WITH EFFECT FROM THE ACADEMIC YEAR 2005-2006

SCHEME OF INSTRUCTION & EXAMINATION

B.E IV YEAR (REGULAR)

(INSTRUMENTATION ENGINEERING)

SEMESTER - II

Sl. No.	Syllabus Ref.No	SUBJECT	Scheme of Instructions Periods per Week L/T	D/P	Scheme of Examination Dura-tion in Hrs	Maximum Marks Univ. Exam	Sessionals
		THEORY					
1.	EE 459	Bio-medical Instrumentation	**4**	**-**	**3**	**75**	**25**
2.	EE/LA/CS	**Elective -II**	**4**	**-**	**3**	**75**	**25**
3.	EE/CS/EN/ME	**Elective - III**	**4**	**-**	**3**	**75**	**25**
4.	ME 472	Industrial Admn & Financial Management					
		PRACTICALS					
1.	EE 482	Project	**-**	**6**	**Viva Voce**	**Gr***	**50**
2.	EE 483	Seminar	**-**	**3**	**3**	**-**	**25**
3.	EE 484	Inst. Eng. Computer Simulation Lab	**-**	**3**	**3**	**50**	**25**
4.	EE 486	Process Instn. Lab	**-**	**3**	**3**	**50**	**25**
		TOTAL	**16**	**15**	**-**	**400**	**225**

* Excellent/ Very Good/ Good/Satisfactory/Unsatisfactory

Elective –II

EE 454 Advanced Control System .
EE 455 Optimization Methods
EE 456 Renewable Energy Sources
EE 460 Industrial Instrumentation
LA 454 Intellectual Property Rights
CS: Real Time Control Systems control

Elective -III

EE 457 Reliability Engineering
CS 472 Neural Networks
CS 460: Internet Programming
EE 459 Technical Writing & Presentation Skills
ME 457: Robotics

EE 459

BIO-MEDICAL INSTRUMENTATION

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

UNIT I

Introduction to Bio-medical Instrumentation: General Characteristics of medical instrumentation like linearity, range, frequency response, signal to noise ratio and stability. Amplifiers for Bio-medical Applications: Differential, Carrier amplifiers. Phase-sensitive detector for LVDT. Principles of wave generation and shaping. Recorders and display devices for Bio-Medical applications. General features of ink-jet, Thermo-sensitive and optical recorders. General features of display devices for bio-signals. Data-acquisition and display using microcomputers.

UNIT II

ECG recording system: Block Schematic diagram of ECG machine, Amplifiers and circuits for ECG, Special types of ECG recorders. Noise problems and their elimination.
Electro-encephalography: Block schematic diagram of ECG recording sys- tem, General features of different blocks, Specification of ECG amplifiers, Qualitative requirements. 10 -20 electrode system, Resting Rhythms and sleep stages, Electro Myography. Block schematic diagram of EMG recording system. EMG amplifiers. Design considerations of EMG amplifiers. Data display for EMG.

UNIT III

Blood pressure and Blood Flows: Electronic Techniques for indirect and direct measurement of blood pressure. Measurement of blood flow by Electro-magnetic, Doppler and Plethysmo-graphic methods.

Phonocardiography: Origin of heart sounds, Phonocardiography instrumentation consisting of microphone, filters and signal conditioners.

UNIT IV

Introduction to Radiography: Physical properties of X-Rays, Principles of generation of X-Rays. Radiation energy distribution, Collimators and grids, Fluoroscopy, Image intensifiers.
Methods of Chemical analysis: Absorption Photometry, Emission photometry, Flurometry, Introduction to auto-analyzer, Chromatography for blood gas analysis. Colorimeters. Spectrophotometers, Electrophoresis.

UNIT V

Electrical hazards during Bio-electric monitoring: Safety, Codes, Standards, Micro and Macro shock and their physiological effects. Leakage currents and protection by use of isolation transformers, Equi-potential grounding and earth free monitoring.

