KANNUR UNIVERSITY

FACULTY OF ENGINEERING

Curricula, Scheme of Examinations & Syllabus for Semesters VII & VIII of B. Tech Degree Programme in **Applied Electronics & Instrumentation** with effect from 2007 Admissions.

SEVENTH SEMESTER

Code	Subject	Hrs/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
2K6 AEI701	Bio Medical Instrumentation	3	1	-	50	3	100
2K6 AEI702	Computer Control of Process	3	1	-	50	3	100
2K6 AEI703	Industrial Instrumentation – II	3	1	-	50	3	100
2K6 AEI704	Digital Instrumentation	3	1	-	50	3	100
2K6 AEI705	Elective II	3	1	-	50	3	100
2K6 AEI706(P)	Process Control Instrumentation Lab	-	-	3	50	3	100
2K6 AEI707(P)	Virtual Instrumentation & Simulation Lab	-	-	3	50	3	100
2K6 AEI708(P)	Mini Project	-	-	4	50	-	-
2K6 AEI709(P)	Physical Education, Health and Fitness	-	-	-	50	-	-
Total		**15**	**5**	**10**	**450**	**-**	**700**

ELECTIVE II

2K6 AEI705 (A) Fiber Optics & Laser Instrumentation

2K6 AEI705 (B) Power Electronics & Drives

2K6 AEI705 (C) Instrumentation in petrochemical Industries

2K6 AEI705 (D) System Identification & Adaptive Control

2K6 AEI705 (E) Robotics Engineering & Applications

2K6 AEI705 (F) DSP Processors

EIGHTH SEMESTER

Code	Subject	Hrs/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
2K6 AEI801	Artificial Neural Network & Fuzzy Logic Control	3	1	-	50	3	100
2K6 AEI802	Analytical Instruments	3	1	-	50	3	100
2K6 AEI803	Opto Electronics Instrumentation	3	1	-	50	3	100
2K6 AEI804	Computer Networks & DCS	3	1	-	50	3	100
2K6 AEI805	Elective III	3	1	-	50	3	100
2K6 AEI806(P)	Seminar	-	-	4	50	-	-
*2K6 AEI807(P)	Project & Industrial Training	-	-	6	100	-	-
2K6 AEI808(P)	Viva voce	-	-	-	-	-	100
Total		**15**	**5**	**10**	**400 3000**		**600 5400**

ELECTIVE III

2K6 AEI805 (A) Real Time Embedded System

2K6 AEI805 (B) Space Instrumentation

2K6 AEI805 (C) Piping and Instrumentation

2K6 AEI805 (D) Automotive Instrumentation

2K6 AEI805 (E) Power Plant Instrumentation

2K6AEI805 (F) Instrumentation System Design

*25 Marks is allocated for Industrial Training

2K6 AEI 701: Bio Medical Instrumentation

3 hours lecture and 1 hour tutorial per week

Module I 14 Hrs

Biological Cell – Cell Structure – Transport of ions through cell membrane – Bio potential – Resting and Action potential

Components of the Biomedical Instrument system – Electrodes– Polarization – Surface electrodes – Needle Electrodes – Micro Electrodes – Skin Electrode equivalent circuits – Transducers in Bio Medical instrument System– Bio amplifiers – Characteristics and requirements

Module II 13 Hrs

Electro Cardiography - ECG lead configurations – Electro Encephalography (EEG) – Electro Myography (EMG) – Phono Cardiography (PCG) – Electro Retinography (ERG) – Electro Occulography (EOG)

Module III 11 Hrs

Measurement of Blood Pressure – Direct and Indirect methods – Blood pumps – Haemo dialysis – Measurement of Heart rate – Measurement of Blood flow – Cardiac Output – Measurement of Respiration and Gas flow – Diathermy – Ventilators – Oxy meters.

Module IV 14 Hrs

Angiography - Cardiac Pacemaker – Defibrillator – Muscle Simulator – X ray machine Radiation safety Instrumentation – Electrical Shock – Micro and Macro shock – Electrical Accidents in Hospitals – Protection from Electrical Hazards – Advances in Biomedical instrumentation.

Text Books

1. Khandpur R. S., Handbook of Biomedical Instrumentation, Tata McGraw Hill, 1996
2. John G. Webster, Medical Instrumentation-Application and Design, John Wiley and sons
3. Cromwell L., Biomedical Instrumentation and Measurements, Prentice Hall of India,1995

Reference Books

1. Geddes and Baker, Principle of applied bio-medical instrumentation, John Wiley and sons.
2. Wiley, Encyclopedia of Medical Devices
3. Bronzino, Hanbook of Biomedical Engineering, IEEE Press book.

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 702: Computer Control of Process

3 hours lecture and 1 hour tutorial per week

Module I 14 Hrs

Introduction to CCP - Continuous and Discrete control of process - Data loggers-Smart Transmitters- Introduction to SCADA system - Introduction to PLC - Functional Block Diagram - PLC installation and Maintenance - Factors to be considered for selecting a PLC - PLC Programming Languages - Relay Logic and Ladder Logic programming for simple Applications - Mini Project execution using PLC

Module II 13 Hrs

Introduction to Discrete data system - Selection of Sampling process – Selection of Sampling period – Z Transform – Data Holds – Pulse Transfer Function – Modified Z Transform – Response of Open loop and Closed Loop System

Deadbeat and Dahlin Control Algorithms- Smith Predictor- Design of Feed forward Controller - IMC

Module III 13 Hrs

Adaptive Control – Different types – Block Diagrams with Brief explanation of Gain Scheduling Adaptive Control, Model Reference Adaptive System and Self Tuning regulator

System Identification Problem – Least square estimation – Recurssive Least Square Estimation – Minimum Degree Pole Placement – Direct and Indirect STR., Minimum Variance Control

Module IV 12 Hrs

Introduction to Virtual Instrumentation - Advantages of Virtual Instruments over Conventional Instruments - Key Elements of Virtual Instruments

Programming tool for Virtual Instrumentation - Introduction to LABVIEW- Acquisition, Analysis and Presentation with LABVIEW- LABVIEW Programming- Simulation of Simple Application using LABVIEW

