GONDWANA UNIVERSITY, GADCHIROLI
Four Year Degree Course in Engineering and Technology
Course and Examination Scheme with Credit Grade System
Third Semester B.E. (Instrumentation Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme									
		Hours Per Week			Number of Credits	THEORY						PRACTICAL			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
								MSE	IE						
IN301	Mathematics-III	3	1	0	4	3	80	10	10	100	40	--	--	--	--
IN302	Electronic Devices & Circuits	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN303	Network Theory	3	1	0	4	3	80	10	10	100	40	--	--	--	--
IN304	Sensors & Transducers –I	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN305	Electronics Measurements	3	1	0	3	3	80	10	10	100	40	--	--	--	--
Laboratories															
IN306	Electronic Devices & Circuits	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN307	Sensors & Transducers –I	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN308	Electronics Measurements	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN309	Programming Practice - I C++	0	0	2	2	--	--	--	--	--	--	50	--	50	25
Total		**15**	**5**	**11**	**25**	--	--	--	--	**500**	--	--	--	**200**	--
Semester Total		**31**				**700**									

GONDWANA UNIVERSITY, GADCHIROLI
Four Year Degree Course in Engineering and Technology
Course and Examination Scheme with Credit Grade System
Fourth Semester B.E. (Instrumentation Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme									
		Hours Per Week			Number of Credits	THEORY						PRACTICAL			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
								MSE	IE						
IN401	Mathematics-IV	3	1	0	4	3	80	10	10	100	40	--	--	--	--
IN402	Feedback Control Systems	3	1	0	4	3	80	10	10	100	40	--	--	--	--
IN403	Sensors and Transducers-II	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN404	Linear Integrated Circuits	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN405	Digital Circuits	3	1	0	3	3	80	10	10	100	40	--	--	--	--
Laboratories															
IN406	Sensors and Transducers-II	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN407	Linear Integrated Circuits	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN408	Digital Circuits	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN409	Programming Practice II: ORCAD	0	0	2	2	--	--	--	--	--	--	50	--	50	25
Total		**15**	**5**	**11**	**25**	--	--	--	--	**500**	--	--	--	**200**	--
Semester Total		**31**				**700**									

GONDWANA UNIVERSITY, GADCHIROLI
Four Year Degree Course in Engineering and Technology
Course and Examination Scheme with Credit Grade System
Fifth Semester B.E. (Instrumentation Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme									
		Hours Per Week			Number of Credits	THEORY						PRACTICAL			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
								MSE	IE						
IN501	Process Automation	3	1	0	4	3	80	10	10	100	40	--	--	--	--
IN502	Signals & Systems	3	1	0	4	3	80	10	10	100	40	--	--	--	--
IN503	Power Electronics	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN504	Microprocessors and Interfacing	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN505	Control System Components	3	1	0	4	3	80	10	10	100	40	--	--	--	--
Laboratories															
IN506	Process Automation	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN507	Power Electronics	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN508	Microprocessors and Interfacing	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN509	Programming Practice III: MATLAB/SCILAB	0	0	2	2	--	--	--	--	--	--	50	--	50	25
Total		**15**	**5**	**11**	**26**	--	--	--	--	**500**	--	--	--	**200**	--
Semester Total		**31**				**700**									

GONDWANA UNIVERSITY, GADCHIROLI
Four Year Degree Course in Engineering and Technology
Course and Examination Scheme with Credit Grade System
Sixth Semester B.E. (Instrumentation Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme									
		Hours Per Week			Number of Credits	THEORY						PRACTICAL			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
								MSE	IE						
IN601	Professional Management Techniques	3	0	0	3	3	80	10	10	100	40	--	--	--	--
IN602	Bio-Medical Instrumentation-I	3	1	0	4	3	80	10	10	100	40	--	--	--	--
IN603	Control System Design	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN604	Microcontroller and its Applications	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN605	Digital Signal Processing	3	1	0	3	3	80	10	10	100	40	--	--	--	--
Laboratories															
IN606	Bio-Medical Instrumentation-I	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN607	Microcontroller and its Applications	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN608	Digital Signal Processing	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN609	Programming Practice IV: LabVIEW	0	0	2	2	--	--	--	--	--	--	25	--	25	12
IN610	Personal Proficiency	0	0	2	2	--	--	--	--	--	--	25	--	25	12
Total		**15**	**4**	**13**	**26**	--	--	--	--	**500**	--	--	--	**200**	--
Semester Total		**32**			**700**										