Electrical factors in Hospital Design: Electrical power supply systems in a Hospital building. Proper installation and grounding for providing safe patient-electrical environment.

Suggested Reading:

1. John G. Webstar, Medical instrumentation -Application & Design, John Wiley & Sons Inc., 3rd Edition, 2003.

2. R.S. Khandpur, Hand Book of Electronic Instrumentation, Tata McGraw Hill Publishing Company Ltd., 2nd Edition, New Delhi, 2003

3. Joseph J.Carr and John M.Brown, Introduction to Biomedical Equipment Technology, Pearson Education, 2001.

4. L. A. Geddes, Principles of Applied Bio-Medical Instrumentation, John Wiley and Sons, New York, USA, 1975.

EE 454

ADVANCED CONTROL SYSTEMS

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

UNIT I

Review of State-space representation of continuous time systems and their solution, State models for discrete time systems described as difference equations and transfer functions, Transfer function from State model, State-transition matrix and solution of State equations for discrete time systems.

UNIT II

Controllability and Observability: Concepts of Controllability and Observability, Controllability tests for continuous-time, discrete-time, time-invariant systems. Observability tests for continuous-time, discrete-time and time-invariant systems, and Controllability and Observability modes in State. Jordon's canonical form, Controllable and Observable companion forms for single in- put single output systems, Pole placement by State feedback.

UNIT III

Nonlinear systems: Behaviour of non-linear systems, Jump resonance, Sub- I harmonic oscillation, Limit cycles, Common physical non-Linearities, Singular points, Phase plane- method, Construction of phase plane trajectories, Isocline method, Delta method, Computation of time.

UNIT IV

Stability: Lyapunov's stability criteria, Theorems, Direct method of Liapunov for linear systems, Methods of constructing Liapunov function, Krasovski's method, Variable gradient method.

UNIT V

Optimal Control: Formulation of optimal control problem, Calculus of variations, Minimization of functionals. Formulation of variational calculus using Hamiltonian method.

Suggested Reading:

1. Gopal. M., Modern Control System Theory, Wiley Eastern Limited, 2004

2. Schulz D.G., Melsa J.L., State Functions of Linear Control Systems, McGrawHill.

EE 455

OPTIMIZATION METHODS

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

UNIT I

Introduction to classical optimization techniques: Statement of optimization problem, Objective function, Classification of optimization problems.
Classical optimization techniques: Single-variable and Multi-variable optimization without constraints. Multi-variable optimization with equality constraints. Lagrange multiplier method, Multi-variable optimization with inequality constraints, Kuhn- Tucker conditions.

UNIT II

Linear Programming: Standard form, Formulation of the LPP, Solution of simultaneous equations by Pivotal condensation, Graphical method, Simplex

algorithm, Big M method, Two phase Simplex method, Duality principle, Dual Simplex method.

UNIT III

Non-Linear Programming:
One dimensional Search method: Fibonacci method, Golden Section method. Direct Search method: Univariate Search and Pattern Search methods, Powell's method.

UNIT IV

Gradient method: Steepest Descent, Conjugate Gradient and Quasi-Newton method, Fletcher-Reeves method of Conjugate gradients

UNIT V

Dynamic Programming: Multistage design process, Types, Principle of optimality, Computational procedure in Dynamic programming, Examples using Calculus method and Tabular method of solutions

Suggested Reading:

1. S.S.Rao, Engineering Optimization Theory and Applications, New Age International,
3rd Edition, 1998.
2. Jasbir S.Arora, Introduction to Optimum Design, McGraw Hill International Edition,
1989
3. S.D.Sharma, Operational Research, Kedarnath Ramnath & Co., 2004

EE 456

RENEWABLE ENERGY SOURCES

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

UNIT I

Statistics on conventional energy sources and supply in developing countries. Definition, Concepts of NCES, Limitations of RES, Criteria for assessing the potential of NCES, Classification of NCES, Solar, Wind, Geothermal, Biomass, Ocean energy sources, Comparison of these energy sources.