Reference Books

1. Despande P.B. and Ash R.H. Computer Process Control, ISA Publication, USA, 1995.
2. Lucas M. P., Distributewd Control System, Van Nastrand Reinhold Company, Newyork.
3. Petrezeulla, Programmable Controllers, Mc-Graw Hill, 1989.
4. Johnsons C.D., Process Control Insrtument Technology
5. Liptak B.G. Instrument Engineer's Handbook-Process Control, Butterworh Heinemann
6. Rahman Jamal and Hebert Picklik, Labview-Applications and solutions, National Instruments release ISBN 0130964239
7. Gary Johnson, Labview Graphical Programming, Mc-Graw Hill, Newyork, 1997.
8. Lisa K. Wells and Jeffry Travis, Labview for everyone, Prentice Hall, Newjersy,1997
9. Ljung L., System Identification: Theory for the user, Prentice Hall, Englewood Cliffs,1987.
10. Soderstorm T. and Petre stoica, System Identification, Prentice Hall International (UK)

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 703: Industrial Instrumentation-II

3 hours lecture and 1 hour tutorial per week

Module I 12 Hrs

Force and weight measurement – comparison with known weights – measuring deflection of a body – measuring electric current – Force measurement using scales, springs and strain gauges –load cells different types – effect of temperature variations – electronic weighing system – types of torque measurement

Strain gauges – types – resistive strain gauges – rosette gauges – bonded and unbonded strain gauges – sensing element materials – protective coating – coating materials

Module II 13 Hrs

Measurement of level – definition of level – visual indicators – float actuators – electrical resistance and static pressure types – principle of operation – construction and characteristics – field of open and closed tanks – level switches – linearization techniques for level sensors – signal conditioning of electrical and pneumatic type boiler drum level control –fluid level sensors – ultra sonic and capacitor type level measurement – solid level measurement

Module III

15 Hrs

Measurements of flow- mechanical flow meters – displacement type-reciprocating piston – rotating piston – helix and oval gear meters – differential type (rotating vane propeller type with counters) – combination meters – principle of operation – construction – installation of mechanical meters – calibration setup of water meters – gas meters (volumetric type and rate flow meters) – hot wire anemometer – differential pressure meters – orifice plates – venture tube – dall tube – flow nozzles – laminar flow – turbulent flow – pitot tube – installation procedures – manometers – flow registering instruments wet and dry type.

Electromagnetic flow meters – ultrasonic flow meters – target meters – turbine flow meters – vortex shedding flow meters – coriolisis force type flow meters – cross correlation techniques for flow measurement – flow measurement using heat transfer measurement of flow of dry solid materials.

Module IV 12 Hrs

Mass and volume measurement – impeller type – weight belt type – turbine type – propeller type – area measurement using plani meter – mechanical tachometer – electric tachometer – contact less tachometer – frequency type tachometer – stroboscopic type tachometer – Vibration measurement – common causes – measurement quantities – methods of vibration measurement

Reference Books

1. Doeblin E.O, 'Measurement Systems': Application and Design, Fourth Edition, McGraw Hill, Newyork, 1992 ISBN 0-07-100697-4.
2. Jain R.K."Mechanical and Industrial Measurements,Khanna Publishers
3. Patranabis, D., 'Principles of Industrial Instrumentation', Second Edition Tata McGraw Hill Publishing Co. Ltd.. New Delhi 1997, ISBN 0074623346
4. Liptak B. 'Process Measurement and Analysis', 3rd Edition Chilton book company Radnor, pennsylvania, 1995 ISBN 0-7506-2255.

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 704: Digital Instrumentation

3 hours lecture and 1 hour tutorial per week

Module I 12 Hrs

Review of digital electronics – basic building blocks – gates – Flip Flop – adder – multiplexer – shift registers – decoder – encoder – sampling – sampling theorem – aliasing errors – reconstruction – extrapolation – synchronous and asynchronous sampling.

Module II 13 Hrs

Counters – Timers – Modes of operation – counting of electrical input events , frequency measurement, Frequency ratio measurement, Period measurement, Time interval measurement, Pulse width measurement

ADC – types and principle of operation – DAC – types and principle of operation – F/V and V/F conversion techniques

Module III 12 Hrs

Digital voltmeter – Application of OPAMPs in voltmeter – Automatic ranging and zeroing in digital voltmeter – Fully automatic digital voltmeter – organization of digital part of a voltmeter – Errors in digital voltmeter – Digital Multimeter – circuits and operation

Module IV 15 Hrs

Digital storage oscilloscopes – digital printers and plotters – LCD display CROs – Colour Monitor – Digital Signal Analyser – Digital Data Acquisition

Introduction to special function add on cards – resistance card – input and output cards – counter, test and time of card and Digital Equipment construction with modular designing – interfacing to microprocessor, micro-controllers and computers – Computer aided software engineering tools (CASE) – use of CASE tools in design and development of automated measuring systems – interfacing IEEE cards – intelligent and programmable instruments using computers

Text Books

1. A. J. Bouwens: Digital Instrumentation, Edition 1997 Tata McGraw Hill Publishing Co. Ltd.. New Delhi
2. D.Patranabis, Principles of Electronic Instrumentation ,PH,2008
3. John Lenk, D. "Handbook of Microcomputer Based Instrumentation and Control"; PH, 1984.

Reference Books

1. Doebelin, Measurement System, Application & Design, IV Ed, McGraw Hill, 1990.
2. Albert.D.Helfrick, William D.Cooper, Modern Electronic Instrumentation and Measurement Techniques
3. Oliver&Cage , Electronic measurements & Instrumentation, McGraw Hill,1987
4. T.S.Rathore, Digital Measurement Techniques, Narosa Publishing House

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 705(A) Fiber Optics & Laser Instrumentation

3 hours lecture and 1 hour tutorial per week

Module I 12 Hrs

Principles of light propagation through fiber – Different types of fibers and their properties – Fiber materials and their characteristics – Transmission characteristics of fibers – Absorption losses – scattering losses – Dispersion – Measurement on optical fibers – Optical sources – Optical detectors

Module II 13 Hrs

Fiber optic instrumentation system – Fiber optic sensors – Different types of modulators – Application in instrumentation – Interferometer method of measurement of length – Measurement of pressure, temperature, current, voltage, liquid level and strain.