GONDWANA UNIVERSITY, GADCHIROLI
Four Year Degree Course in Engineering and Technology
Course and Examination Scheme with Credit Grade System
Seventh Semester B.E. (Instrumentation Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme									
		Hours Per Week			Number of Credits	THEORY						PRACTICAL			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
								MSE	IE						
IN701	Instrumentation System Design	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN702	Advanced Process Instrumentation	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN703	Embedded Systems	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN704	**Elective-I** i) Bio-Medical Instrumentation-II ii) Unit Operation and Power Plant Instrumentation iii) Nano Technology iv) Neural Network and Fuzzy Logic	3	1	0	4	3	80	10	10	100	40	--	--	--	--
Laboratories															
IN705	Instrumentation System Design	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN706	Advanced Process Instrumentation	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN707	Embedded Systems	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN708	Major Project Phase-I	0	0	4	4	--	--	--	--	--	--	100	--	100	50
Total		**12**	**4**	**13**	**23**	--	--	--	--	**400**	--	--	--	**250**	--
Semester Total		**29**			**650**										

GONDWANA UNIVERSITY, GADCHIROLI
Four Year Degree Course in Engineering and Technology
Course and Examination Scheme with Credit Grade System
Eighth Semester B.E. (Instrumentation Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme									
		Hours Per Week			Number of Credits	THEORY						PRACTICAL			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks ESE	Max. Marks Sessional		Total	Min. Passing Marks	Max. Marks TW	Max. Marks POE	Total	Min. Passing Marks
								MSE	IE						
IN801	Analytical Instrumentation and Pollution Control	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN802	Process Modeling and Optimization	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN803	Project Planning Estimation and Assessment	3	1	0	3	3	80	10	10	100	40	--	--	--	--
IN804	**Elective II:** i) Digital Control System ii) MEMS iii) Robotic System & Control	3	1	0	4	3	80	10	10	100	40	--	--	--	--
	iv) Wireless Sensor Networks	3	1	0	4	3	80	10	10	100	40	--	--	--	--
Laboratories															
IN805	Analytical Instrumentation and Pollution Control	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN806	Process Modeling and Optimization	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN807	Project Planning Estimation and Assessment	0	0	3	2	--	--	--	--	--	--	25	25	50	25
IN808	Major Project Phase-II	0	0	6	6	--	--	--	--	--	--	50	50	100	50
Total		**12**	**4**	**15**	**25**	--	--	--	--	**400**	--	--	--	**250**	--
Semester Total		**31**			**650**										

GONDWANA UNIVERSITY, GADCHIROLI

FACULTY OF ENGINEERING AND TECHNOLOGY

CONSLIDATED STATEMENT OF VARIOUS PARAMETERS IN TEACHING & EXAMINATION SCHEME OF

B.E. (INSTRUMENTATION ENGINEERING)

SR.NO.	SEMESTER	NO. OF THEORY SUBJECTS	NO OF LABS/PRACT	TEACHING HOURS(TH) (L+T)	TEACHING HOURS (PRACT)	TOTAL CREDIT	MAX. THEORY MARKS	MAX.PRACT MARKS	MAX. MARKS TOTAL
1	I	--	--	--	--	--	--	--	--
2	II	--	--	--	--	--	--	--	--
3	III	5	4	20	11	25	500	200	700
4	IV	5	4	20	11	25	500	200	700
5	VI	5	4	20	11	26	500	200	700
6	VI	5	4	19	13	26	500	200	700
7	VII	4	4	16	13	23	400	250	650
8	VIII	4	4	16	15	25	400	250	650
		28	**24**	**111**	**74**	**150**	**2800**	**1300**	**4100**

***Audit course. It is neither considered as passing head nor considered for earning some credit(s). However, this is mandatory to be taken up at the respective college level**