UNIT II

Solar Energy: Definition, Energy available from Sun, Solar radiation data, Solar energy conversion into heat, Flat plate and Concentrating collectors, Principle of

natural and forced convection, Solar Engines: Stirling, Brayton engines, Photovoltiacs: p-n junctions, Solar cells, PV systems, Standalone, Grid connected solar power satellite, Calculation of energy through photovol- taic power generation.

UNIT III

Wind Energy: Energy available from wind, General formula, Lift and drag, , Basis of wind energy conversion, Effect of density, Frequency variances,
Angle of attack, Wind speed, Windmill rotors, Horizontal axis and Vertical axis rotors, Determination of torque coefficient, Induction type generators, and Working principle of wind power plant.

UNIT IV

Nature of Geothermal sources: Definition and classification of resources, Utilization for electricity generation and direct heating, Wellhead power generating units, Basic features: Atmospheric exhaust and condensing, Exhaust types of conventional steam turbines. Pyrolysis of Biomass to produce solid, liquid and gaseous fuels. Biomass gasification, Constructional details of gasifier, Usage of biogas for chullas, various types of chullas for rural energy needs.

UNIT V

Wave, Tidal and OTEC energy, Difference between tidal and wave power generation, Principles of tidal and wave power generation, OTEC power plants, operation of small open-cycle experimental facility, Design of 5 MW OTEC pro-commercial plant. Economics of OTEC, Environmental impacts of OTEC, Status of multiple products OTEC systems.

Suggested Reading:

1. Ashok Desai V, Non-Conventional Energy, Wiley Eastern Ltd, 1990
2. Mittal K.M, Non-Conventional Energy Systems, Wheeler Publishing Go. Ltd, 1997
3. Ramesh R, Kumar K.U, Renewable Energy Technologies, Narosa Publishing House, New Delhi,
1997

EE 460

INSUSTRIAL INSTRUMENTATION

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

UNIT I

Overview of Generation System: Brief survey of methods of power generation: Hydro, thermal, Nuclear, Solar, wind etc. Thermal power plants: Process review, Importance of instrumentation and control, Load dispatching computer. Introduction to Data Acquisition System (D.A.S), distributed Control System (D.C.S) and their system configurations.

UNIT II

Parameters and Measurements: Non-Electrical measurements, Boiler level and pressure compensation, Flow of feed water, Fuel, Air and Steam, Temperature and pressure measurement, Radiation detectors, Smoke density measurements, Process & Instrumentation (PI) diagram ISA symbols, P&I diagram of Boiler.

UNIT III

Control Loops & Interlocks and Annunciation Systems: Combustion control, .Control of main header pressure, Air / fuel ratio control, Furnace draft and excesses control, Drum level (three element control), Steam temperature control, Burner tilting up, Bypass damper super-heater, Spray and gas recirculation controls, Boiler Feed Pump (B.F.P) recirculation control, Hot air and rl~ de-aerator level control, Turbine trip conditions, Pulveriser control.

UNIT IV

Turbine Monitoring and Control: Condenser vacuum control, Gland steam exhaust pressure control, Speed, Vibration, Shell temperature monitoring, Lubricating oil temperature control, Hydrogen generator cooling system.

UNIT V

Analyzer in Power Plants: Thermal conductivity type, Parametric type, Oxygen analyzer, Infra-red type analyzer, Spectrum analyzer, Hydrogen purity meter, Chromatograph, pH meter, Conductivity cell, Flue analyzer, Pollution monitoring and control.

Suggested Reading:

1. E.L.Wakil, M.M, Power Plant Technology, McGraw Hill Book Company, 1984.
2. S.C.Arora & S.Domkundwar, A Course in Power Plant Engineering, Dhanpat Rai &
Sons, 2001
3. Bela G.Liptak, Instrument Engineers Hand Book, 3rd Edition, Gulf Publications, 1995
4. R.S.Khandpur, Analytical Instruments, Tata McGraw Hill, 1989 .