Module III 13 Hrs

Fundamental characteristics of laser – three level and four level lasers – properties of lasers – laser modes – resonator configuration – Q switching and modelocking – Cavity dumping – types of lasers – gas laser – solid laser – liquid laser – semiconductor laser

Module IV 14 Hrs

Laser for measurement of distance, length, velocity, acceleration, current and voltage – material processing –laser heating, welding, melting and trimming of materials – removal and vapourisation – Holography – basic principle – methods – Holographic interferometry and applications – Holography for non destructive testing – Holographic components

Reference Books

1. Jasprit Singh, Semi Conductor Optoelectronics, McGraw Hill,1995 ISBN 0070576378
2. Ghatak A.K. and Thiagarajar K, Optical Electronics Foundation book , TMH, Cambridge University Press, 1989 ISBN 052134089
3. John and Harry, Industrial Lasers and their Applications, McGraw Hill 1974 ISBN 0070844437
4. John F Ready,. Industrial Applications of Lasers, Academic Press, 1997 ISBN 0125839618
5. Monte Ross, Laser Applications, McGraw Hill, 1968 ISBN 0124319025

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 705(B) Power Electronics and Drives

3 hours lecture and 1 hour tutorial per week

Module: I 12 Hrs

Power semi conductor devices – power diodes – types – Power MOSFETs – Characteristics – Thyristor – Characteristics – types – Single phase and three phase rectifiers – controlled and uncontrolled rectifiers – full wave and half wave rectifiers – Design of converter circuits – sinle phase AC voltage converters – cyclo converters

Module: II 13 Hrs

Thyristor commutation techniques – natural and forced commutation – DC Choppers – step up and step down choppers – classification of choppers into classes – Inverters – single phase and three phase – voltage control of inverters – PWM Inverters

Introduction to Industrial drives – Block Diagram – Necessity of electrical Drives in industry – Working

Module: III 13 Hrs

Braking of series and separately excited DC motor – Transfer function of series and separately excited DC motors – Torque-slip Characteristics – Operation with different types of load (R and RL) – DC motor with single phase and three phase converters operating in different modes – CLC and TRC strategies for DC machines – Analysis of DC motors fed from different Choppers

Module: IV 14 Hrs

Introduction to Induction motor drives – Operation of induction motor with non sinusoidal supply wave forms- Variable frequency operation of 3 phase Induction motor – Constant flux operation – Current fed operation – Dynamic and regenerative braking of inverter fed ac drives – torque equations – Constant torque operations – TRC Strategy – Stator voltage control – rotor resistance control – principle of vector control - FOC

Reference Books

1. Muhammed H. Rashid, Power Electronics, Circuits, devices and application, PHI
2. Ramamurthy M., Thyristers and their application, EWP.
3. Dubey G. K., Power semiconductor controlled drives, Prentice Hall International, New Jersy, 1989.
4. Bimal K Bose Modern Power electronics and AC Drives,"Pearson education asia 2002.
5. Krishnan. R, "Electrical Motor Drives- Modeling, Analysis and Control "Prentice Hall of India Pvt Ltd., 2nd Edition , 2003
6. Paul .C.Krause, Oleg wasyncznk, Scott.D. Sudhoff "Analysis of Electric Machinery and Drive Systems", 2nd edition , Wiley Interscience, John wiley & Sons, 2002.
7. Werner Leonard, Control of Electrical Drives' 3rd edition, Springer, 2001.

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 705(C): Instrumentation in Petrochemical Industries

3 hours lecture and 1 hour tutorial per week

Module I 12 Hrs

Importance of petrochemical industry – Growth in India – Petroleum exploration – Recovery Techniques – Constituents of petroleum – oil-gas separation – Processing wet gases – Refining of crude oil – Refinery gases

Module II 15 Hrs

Important unit operations – Drying-Separation – Heat transfer – Distillation – Thermal cracking – catalytic cracking – catalytic reforming – Chemical oxidation – Chemical reduction – Polymerization – Alkylation – Isomerization – Production of Ethylene, Acetylene – and propylene from petroleum

Parameters to be measured in refinery and petrochemical industry – Temperature, Flow and Pressure measurements in Pyrolysis – catalytic cracking – reforming processes – Selection and maintenance of measuring instruments – Intrinsic safety.

Module III 13 Hrs

Process control in refinery and petrochemical industry – Control of distillation column – catalytic cracking unit – catalytic reformer – pyrolysis unit – Automatic control of polyethylene production – Control of vinyl chloride and PVC production – Optimal control of cracking un its and reformers.

Module IV 12 Hrs

Chemical from petroleum – Methane derivatives – Acetylene derivatives – Ethylene derivatives – Propylene derivatives – Cyclic petrochemicals – Other Products

Text Books

1. Balchan .J.G. and Mumme K.L., Process Control Structures and applications, Van Nostrand Reinhold Company, New York, 1998.
2. Waddams A.L, Chemical from petroleum, Butter and Janner Ltd., 1968.

Reference Books

1. Austin G.T. Shreeves, Chemical Process Industries, McGraw-Hill International student edition, Singapore, 1985.
2. Liptak B.G. Instrumentation in process industries, Chilton book Company, 1994.
3. Liptak B.G., Process measurement and analysis, Third edition, Chilton book Company.

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

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2K6 AEI 705(D) System Identification and Adaptive Control

3 hours lecture and 1 hour tutorial per week

Module I 12 Hrs

Mathematical Modeling of a process – System Identification – Definition, Steps and Limitation – Non parametric method – Transient method – Frequency method – Correlation method – Spectral method

Module II 13 Hrs

White Box, Black Box and Grey Box models – General Time invariant model – Transfer Function Models – ARX – ARMAX – ARMA – ARARX – Least Square Method – Prediction Error Method – Best Linear Unbiased Estimate – BLUE with Linear Constraint – Instrumental Variable Method

Module III 15 Hrs

Recursive Identification methods – Recursive Least Square method(RLS) – Recursive Instrumental Variable method (RIV) – Recursive Extended Instrumental Variable method (REIV) – Recursive Prediction Error method (RPEM) – Pseudo Linear Regression (PLR)

Module IV 12 Hrs

Closed Loop Identification Methods – Spectral Analysis – Instrumental Variable method – Prediction Error Method

Adaptive Control – General Block Diagram – Adaptive Schemes – Gain Scheduling Method – MRAS – Self Tuning Regulator – Pole Placement Techniques

Reference Books

1. Ljung L., System Identification: Theory for the user, Prentice Hall, Englewood Cliffs,1987.
2. Soderstorm T. and Petre stoica, System Identification, Prentice Hall International (UK)
3. Satry S. and Bodson M. adaptive Control – Stability Convergence and Robustness, Prentice Hall Inc., New Jersy, 1989

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 705(E) Robotics Engineering and Applications

3 hours lecture and 1 hour tutorial per week

Module I 14 Hrs

Introduction – Robot definition – Robotics and Programmable automation Historical Back ground – Laws of robotics – Robotics Systems and Robot anatomy – Specification of Robots – Robot geometrical Configuration – Basic Robot motions – Point to point control – Continuous path control.