Subject wise Board of Studies Affiliation

Board of Studies	Subject Codes
APPLIED SCIENCES & HUMANITIES	IN301, IN401,
ELECTRICAL ENGINEERING	IN503
ELECTRONICS ENGINEERING	IN502,IN 605
INSTRUMENTATION ENGINEERING	Rest all ,except above enlisted

VII Semester B.E.
Instrumentation Engineering

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: IN701
Title of the Course: Instrumentation System Design

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/ week	Credits	Duration of paper (in hrs)	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Units	Contents	Hours
1	**Design of temperature Transducers:** An overview of static and dynamic performance characteristics of instruments, Selection criteria for temperature transducers, Design of cold junction compensation and linearizing circuit for thermocouple and thermistor, Calibration and installation procedure for thermocouple and RTD, Design considerations for transducers such as thermocouple, RTD.	07
2	**Design of flow Transducers**: Selection criteria for flow transducers, Orifice meter - design of orifice for given flow condition - design of rotameter, Design of square root extractor for variable head flowmeters, zero and span adjustment in transmitters, Design of 2 and 4 wire transmitters with 4-20mA output, Design of smart transmitters.	10
3	**Design of pressure and level transducers**: Bourdon gauges, factors affecting sensitivity, design of Bourdon tube, design of pressure gauge, diaphragm based pressure gauge, design of level sensors and its signal conditioning circuits, Load cell and its signal conditioning, Design of P/I and I/P converters,	09
4	**Design of Control Valve**: Review of flow equations. Valve selection and sizing for liquid service, gas or vapor service, selection of body and trim materials and characteristics of control valves for typical applications, flashing liquids, mixed phase flow. Control valve noise. Actuator sizing. Types of pumps pump performance, characteristics of different pumps, selection of pumps.	10
5	**Microprocessor based design and Reliability**: Design of logic circuits for alarm and annunciator circuits, interlocks - design of microcontroller based system for data acquisition - design of microprocessor based P+I+D controller. Reliability engineering: Reliability concepts, causes of failures, bath tub curve, Quality and reliability, MTTF, MTBF, and MTTR. Availability and Maintainability. Redundancy and redundant systems.	09
	Total	45

Text Book:

1. Process Control and Instrumentation technology by C. D. Jonson.
2. Balaguruswamy E, “Reliability”, Tata McGraw-Hill Pub.co. New Delhi, 1999.
3. E. O. Doebline, Measurement Systems, McGraw-Hill, 2003.
4. John Bentley, Principles of Measurement Systems, Prentice Hall, 2004.
5. Anderson N.A., Instrumentation for Process Measurment and Control, 3/e, Routledge, 1997.

Reference Books:

1. Bela G. Liptak, “Instrument Engineer’s Hand Book – Process Control”, Chilton Company, 3rd Edition, 1995.
2. Andrew Williams, “Applied instrumentation in the process industries”, 2nd Edition, Vol. 1 &3, Gulf publishing company.

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: IN702
Title of the Course: Advanced Process Instrumentation

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/ week	Credits	Duration of paper (in hrs)	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Units	Contents	Hours
1	**Review of computers in process control:** Data loggers, Data Acquisition Systems (DAS), Direct Digital Control (DDC). Supervisory Control and Data Acquisition Systems (SCADA), sampling considerations, Functional block diagram of computer control systems, alarms, interrupts. Characteristics of digital data, controller software, linearization.	07
2	**An Introduction to Networks in process automation:** Information flow requirements, Hierarchical communication model, Data Communication basics, OSI reference model, Industry Network, Recent networks. Introduction to Communication Protocols: Communication basics, Network Classification, Device Networks, Control Networks, Enterprise Networking, Network selection. Foundation field bus, Profibus.	10
3	**Introduction to process safety:** Risk, risk terminologies, consequence and risk, risk measurement, Process Hazard Analysis (PHA), Hazard and operability study (HaZop), Safety Integrity Level (SIL), Introduction to IEC61511 standard for Functional safety , protection layers, Safety Instrumented System: function, architecture, safety life cycle, Application of safety system	09
4	**Analysis of some common loops:** Flow, pressure, level, temperature, composition etc. configuration of PID controller for specific loop, SLPC-features, faceplate, functions, MLPC- features, faceplate, functions, SLPC and MLPC comparison.	11
5	**Study of pilot plants:** Process flow diagram, design aspects for boiler, heat exchanger, evaporator, distillation column and spray dryer.	08
	Total	45