LA 454

INTELLECTUAL PROPERTY RIGHTS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Unit –I

Introduction: Meaning of Intellectual Property- Nature of I.P- Protection of I.P. Rights-kinds of Intellectual Property Rights –International Conventions of Intellectual Property Rights- patent Treaty 1970, GATT 1994, TRIPS & TRIMS – International Organization for Protection of IPR – WTO, WIPRO, UNESCO.

Unit –II

Patents: Meaning of Patent- Commercial Significance – Obtaining of Patent – patentable Subject – matter – rights and obligations of Patentee – specification – Registration of patents – Compulsory licensing and licenses of rights – Revocation.

Unit –III

Industrial Designs: Definitions of Designs – Registration of Designs – Rights and Duties of Proprietor of Design – Piracy of Registered Designs.

Unit –IV

Trade Marks: Meaning of trademark – purpose of protecting trademarks Registered trade mark – procedure – passing off – Assignment and licensing of trade marks – Infringement of trademarks.

Unit – V

Nature, scope of copyright – Subject matter of copy right – Right conferred by copyright- Publication – Broad – casting, telecasting – computer programme – Database right – Assignment – Transmission of copyright – Infringement of copy right.

Suggested Reading:

1. Cornish W.R, "Intellectual Property Patents ", Copyright, Trademarks and Allied Rights, Sweet & Maxwell 1993.
2. P. Narayanan, "Intellectual Property Law ", Eastern law House 2nd Edn. 1997.

3. Robin Jacob & Daniel Alexander, " A Guide Book to Intellectual Property Patents, Trademarks, Copy rights and designs, Sweet and Maxwell, 4th Edn.,1993

CSE 464

REAL TIME CONTROL SYSTEM

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

UNIT -I

Definitions of real time systems, typical real time applications, Hard versus soft real time systems, a reference model of Real- Time systems, commonly used approaches for real time scheduling.

UNIT-II

Concept of computer control: sequence control; feedback loop control; supervisory control; human-machine interface; hierarchical and distributed control.

UNIT -III

Real time system life cycle, structured design approaches including event- based, process-based and graph based theoretical model, Real- Time programming. Ada as a real time programming language.

UNIT -IV

Real time operating systems, overview, time services and scheduling mechanisms, other basic operating system functions, capabilities of commercial real time operating systems.

UNIT- V

Fault tolerance techniques, definitions, fault types, fault detection, fault and error containment, redundancy, integrated failure handling.

Suggested Reading:

1. Jane W.S.Liu, "Real Time Systems", Pearson Education Asia -2001. 2. R. Bennett, "Real- Time

Computer Control", Prentice-Hall, 1994
3. Shem Tov Levi & Ashok K. Agrawala, "Real Time System Design", McGraw Hill Publishing
Company -1990.
4. C.M. Krishna and Kang G.Shin,"Real Time Systems", McGraw Hill Companies Inc., 1997.

EE 460

RELIABILITY ENGINEERING

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

UNIT I

Discrete and Continuous random variables. Probability density function and Cumulative distribution function, Mean and variance. Binomial, Poisson, Normal, Exponential and Weibull distributions.

UNIT II

Failure and causes of failure, Failure rate and failure density, Reliability function and MTTF. Bath-tub curve for different systems. Parametric methods for above distributions, Non -parametric methods from field data.

UNIT III

Reliability block diagram, Series and parallel systems, Network reduction technique, Examples, Evaluation of failure rate, MTTF and reliability, Active and Standby Redundancy, r out of n configuration, Non Series -parallel systems, Tie-set and cut-set methods.

UNIT IV

Availability, MTTR and MTBF, Markov mode-ls and State transition matrices. Reliability models for single component, two component, load sharing and standby systems. Reliability and availability models of two unit parallel sys- tem with repair and standby system with repair. Repairable Systems. Maintainability. Preventive maintenance. Evaluation of reliability and MTTF. Over- haul and replacement. Optimum maintenance policy.