Module II 13 Hrs

Robot Drive Mechanism – Objectives – Motivation – Open Loop Control – Closed loop control with position and velocity feedback – Types of drive systems – Hydraulic piston and transfer valves – Hydraulic actuators – Linear and rotary actuators – Components used in pneumatic control – Pistons – Linear and Rotary pistons – Motors – DC Motor – Stepper motors – Half Step mode operation – Micro step mode.

Module III 11 Hrs

Sensors – Introduction to sensors and Transducers – Need of sensors in Robotics – Position Sensors – Optical and Non optical position sensors – Velocity sensors – Accelerometers – Proximity sensors – Contact and non contact type – Range sensing – Force and Torque sensors – Different sensing variables – Smell, Heat or Temperature, Humidity, Light, and Speech or voice recognition systems – robot Control through Vision sensors – Robot guidance with vision system.

Module IV 14 Hrs

Industrial Applications – Application of Robots – Material Handling – Machine Loading and Unloading – Assembly – Inspection – Welding – spray painting – Mobile robots – Microbots – Recent developments in robotics – Safety Consideration

Reference Books

1. Groover M.P., Weiss M, Nagel R.N, Odrey N.G, 'Industrial Robotics - Technology, Programming and Applications', McGraw Hill, 1986. ISBN-0-07-100442-4
2. John J. Craig, 'Introduction to Robotics, Mechanics and Control', Addison-Wesley Publishing Co,1999, I edition ISBN-020-152539-9.
3. McDonald A.C, 'Robot Technology -Theory, Design and Applications', Prentice Hall, New Jersey, 86.
4. Asada H. & Slotine JJ.E., 'Robot analysis & control', John Wiley & Sons, New York, 1986.
5. Fairhust M.C., 'Computer Vision for Robotic systems - An introduction', Prentice Hall, London, 1988.
6. Koren Y., 'Robotics for Engineers', McGraw Hill Book Co., USA, 1985. ISBN-0-07-100534-
7. Klafter, 'Robotics Engineering', Prentice Hall, 1994.
8. Nikku, 'Introduction to Robotics', TBH Publishers, 2000, ISBN – 81203 23793
9. Mithal, 'Robotics and Control', TBH Publishers, 2003, ISBN – 0070482934

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 705(F) Digital Signal Processors

3 hours lecture and 1 hour tutorial per week

Module I 12 Hrs

High level overview of Digital Signal Processing – DSP system features and applications – Introduction to DSP Processors – Common features of DSP processors – Numeric representations and arithmetic – Fixed point versus floating point – Extended precision – Floating point and block floating point – Data path – Fixed and floating point data paths

Module II 12 Hrs

Memory architecture – Harvard architectures – multiple access memories – program caches – wait states – ROM – external memory interfaces – multiprocessor support – dynamic memory – DMA – different addressing modes used in DSP processors

Module III 13 Hrs

Instruction set – Instructions commonly found in DSP processors – various instruction types – special function instructions – review of registers in DSPs – orthogonality of the instruction set – assembly language format – execution control – hardware looping – interrupts stacks- relative branch support – pipelining- pipeline programming models

Module IV 15 Hrs

Peripherals – serial ports – timers – parallel ports – host ports – communication ports – on chip A/D and D/A converters – external interrupts – on chip debugging facilities – DSP development tools – Assembly language tools – High level language development tools – block diagram based programming tools – DSP system design flow – choosing a processor architecture – DSP processor trends – an example DSP architecture analog devices/ Motorola/ Texas Instruments – Alternatives to commercial DSP processors

Text Books

1. Phil Lapsley, Jeff Bier, Amit Shoham & Edward A. Lee, "DSP Processor Fundamentals-Architectures and Features", IEEE Press

Reference Books

1. Emmannuel C Ifeachor, Barrie W. Jervis, "Digital Signal Processing: A Prctical Approach", Addison Wesley
2. Steven W.Smith, "The Scientist and Engineer's Guide to Digital Signal Processing", www.DSPguide.com
3. Padmanabhan K., Ananthi S. & Vijayarajeswaran R., "A Practical Approach to Digital Signal Processing", New Age International PublishersBateman, Andrew Yates & Warren, "Digital Signal Processing Design", Pitman

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 706(P) : Process Control Instrumentation Lab

3 hours practical per week

(Twelve experiments from the following topics listed will be scheduled for the laboratory depending on the availability of equipment, components etc.)

1. Characteristics of On-off control
2. Characteristics of P control
3. Characteristics of I control
4. Characteristics of D control
5. Characteristics of P+I control
6. Characteristics of P+D control
7. Characteristics of P+I+D control
8. Studies of cascade control
9. Studies of feed forward control
10. Characteristics of control valves
11. Use of programmable logic controller
12. Characteristics of devices connected with process control systems/Plants
13. Studies of Ratio control
14. Supervisory control-SCADA package
15. Non-linear plant control-pH & conductivity

Sessional work assessment

Laboratory Practicals and Record	= 35
Tests	= 15
Total marks	= 50

2K6 AEI 707(P) Virtual Instrumentation and Simulation Lab

3 hours practical per week

(Twelve experiments from the following topics listed will be scheduled for the laboratory depending on the availability of equipment, components etc.)