Text Book:

1. User Manuals of Foundation Fieldbus, Profibus, Modbus, Ethernet, Devicenet, Controlnet.
2. Process Control and Instrumentation technology by C. D. Jonson.
3. Thomas E. Marlin ‘Process Control’, (McGraw-Hill International Edition)
4. Krishna Kant, “Computer-based Industrial Control”, Prentice Hall, New Delhi, 1997.

Reference Books:

1. Jose A. Romagnoli, Ahmet Palazoglu, ‘ Introduction to process Control’ (CRC Tylor and Francis group)
2. Les A. Kane, “Handbook of Advanced Process Control Systems and Instrumentation” (Springer)

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: IN703
Title of the Course: Embedded Systems

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/ week	Credits	Duration of paper (in hrs)	MSE	IE	ESE	Total
3	1	3	4	4	3	10	10	80	100

Units	Contents	Hours
1	**Embedded system Introduction:** Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, memory management, hardware and software design and testing.	08
2	**System Architecture:** Introduction to AVR Microcontroller: History and Features, AVR architecture and Assembly language Programming.	09
3	**Study of on Chip Peripherals:** Study of on-chip peripherals like I / O ports, timers, interrupts, on-chip ADC, DAC, Watch-Dog Timer, Power down Modes.	09
4	**Interfacing and Programming in C:** Programming on-chip peripherals: Timer, Interrupts, Serial Port, PWM, SPI	10
5	**Real Time Operating System :** Introduction to Real – Time Operating Systems: OS services, Process Management, Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment.	09
	Total	45

Text Books:

1. Rajkamal - Embedded Systems, TMH.
2. The AVR Microcontroller and Embedded Systems, Muhammad Ali Mazidi, Pearson Publication

Reference Books:

1. DR.K.V.K. K. Prasad - Embedded / real time system, Dreamtech
2. Steve Heath - Embedded System Design , Neuwans
3. David Simon - Embedded systems software primer, Pearson

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: IN704 Elective-I (i)
Title of the Course: Elective-I: Biomedical Instrumentation – II

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/ week	Credits	Duration of paper (in hrs)	MSE	IE	ESE	Total
3	1	0	4	4	3	10	10	80	100

Unit	Contents	Hours
1	**Measuring, Recording & Monitoring Equipment-I:** Central nervous systems and muscular system Receptors, sensory pathways and motor systems, processing sensory information, neural, neuromuscular, sensory muscular and sensory measurements, biofeedback, evoked response, electroencephalography (EEG), EEG amplifier, separation of alpha, beta, theta and delta waves from EEG. Classification of muscles – muscle contraction mechanism, myo-electric voltages, electromyography (EMG), noise removal and signal compensation for reducing ECG artifacts in an EMG recording.	10
2	**Measuring, Recording & Monitoring Equipment-II:** Pulmonary Function Analyzer, Audiometers and Biomedical Telemetry & Telemedicine	7
3	**Modern Imaging Systems:** Understanding of Principle, System components & it's working of following X-ray machines and Digital radiography, Magnetic Resonance Imaging systems, Ultrasound Imaging Systems.	10
4	**Electrical Safety of patient:** Electrical Shock Hazards, Leakage Currents, Safety Codes for Electro-medical Equipment, Electrical Safety Analyzer and Testing of Biomedical Equipment.	7
5	**Therapeutics Equipment:** Laser Application Medical Field, Hemo-dialysis Machines Anesthesia Machine, Ventilators and Automatic Drugs Deliver System	11
	Total	45

Text Books:

