 5. Conceptualize signal conditioning and data acquisition methods | | | | | | |
| **UNIT 1 - FORCE AND MOTION SENSORS** | | | | | | |
| Sensors & Transducer: Definition, Classification of transducers, Advantages and Disadvantages of Electrical Transducers; Measurement of displacement using Potentiometer, LVDT & Optical Encoder; Measurement of force using strain gauges & load cells; Measurement of pressure using LVDT based diaphragm.  **Total Periods : 9** | | | | | | |
| **UNIT 2 – OPTICAL, PRESSURE AND TEMPERATURE SENSORS** | | | | | | |
| Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors  Suggested Reading: Piezoelectric sensor.  **Total Periods : 9** | | | | | | |
| **UNIT 3 - MACHINE VISION** | | | | | | |
| Introduction to machine vision, Difference between machine vision and computer vision; Imaging Sensors; sensing & digitizing function in machine vision, image processing and analysis, training the vision system in a pick and place robot.  Suggested Reading: CCD and CMOS  **Total Periods : 9** | | | | | | |
| **UNIT 4 - SMART SENSORS** | | | | | | |
| Smart Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self- testing & self-communicating,  Suggested Reading: Application of smart sensors: Smart city, Industrial robots & electric vehicles.  **Total Periods : 9** | | | | | | |
| **UNIT 5 - SIGNAL CONDITIONING and DAQ SYSTEMS** | | | | | | |

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| Signal Conditioning: Introduction, Functions of signal conditioning equipment, need for amplification of signals, Types of amplifiers. Data Acquisition Systems and Conversion: Introduction, Objectives & configuration of data acquisition system, Analog & Digital IO, Counters, Timers.  Suggested Reading: Need of data conversion.  **Total Periods : 9** |
| **TEXT BOOKS**   1. DVS Murthy, Transducers and Instrumentation, PHI 2nd Edition 2013 2. D Patranabis, Sensors and Transducers, PHI 2nd Edition 2013. 3. S. Gupta, J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED / Instrument Society of America, 1994. |
| **REFERENCE BOOKS**   1. Arun K. Ghosh, Introduction to measurements and Instrumentation, PHI, 4th Edition 2012. 2. A.D. Helfrick and W.D. cooper, Modern Electronic Instrumentation & Measurement Techniques,PHI – 2001 3. Hermann K.P. Neubert, ―Instrument Transducers‖ 2nd Edition 2012, Oxford University Press. |

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| **20EE5907** | **POWER PLANT ENGINEERING FOR ELECTRICAL ENGINEERS** | **L** | **T** | **P** | **S** | **C** |
| **ASSESSMENT TYPE** | **TYPE – 1** | **3** | **0** | **0** | **1** | **3** |
| **OBJECTIVES**  To Provide an overview of Power Plants and the role of Electrical Engineers in plant operation and maintenance. | | | | | | |
| **COURSE OUTCOMES**  Upon completion of the course, students shall have ability to,   1. Understand the layout and working of steam power plant and Cogeneration systems 2. Understand the performance parameters and working of different hydro power station 3. Summarize the layout, working and site selection criteria of Nuclear power station 4. Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants. 5. Understand Principle and layout of various non conventional power generation. | | | | | | |
| **UNIT 1 – THERMAL POWER PLANT** | | | | | | |
| Layout of modern coal power plant- Pulverization- Fluidized Bed Combustion-coal and ash handling, Draught system, oilers, Super-Heaters-Economizer-Air Preheater, Condensers-Cooling Tower, Feed water treatment, Subsystems of thermal power plants, Cogeneration systems- New trends and challenges.  Suggested Reading -Types of power station  **Total Periods : 9** | | | | | | |
| **UNIT 2 – HYDRO ELECTRIC POWER PLANT** | | | | | | |
| Hydrology, Hydrographs, Flow duration curve Hydroelectric power plants - classification, Layout, selection of water turbines ,auxiliaries and working of a hydro station-Hydropower and Industrial Internet of Things (IIOT).  Suggested Reading - Types of dam, pumped storage hydel plants  **Total Periods : 9** | | | | | | |

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| **UNIT 3 - NUCLEAR POWER PLANTS** |
| Basics of nuclear energy, Layout and main parts of nuclear power station, types of reactor, Fast Spectrum Reactor - site selection criteria for nuclear power plant, safety measures.  **Total Periods : 9** |
| **UNIT 4 - GAS, DIESEL POWER PLANT AND COMBINED CYCLE POWER PLANTS** |
| Types, open and closed cycle gas turbine, work output & thermal efficiency, methods to improve performance-reheating, inter cooling, regeneration-advantage and disadvantages- Diesel engine power plant-component and layout. Combined  Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.  **Total Periods : 9** |
| **UNIT 5 - NON-CONVENTIONAL POWER GENERATION** |
| Conversion of solar energy into electric energy., OTEC, wind power plants, tidal power plants and geothermal resources, fuel cell, MHD power generation-principle, thermoelectric power generation, thermionic power generation.  Suggested Reading - Solar energy collectors  **Total Periods : 9** |
| **TEXT BOOKS**   1. P.K. Nag, ―Power Plant Engineering‖, Tata McGraw – Hill Publishing Company Ltd., Third Edition, 2008. 2. Rajput R.K., ―A Text book of Power plant Engineering‖, 5th Edition, Lakshmi Publications, 2013. 3. G.D. Rai ,'An introduction to power plant technology', Khanna Publishers, New Delhi -110 005. |
| **REFERENCE BOOKS**   1. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, ―Standard Handbook of Power Plant Engineering‖, Second Edition, McGraw – Hill, 1998. 2. M.M. El-Wakil , 'Power Plant Technology', McGraw Hill 1984. 3. B.R. Gupta Generation of Electrical Energy, S.Chand Publishers, New Delhi,2015. 4. J.B.Gupta , A Course in Electrical Power, S.K. Kataria & Sons Publishers, New Delhi ,2014. 5. Paweł Madejski,New Trends and Recent Developments for Thermal Power Plants, May 2nd, 2018. |

**PROFESSIONAL ELECTIVE – II**

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| **20EE6901** | **INDUSTRIAL IoT** | **L** | **T** | **P** | **S** | **C** |
| **ASSESSMENT TYPE** | **TYPE - 1** | **3** | **0** | **0** | **1** | **3** |
| **OBJECTIVES**  To impart knowledge on Industrial IoT models, Analytics, Secured computing and related applications | | | | | | |
| **COURSE OUTCOMES**  Upon completion of the course, students shall have ability to,   1. Explain the basic IoT architecture and functional blocks 2. Explain the recent advancements in the industry with Intelligent technologies 3. Apply IoT for various operational Process of Industries 4. Understand the techniques involved in improving security in Industrial IoT 5. Apply IoT for various industrial processes. | | | | | | |
| **UNIT 1 - INTERNET OF THINGS** | | | | | | |