1. Familiarization of Simulation softwares (Matlab, Labview, PLC).
2. Modeling of a first order process.
3. Design of feedback controllers for FOPDT process.
4. Auto tuning of PID controller.
5. Design of feed forward controller.
6. Design of cascade controller.
7. PID implementation issues.
8. Simulation of MIMO system.
9. Controller design for interacting process
10. Design of adaptive controller for non linear process.
11. Neural network modeling of process.
12. Design of fuzzy logic controller
13. Implementation of Boolean expressions using PLC ladder programming
14. Simulation of simple process control applications using PLC ladder programming

Sessional work assessment	
Laboratory Practicals and Record	= 35
Test/s	= 15
Total marks	= 50

2K6 AEI 708(P): MINI PROJECT

4 hours per week

The project work can be a modeling/design project, experimental project or computer simulation projects in the topics of Applied electronics & Instrumentation engineering interest including communication engineering and computer engineering - it can be allotted as a group project with groups consisting of three to five students

The assessment of all the mini projects shall be done by a committee consisting of three or four faculty members specialised in the various fields of Applied electronics & Instrumentation engineering - the students will present their project work before the committee - the group average marks for the various projects will be fixed by the committee - the guides will award the marks for the individual students in a project maintaining the group average - each group will prepare the project report and submit to the department through the guide - the head of the department will certify the copies and shall retain one copy in the departmental library

Sessional work assessment	
Presentation	: 30
Report	: 20
Total marks	: 50

2K6 AEI 709(P): PHYSICAL EDUCATION, HEALTH & FITNESS

Introductory Lectures:

Unit 1: Health and fitness: Modern concept of health and fitness, meaning, scope, need and importance of health, fitness and wellness.

Unit II: Exercise and fitness: Means and methods of developing fitness. Importance of physical activities and exercises in developing and maintaining good health, Physical fitness and well being.

Unit III : Sports and Physical education: Meaning and scope, role and importance of sports and games in the development of physical fitness and personality. Social values of sports. Rules of major games.

Practical Sessions:

(All classes will be conducted after the normal working hours of the college)

50 sessions of minimum 1 hour duration each are envisaged (including Theory and Practical). The student can opt for one of the following activities in line with the specific programme / schedule announced by the faculty.

Athletics, Badminton, Basketball, Cricket, Football, General fitness, Hockey, Kabadi, Table Tennis, Ball Badminton, Archery, Volley ball, Yoga (not all activities may be offered in a particular semester. More disciplines will be offered based on the availability of infrastructure and expertise).

In addition, health and fitness assessment such as height, Weight, Resting Pulse rate and blood Pressure will be carried out.

Objective :

a) Basically to inculcate awareness of health, general fitness and attitude to voluntary physical involvement.
b) To promote learning of basic skills in sports activities and secondarily to pave the way for mastering some of the skills through continued future involvement.

Scheme of assessment:

The student will be continuously assessed on his performance on the field of play. There will not be minimum mark for pass or fail. Total 50 marks will be given assessing their attendance, regularity, punctuality and performance for 50 hours of activity from 1st semester to 7th semester.

2K6 AEI 801: Artificial Neural Network & Fuzzy Logic Control

3 hours lecture and 1 hour tutorial per week

Module I 15 Hrs

Introduction to Neural Network – Biological Neuron – Characteristics of ANN – Characteristics of ANN – History of ANN – Artificial Neuron – Mc Culloch Pitts model – Activation function – Perceptron – Training of Perceptron – Application of Perceptron – Multi Layer Perceptron

Classification of learning Algorithms – Back Propagation Algorithm derivation – Simple Numerical Problems – Drawbacks of BPA, Recurrent Neural Network, Hopefield Structure, Comparison of Feed forward and feed back neural structures – Applications of Neural Networks – the XOR problem and Travelling salesman problem

Module II 12 Hrs

Modeling of a system – Procedure for developing ANN Model – Identification of Optimal Architecture – Validation of Developed ANN Model

ANN Based Control Schemes – Indirect and Direct control Schemes using ANN – ANN MBC – ANN Inverse MBC – ANN Auto Tuner – Controller Modeling – Stand Alone Neuro Control – Model Based Neuro Control – Robust Model Based Control Scheme – Case Study – Familiarization of ANN Tool box in MATLAB .

Module III 11 Hrs

Introduction to Fuzzy Logic – Fuzzy Set – Different terms and Definitions – Fuzzy Complement – Involutive property of Fuzzy Complement – Equilibrium point – Fuzzy Relation Joint – Fuzzy Composition – max-min composition – max product composition Fuzzy projections – Fuzzy cylindrical extension

Module IV 14 Hrs

Fuzzy Logic Control – Definition and need of FLC – Components of FLC – Block Diagram – Justification – Knowledge Base – Decision Making Logic – Defuzzification – Generalized flow Chart – Case Study – Development of FLC for optimal tuning of PID Controllers - Simulation Studies using FLC Toolbox in MATLAB,

Introduction of Genetic Algorithm – properties – Natural Evolution – Cross over – Mutation – Hybrid system – Neuro Fuzzy Control.

Reference Books

1. Laurence Fausett, Fundamentals of Neural Networks, Prentice Hall Englewood cliffs,
2. Timothy J. Ross, Fuzzy Logic with Engineering Applications, Mc-Graw Hill Inc., 1997.
3. Goldberg, Genetic Algorithm in search, Optimization, and machine Learning, Addison Wesley Publishing Company, Inc., 1989
4. Simon Haykins, Neural Network a comprehensive foundation, Mc Millan College.
5. Bart Kosko, Neural Network and Fuzzy systems, Prentice Hall.
6. Millon W. T. Sutton R. S.,and Webrose P. J., Neural Networks for control, MIT Press,
7. MATLB Neural Network toolbox manual.
8. MATLAB Fuzzy Logic Toolbox manual.

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 802: Analytical Instruments

3 hours lecture and 1 hour tutorial per week

Module I 12 Hrs

Spectrophotometers: Spectral methods of analysis – UV, Visible, IR, FTIR, atomic absorption – Flame Emission mass spectrophotometers – Sources – Detectors – Applications.