1. A Handbook of Biomedical Instrumentation by R. S. Khandpur, Publication: Tata McGraw Hill Eleventh reprint Edition: Second Ed., 2008.
2. Introduction to Biomedical technology by Joseph J. Carr and John M. Brown Publication : Pearson Education India(PHI), 4th Edition (7th Impression) 2011

Reference Books:

1. Bioinstrumentation by John G. Webster, Publications: John Wily and Sons, Inc 2004.
2. Medical Instrumentation Application and Design by John G. Webster, Publications: John Wily and Sons, Inc Edition: Reprint 2011.
3. Biomedical Instrumentation Systems by Shakti Chatterjee and Aubert Miller, publication: Cenage Learning. Edition 2010

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: IN704 Elective-I (ii)

Title of the Course: Elective-I: Unit Operation and Power Plant Instrumentation

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/ week	Credits	Duration of paper (in hrs)	MSE	IE	ESE	Total
3	1	0	4	4	3	10	10	80	100

Units	Contents	Hours
1	**Basics of chemical engineering unit operations**: Fluid flow processes including fluids transportations, filtration and solids fluidization. Heat transfer processes, including evaporation, condensation and heat exchange. Mass transfer processes, including gas absorption, distillation, extraction, absorption, and drying. Thermodynamic processes, including gas liquidification, and refrigeration. Mechanical Processes including solid transportation, crushing and pulverization, screening and sieving. Basic concepts behind pumps, compressors, fans, blowers etc.	07
2	**Heat Transfer:** Importance of heat transfer in chemical engineering operations, principle of heat flow in fluids, Heat exchange equipment. **Mass Transfer:** Distillation: Vapor-Liquid equilibrium, Ideal solutions, Relative Volatility, Azeotropic mixtures, Methods of Distillation: Flash, continuous, Multi-component system. **Drying**: Theory and Mechanism of drying, steady and unsteady drying, moisture content, total time of drying, characteristics, Classification and selection of industrial dryers.	08
3	**Energy Systems:** Energy sources, their availability, energy scenario in India, Introduction to power generation: Classification: Renewable and non-renewable energy generation resources, Renewable: small hydro, biomass, wind power, solar, geothermal. Nonrenewable: Fossil fuels (Coal, oil, Natural gas) and nuclear power. **Brief study of Hydroelectric, Wind, Solar, Biomass and Nuclear.**	08
4	**Thermal Power Plant:** General layout of modern thermal power plant, Site selection, Presents status of power generation in India. **Boilers & Accessories:** Unique features and advantages of high pressure boilers. Super-heaters, Re-heaters, economizers, Air pre-heaters, Methods of superheat control, Corrosion in boilers and its prevention. **Draught System:** Natural draught- estimation of height of chimney, Maximum discharge, Condition, Forced, Induced and balanced draught, Power requirement by fans. **Coal & Ash Handling Systems with required axillaries.**	14
5	**Condensers and Cooling Towers:** Types of condensers, sources of air in condenser, Effects of air leakage, Methods of obtaining maximum vacuum in condenser, Dalton's law of partial pressure, vacuum & condenser efficiency, Mass of cooling water required, Necessity of cooling ponds and cooling towers, Condenser water cooling systems, Types of cooling towers, cooling ponds. **Feed Water Treatment:** Necessity of feed water treatment, Different impurities found in feed water, Effect of impurities, pH & its role in corrosion and scale formation, Internal & external water treatment systems- hot lime soda process, Zeolite ion exchange process,	08

	Demineralization plants, Reverse osmosis process, Sea water treatment using reverse osmosis, De-aeration.	
	Total	45

Text Books:

1. Power Plant Engineering by Domkundwar
2. Process control, B. G. Liptak
3. Power Plant Engineering P. K. Nag McGraw Hill
4. Renewable Energy technology by Chetan Singh Solanki, PHI
5. McCabe, W. L. Smith, J.C. and Harriot, P. "Unit operations in chemical engineering", McGraw Hill

Reference Books:

1. Manoj Kumar Gupta, ―Power Plant Engineering, PHI Learning Private Limited, 1st ed., 2012.
2. Power plant engineering by S. L. Uppal.
3. G.S. Sawhney, ―Non-Conventional Energy Resources, PHI Learning Private Limited, 1st Ed., 2012
4. Power Plant engineering by N. R. Nagpal.
5. Generation of Electrical Energy by B. R. Gupta
6. Nonconventional Energy resources by B. H. Khan, McGraw Hill
7. Nonconventional Energy sources, G. D. Rai, Khanna Publication.