UNIT V

Importance of power system reliability, Outage definitions. Markov model of a generating plant with identical units and un-identical units. Capacity-out- age probability table. Frequency of failures and Cumulative frequency.

Suggested Reading:

1. Charles E. Ebeling, Reliability and Maintainability Engg. McGraw Hill International Edition,1997
2. Balaguruswamy, Reliability Engineering, Tata McGraw Hill Publishing Company Ltd., 1984
3. Endrenyi, Reliability Modeling in Electric Power Systems, John Wiley & Sons, 1978

EE 461

AUTOMATION IN PROCESS CONTROL

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

UNIT I

Data Acquisition and Control: Signals, Interfacing input signals, Digital signal conditioning, Output system with continuous actuators, Data acquisition and control using standard Add-on-cards, Plug-in-cards, Input/Output de- vices.

UNIT II

SCADA: Introduction to Supervisory Control and Data Acquisition (SCADA), Configuration of SCADA system, Remote Terminal units, Typical applications as applied to process control systems.

UNIT III

DCS: Computers-Hierarchical control, DCS basics, Analog control, Direct Digital Control and Distributed Process Control, DCS Hardware configuration, Software configuration. Displays: Group displays, Overview display, Detail displays and Graphic displays. Local Control Units (LCU). DCS advantages over Mainframe Direct Digital Control. DCS P&ID symbols, DCS Integration with PLCs.

UNIT IV

Examples of Experimental Computer Control of Processes: Computer control of liquid level system, Computer control of a heat exchanger, Temperature control for plastic injection moulding processes, On-line optimizing control of a Distillation column.

UNIT V

Smart Sensors and Field bus: Smart sensors, Smart differential pressure transmitter, Smart temperature transmitter, Smart positioner for control valves, Advantages of smart sensors, Field bus systems, HART protocol, Device description language, Topology of Field bus, Industrial Field buses.

Suggested Reading:

1. Krishna Kant, Computer Based Industrial Control, Prentice Hall of India,2001
2. M.Chidambaram, Computer Control of Processes, Narosa Publishing House, New Delhi, 2003
3. Bela G.Liptak, Instrument Engineers Hand Book, 3rd Edition, Gulf Publications, 1995

CS472

NEURAL NETWORKS

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

UNIT -I

INTRODUCTION.
Knowledge- based information processing., A general view of knowledge based algorithm. Neural Information processing. Hybrid Intelligence. Artificial Neuron.

UNIT -II
Basic Neural Computation Models:
Basic concepts of Neural Networks -Network properties, Node properties. sigmoid functions. System dynamics, Inference and learning algorithm. Data representation.
Functional classification models -single layer perceptions.
Multi layer perceptions.

UNIT –III

Learning: Supervised and unsupervised statistical learning. Al learning.
Neural Network Learning -Back.
Propagation algorithm and derivation. Stopping criteria. Complexity of Learning Generalization.

UNIT -IV

Self-organizing Networks:
Introduction, The Kohonen algorithm. Weight initialization, weight training, associative memories, bi-directional associative memories.

UNIT-V

Hopfield Networks:
Introduction. The Hopfield model, Hopfield network algorithm. Boltzman's machine algorithm. Neural Network applications.

Suggested Reading:

1. Limin Fu: Neural Networks in Computer intelligence. Tata McGraw Hill, 2003.
2. Simon Haykin: "Networks Networks -A Comprehensive Foundation", Pearson Education, 2nd Edition, 2001.
3. Bart Kosko: Neural Networks and Fuzzy systems, Prentice Hall of India, 1994.
4. James A. Freeman: Simulating Neural Networks, Addison Wesley Pub, 1995.

CS 460

INTERNET PROGRAMMING

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

Unit-I

Introduction to Internet and Intranet HTTP protocol. TCP/IP -Concepts, addressing routing, web application building blocks, HTML, CGI, Integrating ODBC and CGI.