Module II 13 Hrs

Gas Analyzer: Oxygen Analyser – CO and CO2 monitor – NO_2 analyser – H_2S analyser – dust and smoke measurement – Thermal conductivity type – Thermal analyser – Industrial analyser

Module III 14 Hrs

Magnetic Resonance techniques – nuclear magnetic resonance – principles and components – NMR spectrometer – FT NMR – types of magnets and probes – measurement techniques – ESR spectrometer – principles and instrumentation – X-Ray diffraction – Bragg- X-ray spectrometer – principles and instrumentation – X-ray absorption fluorescence spectrometry – principles and instrumentation

Module IV 13 Hrs

Mass spectrometry – Principles – magnetic deflection mass analyser – electorstaic analyser – principles and instrumentation – chromatography – general principles – classifications – gas and liquid chromatography – Chromatographic detectors – GLC and HPLC – principles and instrumentation – nuclear radiation detectors

Reference Books

1. Williard, Merit, Dean & Settle, “Instrumental Methods of Analysis”, CBS
2. Skoog A & West M., “Principles of Instrument analysis”, Hall- Saunders International
3. Edwing G.W., “Instrumental Methods of Chemical Analysis”, McGraw Hill
4. Khandpur R.S., “Handbook of Analytic Instruments

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 803: Opto Electronic Instrumentation

3 hours lecture and 1 hour tutorial per week

Module I 15 Hrs

Interferometers – Fabry-Perot and Michelson interferometers – Mach-Zehnder interferometers – interference filters – interferometer methods in metrology and testing of optical components – optical spectrum analyzer – modulation of lights – electro-optic effect – Kerr modulators – magneto-optic devices – acoustic optic modulators – display devices – light emitting diode – plasma displays – liquid crystal displays – pin diodes – photo detectors - optocouplers

Module II 12 Hrs

Optical materials and coating – moiré fringes – photo elasticity – lasers – principles of operation – Einstein relations – population inversion – optical feed back – laser modes – classes of lasers – solid state, gas and liquid dye lasers – semiconductor lasers- Q-switching and mode locking – properties of laser light

Module III 12 Hrs

Applications of lasers – laser gyro – Laser Doppler Anemometry (LDA) – holographic interferometry – distance measurement – holography – principles and applications – optical fibres – light guidance through fibres – step index and graded index fibres – multimode and single mode fibres – fibre fabrication

Module IV 13 Hrs

Measurement of fiber characteristics – attenuation, dispersion and refractive index profile measurement – OTDR – fiber optic components – couplers, splicers and connectors – applications of optical fibres – optical fiber components – recent trends

Reference Books

1. Jasprit Singh, Semi Conductor Optoelectronics, McGraw Hill,1995 ISBN 0070576378
2. Ghatak A.K. and Thiagarajar K, Optical Electronics Foundation book , TMH, Cambridge University Press, 1989 ISBN 052134089
3. Jain R. K. Engineering metrology, Khanna Publishers.
4. Meyer-Arendt J. R., Introduction to classical and modern optics, PHI
5. Wilson J. and Hawkes J. F. B. Opto electronics an Introduction. Prentice Hall of India.

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 804: Computer Networks and Distributed Control Systems

3 hours lecture and 1 hour tutorial per week

Module I 14 Hrs

Network hierarchy and switching – Open System Interconnection model of ISO – Functions of various layers – Datalink control protocol – HDLC – Media Access Protocol – Command/response – token passing – CSMA _ CSMA/CD – TCP/IP – Bridges – routers – gateways

Module II 14 Hrs

Distributed Control System – introduction – Comparison of PLC and DCS – Evolution – Different architectures – Local Control unit – Operator Interface– Engineering Interface– Displays – Alarms and Alarm management

Module III 11 Hrs

Integration of DCS with PLC, computers and direct I/Os - Study of any one popular DCS available in market – Factors to be considered while selecting DCS – Case Studies in DCS

Module IV 13 Hrs

Introduction to signal standards – evolution – HART Communication protocol – Communication modes – HART networks – HART commands – HART and OSI model

Field bus – Introduction – general architecture – basic requirements of field bus standard – fieldbus topology – interoperability – interchangeability

Reference Books

1. A.S.Tanenbaum, computer networks, third edition, prentice hall of india,1996
2. Michael P .Lucas, Distributed Control system, Van Nastrant Reinhold Company,New York,
3. Romilly Bowden, HART application Guide, HART communication Foundation,1999
4. G.K.Mc-Millan,Process/Industrial Instrument and control and hand book,Mc- GrawHill, New York,1999
5. Bowden, R., "HART Application Guide", HART Communication Foundation, 1999.

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 805(A) Real Time Embedded System

3 hours lecture and 1 hour tutorial per week

Module: I 12 Hrs

System Design

Definitions – Classifications and brief overview of micro controllers microprocessors and DSPs – Embedded processor architectural definitions – Typical application scenario of embedded systems

Module: II 14 Hrs

Interface Issues Related to Embedded Systems

A/D, D/A converters, timers, actuators – FPGA

Techniques for embedded Systems

State Machine and state Tables in embedded design – Simulation and Emulation of embedded systems – High level language descriptions of S/W for embedded system

Module: III 13 Hrs

Real time Models, Language and Operating Systems

Event based, process based and graph based models – Petrinet models – Real time languages – Real time kernel – OS tasks – task states – task scheduling – interrupt processing – clocking communication and synchronization – control blocks – memory requirements and control – kernel services.

Module: IV 13 Hrs

Case Studies

Discussion of specific examples of complete embedded systems using MC68HC11, Intel 8051, PIC series of micro controller

Text Books

1. Herma K., 'Real Time systems - Design for Distributed Embedded Applications', Kluwer Academic, 1997, ISBN 0792398947
2. Ganssle J., 'Art of Programming Embedded Systems', Academic Press, 1992, ISBN 0122748808
3. Ball S.R., 'Embedded Microprocessor Systems'- Real World Design, Prentice Hall,1996, ISBN 0750675349.

Reference Books

1. Gajski, D.D. Vahid, F, Narayan S., 'Specification and Design of Embedded Systems', PTR Prentice Hall, 1994, ISBN 0131507311.
2. Intel Manual on 16-bit Embedded Controllers, Santa Clara, 1991.
3. Slater, M., 'Microprocessor based Design, A Comprehensive guide to effective Hardware Design', Prentice Hall, New Jersey, 1989, ISBN 0135822483.
4. Peatman.J.B., 'Design with PIC Micro Controllers', Pearson Education, Asia, 2001, ISBN 00704923
5. C.M.Krishna, Kang G. Shin, 'Real Time Systems',McGrawHilF,1997,ISBN 007057043.
6. Raymond J.A.Buhr, Donald L. Bailey, 'An Introduction to Real Time Systems', Prentice Hall International, 1999, ISBN 0136060706.