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: ET705 Elective –I (iii)
Title of the Course: Elective –I: Nanotechnology

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/ week	Credits	Duration of paper (in hrs)	MSE	IE	ESE	Total
3	1	0	4	4	3	10	10	80	100

Units	Contents	Hours
1	**Introduction:** Introduction to Nanotechnology: Fundamental science behind nanotechnology, tools for measuring nanostructures, tools to make nanostructures and imagine nano-behaviours.	9
2	**Nano-CMOS Devices:** Silicon Nanocrystal non volatile memories, Novel dielectric materials for future transistors, Nano-CMOS devices and applications. Scanning probe instrument, nanoscale lithography.	9
3	**Nano particles and Nanotubes:** Properties of Nano particles: Metal nanostructures and semiconducting nanoparticles, Carbon nanostructures: carbon molecules, clusters, nanotubes, properties of nanotubes-strength and elasticity, applications of carbon nanotubes.	9
4	**Nanomachines and Nanodevices:** Nanomachines and Nanodevices, NEMS and MEMS and their fabrication, molecular and super molecular switches. Lithography.	9
5	**Nanoelectronics:** Introduction, the tools of manufacturing of micro and nano fabrication optical lithography, electron beam lithography, atomic lithography. Nano-Electronics for advanced computation and communication. **Use of Nanotechnology in Electronics:** Application of nano structures in electronics, sensors, optics, energy capture, transformation and storage. Application of nanotechnology in biomedical electronics.	9
	Total	45

Text Books:

1. Anatoli Korkin, Jan Labanowski, Evgeni Gusev, Serge Luryi, "Nanotechnology for Electronic Materials and Devices"; Springer.
2. Mark Ratner, Daniel Ratner, "Nanotechnology: A Gentle introduction to a next big Idea"; Pearson Education.
3. Gregory Timp, "Nanotechnology"; Springer-Verlag NY.
4. Introduction to Nanotechnology –by Charles P. Poole Jr., Frank J. Owens – John Wiley & Sons.

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: IN704 Elective-I (iv)
Title of the Course: Elective-I: Neural Network and Fuzzy Logic

Course Scheme					Evaluation Scheme (Theory)				
Lecture	Tutorial	Practical	Periods/ Week	Credits	Duration of paper (in hrs)	MSE	IE	ESE	Total
3	1	0	4	3	3	10	10	80	100

Units	Contents	Hours
1	**Fundamental Concepts and Models of Artificial Neural Systems:** Biological Neurons and Their Artificial Models, Models of Artificial Neural Networks, Learning and Adaptation, Neural Network Learning Rules, Overview of Neural Networks.	9
2	**Single-Layer Perceptron Classifiers:** Discriminant Functions, Linear Machine and Minimum Distance Classification, Training and Classification using the Discrete Perceptron: Algorithm and Example, Single Layer Continuous Perceptron Networks for Linearly Separable Classifications.	9
3	**From Classical (CRISP) Sets to Fuzzy sets:** Introduction, Crisp Sets: An overview, Fuzzy sets: Basic Types, Fuzzy sets: Basic Concepts, characteristics and significant of the Paradigm shift. Fuzzy sets versus Crisp sets: Additional properties of α-cuts, Representation of Fuzzy sets, Extension Principles for Fuzzy sets.	9
4	**Operations of Fuzzy sets:** Types of Operations, Fuzzy complements, Fuzzy Intersections: t-norms, Fuzzy Unions: t-Conorms, Combinations of operations, Aggregation Operations.	9
5	**Fuzzy Arithmetic:** Fuzzy Numbers, Linguistic Variables, Arithmetic, Operations on Intervals and Arithmetic Operations on Fuzzy Numbers, Lattice Fuzzy Numbers and Fuzzy Equations.	9
	Total	45

Text Book:

1. Bose & Liang, "Artificial Neural Networks ", Tata McGraw Hill, 1996
2. Kosco B, "Neural Networks and Fuzzy Systems: A Dynamic Approach to Machine Intelligence, Prentice Hall of India, New Delhi, 1992.
3. S. Rajasekaran and G.A. Vijaylakshmi Pai, Neural Network. Fuzzy Logic and Genetic Algorithm, Prentice Hall of India.
4. Jacek M. Zurada, Introduction to Artificial Neural System, Jaico Publishing Home, 2002.