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 805(B) Space Instrumentation

3 hours lecture and 1 hour tutorial per week

Module I 13 Hrs

Introduction to telemetry systems – Aerospace transducers – Signal conditioning and multiplexing methods – Analog and digital telemetry – Command Link and Remote control system – Application of telemetry in flight systems

Module II 13 Hrs

Aircraft compass – Magnetic compass – Errors and their minimization – remote indicating type magnetic compass – Rate of climb indicator – Principle, Construction and Application – Pitot static systems – Construction – Position of pitot probes and static vents – Air speed indicator – Mach meter – Integrated flight Instruments

Module III 14 Hrs

Gyros – rate gyro – rate indicating gyro – free gyro – vertical gyro – directional gyro – analysis and application – Internal guidance platforms – Internal Accelerometers – microsyns

Module IV 12 Hrs

Flight control systems – Block diagrams – methods of control – Application of digital and Adaptive control systems - Autopilot

Reference Books

1. F. H. J. Palledi Pitman, Aircraft Instruments Principles and Applications.
2. Richard F. J., Space communication techniques.
3. Hari L. Stiitz, Aerospace telemetry.
4. Farkas, Electronic Testing.
5. Williams , Aircraft Instruments.

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 805(C) Piping and Instrumentation

3 hours lecture and 1 hour tutorial per week

Module I 11 Hrs

Types of flow sheets, Flow sheet Presentation, Flow Sheet Symbols, Process flow diagram- Synthesis of steady state flow sheet - Flow sheeting software.

Module II 14 Hrs

P & I D objectives, guide rules, Symbols, Line numbering, Line schedule, P & I D development, typical stages of P & I D. P & I D for rotating equipment and static pressure vessels, Process vessels, absorber

Module III 14 Hrs

Control System for Heater, Heat exchangers, reactors, dryers, Distillation column and Evaporators.

Module IV 13 Hrs

Applications of P & I D in design stage - Construction stage - Commissioning stage - Operating stage - Revamping stage - Applications of P & I D in HAZOPS and Risk analysis.

Text Books

1. Ernest E. Ludwig, “Applied Process Design for Chemical and Petrochemical Plants”, Vol.-I Gulf Publishing Company, Houston, 1989.
2. Max. S. Peters and K.D.Timmerhaus, “Plant Design and Economics for Chemical Engineers”, McGraw Hill, Inc., New York, 1991.

Reference Books

1. Anil Kumar,”Chemical Process Synthesis and Engineering Design”, Tata McGraw Hill publishing Company Limited, New Delhi - 1981.
2. A.N. Westerberg, et al., “Process Flowsheeting”, Cambridge University Press, 1979.

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 805(D) Automotive Instrumentation

3 hours lecture and 1 hour tutorial per week

Module I 12 Hrs

Automobile Panel Meters And Sensor Design:

Ergonomics – Panel Meters – Controllers – Sensor for Fuel Level in Tank – Engine Cooling Water Temperature Sensors Design – Engine Oil Pressure Sensor Design – Speed Sensor – Vehicle Speed Sensor Design – Air Pressure Sensors – Engine Oil Temperature Sensor.

Module II 16 Hrs

Indicating Instrumentation Design

Moving Coil Instrument Design – Moving Iron Instruments – Balancing Coil Indicator Design – Ammeter and voltmeter – Odometer and Taximeter Design – Design of Alphanumeric Display for Board Instruments

Switches And Controls

Horn Switches – Dipper Switches – Pull and Push Switches – Flush Switches – Toggle Switches – Limit Switches – Ignition Key – Ignition Lock – Relay and Solenoid – Non-contact Switches

Module III 12 Hrs

Warning and Alarm Instruments

Brake Actuation Warning System – Traficators – Flash System – Oil Pressure Warning System – Engine Overheat Warning System – Air Pressure Warning System – Speed Warning System – Door Lock Indicators – Gear Neutral Indicator – Horn Design – Permanent Magnet Horn – Air Horn – Music Horns

Module IV 12 Hrs

Dash Board Amenities

Car Radio Stereo – Courtesy Lamp – Timepiece – Cigar Lamp – Car Fan – Windshield Wiper – Window Washer – Instrument Wiring System and Electromagnetic Interference Suppression – Wiring Circuits for Instruments – Electronic Instruments – Dash Board Illumination

Text Books

1. Walter E, Billiet and Leslie .F, Goings, 'Automotive Electric Systems', American Technical Society, Chicago, 1971.
2. Judge.A.W, 'Modern Electric Equipments for Automobiles', Chapman and Hall, London,

Reference Books

1. Sonde.B.S., 'Transducers and Display System', Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1977.
2. W.F. Walter, 'Electronic Measurements', Macmillan Press Ltd., London.
3. E.Dushin, 'Basic Metrology and Electrical Measurements', MIR Publishers, Moscow,1989

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 805(E) Power Plant Instrumentation

3 hours lecture and 1 hour tutorial per week

Module: I 12 Hrs

Introduction to power plant processes – types of fuels – rankine and brayton cycles – boilers – water tube – oncethrough and fluidized types – types of condensers – steam turbines - cooling water system – types of hydro turbines – gas turbines – combined cycle power plant – power generating and distributing systems – introduction to nuclear reactor – PWR/BWR/FBR/GCR – pollution from power plants

Module: II 14 Hrs

Measurement and analysis in power plant

Flow measurements: feed water, fuel and air flow – corrections for temperature and pressure measurements – Level measurements – Smoke density measurements – chromatography – pH meter – TDS meter – Flame scanner – measurement of dissolved oxygen – different methods of water treatment

Piping and instrumentation diagrams: Tag numbers – Tag descriptors – Instrument location – shared displays/shared controllers – Piping and connection symbols – valve symbols – P &ID examples

Module: III 12 Hrs

Controllers in Power plants

Combustion control: main pressure, air/fuel ratio combustion control – furnace draft and excess air control – 2 element and 3 element drum level control – Burner tilting up and bypass damper – BFP recirculation control – Condenser vacuum control – Control and safety instrumentation – hot well and de-aerator level control

Module: IV 14 Hrs

Nuclear Power plant Instrumentation

P & ID for different types of nuclear power plants – Radiation detection instruments – Process sensors for nuclear power plant – nuclear reactor control system and allied instrumentation

Reference Books

1. Kallen, “Power plant Instrumentation”
2. Liptak B. G., “Instrumentation in process Industries” Chilton Book Co.
3. David Lindesnev, “Boiler Control systems” Mc Graw Hill International
4. British Electricity International, “Modern power station Practice”, Vol 6 Pergamon Press 1992.Samuel Glass stone, “Principles of Nuclear reactor engineering”
5. Elanka S. M. and Kohal A. L., “Standard Boiler operations”, Mc Graw Hill New Delhi

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 805(F) Instrumentation System Design

3 hours lecture and 1 hour tutorial per week

Module I 13 Hrs

Introduction to Instrumentation system design – system configuration – problem analysis – electronic processing modules for handling transducer outputs – P/I conversion – loading effect – impedance matching – noise problem – grounding and shielding techniques – bridge circuits – voltage follower – differential amplifier – chopper stabilized DC amplifier carrier Samplifier charge amplifiers – impedance converters – instrumentation amplifiers – isolation amplifier – linearization – phase sensitive detector – absolute value circuit – peak detector – sample and hold circuit – RMS converters – comparators – log amplifier – F to V and V to F converters – filtering – types of filters – data conversion – ratio metric conversion – logarithmic compression

Module II 13 Hrs

Cabling in process instrumentation – Types of cables – extension cables for thermocouples – introduction to process piping – material selection – selection of pipes, valves etc, as per ASTM/ANSI/BIS/ISA standards – control valve selection – pressure drop requirements for good contro – capacity requirement – design rate – rangeability – split ranging control valves – introduction to control valve sizing – illustration of typical sizing calculation for liquid, steam, and gas (one each) – illustration of typical calculation in process instrumentation

Module III 13 Hrs

Instrument project control – documents to be produced- process flow – mechanical flow – instrument index and instrument specification sheets – loop wiring diagrams – panel drawing and specifications – plot plans – instrumentation details – purchase requisites – process information – instrument specification and standards – piping specifications – electrical specifications – bid documents – project procedures – project schedules – work coordination – project manager – process engineer – equipment engineer – piping design supervisor – job execution – planning hints – scheduling – specifying instruments – vendor selection – shipping – receiving and storing instruments – installation and check out project checklist – design considerations – engineering design criteria – pneumatics versus electronics – process control requirements – control centers – location – layout – electrical classification – specifications of various measurements and control loops (flow, pressure, level, temperature etc) – control valves

– control panels – analytical instruments – transmission – identification – process connections – location of taps – sealing instruments from process – manifolds and gauge valves – mounting instruments – selection of units – charts and ranges – instrument identification – winderising – construction materials – packaged equipment systems – electrical safety – purging and pressurizing enclosures – intrinsic safety

Module IV 13 Hrs

Construction and start up: organizing – documents required – planning schedule – cost control – ordering and receiving equipment and material – purchase orders – material status – installing instrument systems – typical installation procedures – coordinating work among crafts – checklists of installation practices – calibration – testing – typical flow transmitter – checkout procedure – typical control valve check out procedure – star up – placing instruments in service – tuning control loops – evaluating process upsets and disturbances – special equipments – loop analysis based design – procedure for automated design – instrument purchase specifications – control panels – introduction – control room layout – instrument power requirements and distribution – control room lighting – communication systems – electrical classifications – control panel types – flat – faced and break – front panels – consoles – comparison of panel types – panel layout – face layout rear layout – auxiliary racks and cabinet – panel piping and tubing – introduction to different types of cables used in instrumentation – air headers – graphic displays – panel bid specifications

Reference Books

1. Rangan, Sharma & Mani, " Instrumentation Devices and Systems", TMH
2. Doebelin, "Measurement Systems- Application and Design", McGraw Hill
3. Johnson C.D., "Process Control Instrumentation"
4. Andrew W.G & Williams H.B., " Applied Instrumentation in Process Industries Vol 1, 2 &3

Sessional work assessment

Two tests 2 x 15 = 30

Two assignments 2 x 10 = 20

Total = 50

University examination pattern

Q I - 8 short answer type questions of 5 marks, 2 from each module.

Q II - 2 questions A and B of 15 marks from module I with choice to answer any one.

Q III - 2 questions A and B of 15 marks from module II with choice to answer any one.

Q IV - 2 questions A and B of 15 marks from module III with choice to answer anyone.

Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 AEI 806 (P) : SEMINAR

4 hours per week

Individual students should be asked to choose a topic in a field of their interest but in Applied Electronics & Instrumentation engineering, preferably from outside the B.Tech syllabus and give a seminar on that topic for about thirty minutes - a committee consisting of at least three faculty members (preferably specialized in different fields of engineering) shall assess the presentation of the seminars and award the marks to the students based on the merits of the topic of presentation - each student shall submit two copies of a write up of his seminar talk - one copy shall be returned to the student after duly certifying it by the Head of the department and the other will be kept in the departmental library

Sessional work assessment	
Presentation	: 30
Report	: 20
Total marks	: 50

2K6 AEI 807(P) : PROJECT& INDUSTRIAL TRAINING

6 hours per week

The project work can be a Modelling and Simulation, Design or Experimental, in the field of Applied Electronics and Instrumentation. It can be allotted as a group project with groups consisting of three to five students. Each group will prepare the project report and submit to the department through the guide - the Head of the Department will certify the copies and shall retain one copy in the departmental library

All students shall undergo an industrial training programme either by attending training program for a minimum of five days in a registered industry/Govt. establishment/Research institute or by visiting at least five reputed industries/Engineering establishments. They have to submit a report of the industrial training program.

The assessment of all the projects shall be done by a committee consisting of three or four faculty members specialised in the various fields of Applied Electronics and Instrumentation. The students will present their project work before the committee - the group average marks for the various projects will be fixed by the committee - the guides will award the marks for the individual students in a project maintaining the group average

A maximum of 25 marks will be awarded for the industrial training

Sessional work assessment

Project work	: 75
Industrial Training	: 25
Total marks	: 100

2K6 AEI 808(P) : VIVA VOCE

There is only University examination for Viva Voce. Examiners will be appointed by the university for conducting the viva voce. The viva voce exam will be based on the subjects studied for the B.Tech course, mini project, project & Industrial training and seminar reports of the student - the relative weightages would be as follows

Sessional work assessment

Subjects	: 30
Mini project	: 20
Project & Industrial Training	: 30
Seminar	: 20
Total marks	: 100