Reference Books:

1. Simon Haykin - “Neural Networks “, Pearson Education.
2. Klir G.J. and Folger T.A., Fuzzy sets, “Uncertainty and Information”, Prentice Hall of India, New Delhi, 1994.

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: IN705
Title of the Course: Instrumentation System Design (Practical)

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	3	2	25	25	50

Course Objectives:

1. To understand and analyze the design concepts in Instrumentation System Design through experimentation.
2. To learn and use the proper methods while gathering experimental data.

List of Experiments:

1. Design of signal conditioning for a K-type thermocouple/ RTD
2. Development of mathematical model of control valve
3. Configuration of D.P Transmitter and its application for flow
4. Calibration of I/P and P/I converter
5. Tuning of PID controller
6. Study of control valve & plot the characteristics of control valve
7. Calibration and installation of flow, pressure, temperature and level transmitters
8. Design of logic circuit for alarm and annunciator
9. A mini project which includes PCB design

Course Outcomes:

Students will be able to learn design concepts in instrumentation systems which include measurement of parameter signal processing, controlling, debugging related to objectives defined in the problem statement.

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: IN706
Title of the Course: Advanced Process Instrumentation (Practical)

Course Scheme				Evaluation Scheme (Laboratory)		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	3	2	25	25	50

Course Objectives:

1. To understand and analyze the theoretical concepts in Advanced Process Instrumentation through experimentation.
2. To learn and use the proper methods while gathering experimental data.
3. To get familiar with the proper use of process control instruments and equipments in Process Control laboratory.

List of Experiments:

1. Programming using Function block diagram method (03 programs)
2. GUI development for any two application using SCADA software.
3. Study of Foundation field bus
4. Study of Profibus
5. Study of PHA and HaZop
6. Study of functions of SLPC and MLPC

Note: Students have to perform minimum 08 experiments based on above syllabus.

Outcomes:

Students will be able to do experiments based on syllabus using proper methodology and derive scientific conclusion/s based on experiments conducted.

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: IN707
Title of the Course: Embedded system

Course Scheme				**Evaluation Scheme (Laboratory)**		
Lecture	Tutorial	Practical	Credits	TW	POE	Total
0	0	3	2	25	25	50

Notes: Minimum 8 practical based on above syllabus. Programming in Assembly and C language.

SEVENTH SEMESTER B.E. INSTRUMENTATION ENGINEERING

Course Code: IN708
Title of the Course: Major Project Phase –I (Practical)

Course Scheme					Evaluation Scheme(Laboratory)		
Lecture	Tutorial	Practical	Periods/ week	Credits	TW	POE	Total
0	0	4	3	4	100	00	100

- The Major Project Phase – I- It includes seminar work, literature survey and minimal implementation of the project including software and Hardware, which is to be carried out in the institution/industry/research laboratory.
- The duration of project work should be a minimum of two semesters: Major Project Phase –I & II.
- Each student has to present a seminar, on any technical topic related to any subject not covered in the syllabus or preferably based on the project.
- The presentation time is of minimum 10 minutes followed by a 5 minutes session for discussion/question and answers.
- The seminar topic selected by the student must be approved by the project committee of the department at the beginning of the semester; the duplicity of the topics must be avoided.
- Each student/project group has to demonstrate the minimal implementation of the project work and should submit individual seminar report on the day of seminar to the department along with the project progress report.
- The seminar presentation & submission of the report will carry 50% weightage and demonstration and submission of project progress report will carry 50% weightage for final evaluation. The evaluation is to be carried out by department project committee including guide.