Unit-II

Java programming -Overview of Java, Data types, Variables, Arrays, Operators, Control structures, Classes, Inheritance, packages and interface.

Unit-III

Java programming -Exception handling, multithreaded programming, I/O, Applets Networking, AWT, AWT Controls.

Unit-IV

Internet Concepts -Cross -Platform client browser setup, corporate information models, structuring company information resources, document management, workflow software, groupware, case studies.

Unit- V

Information servers -DNS, Mail Servers, News Servers, Chat, FTP Servers, proxy servers, security and firewalls, search engines.

Suggested Reading:

1. John Desborough, "Intranet Web Development", New Riders Publ. 1996.
2. Partrik Naughton, Robert Schildt. "The complete reference Java", Tata - McGraw Hill., 1997

ME 460

ROBOTICS

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 marks

UNIT -I

Robots: History and evolution of robots, Laws of robotics, Basic configuration, degree of freedom, work envelope, motion control methods. Application in industry -material handling, loading & unloading processing, welding & painting applications, assembly and inspection, Robot specification requirements.

Unit-II

Rotation matrix. Homogenous transformation matrix. Denavit- Hartenberg convention. Euler angles, RPY representation. Direct and inverse Kinematics for industrial robots for position and orientation Redundancy.

Unit-III

Manipulator Jacobian Joint -End effector velocity -direct and inverse velocity analysis, Trajectory planning, interpolation, cubic polynomial linear segments with parabolic blending, static force and moment transformation, Solvability, Stiffness, Singularities.

Unit-IV

Robot dynamics: Lagrangian formulation, link Inertia tensor and manipulator Inertia tensor, Newton -Euler formulation for RR & RP Manipulators. Control: Individual joint, computed torque.

Unit- V

End effectors, Position and velocity measurement. Sensors: Proximity and range, tactile, force and torque. Drives for robots: Electrical, hydraulic and pneumatic. Robot vision: Introduction to techniques, image acquisition and processing. Introduction to robot programming languages like AL and AML.

Suggested Reading:

1. Spong and Vidyasagar, Robot Dynamics and Control, John Wiley and Sons, 1990
2. R.K. Mittal, I.J. Nagrath, Robotics and Control, Tata McGraw-HiI12003. 3. Groover, Industrial
Robotics, McGraw-Hillo
4. Asada and Slotine, Robot Analysis and Intelligence. Wiley Interscience, 1986.
5. Fu.K.S. Gon Zalez RoC., Lee CoS.G., "Robotics, Control Sensing Vision and Intelligence"
McGraw Hill, into Ed., 1987.

EE 482

PROJECT

Instruction	6 Periods per week
Duration of University Examination	Viva voce
University Examination	Grade*
Sessional	50Marks

Solving a real life problem should be the focus of U.G projects. Faculty members' should propose the projects brief (scope and references) well in advance which should be made available to the students through department library. The project could be classified as Hardware, Software, Modeling, Simulation etc., It should involve one or many elements of techniques such as Analysis, Design and Synthesis. The Department will appoint a Project coordinator who will coordinate the following

- Grouping of students (Max. 3 in group)
- Allotment of Projects and Project Guides
- Project monitoring at regular intervals

All Projects allotment will be completed by the 4^{th} week of the 4the year I semester, so that students get sufficient time for completion of the project.

All Projects will be monitored Atleast twice in a semester through students presentation. Sessional marks should be based on the grading/marks awarded by monitoring committee of faculty members and marks given by the supervisers.

Effort should be made that some of the projects are carried out in industries with the help of industry co-coordinators. Problems can also be invited from the industries to be worked out through UG projects.

Common norms will be established for final documentation of the project report by the respective departments.

*Excellent/Good/Satisfactory/Unsatisfactory

Note: 3 periods of contact load will be assigned to each project guide.

EE 483

SEMINAR

Instruction	3 Periods per week
Sessional	25 Marks

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his/her specialization.

Seminar topics may be chosen by the students with advice from the faculty members. Students are to be exposed to the following aspects of a seminar presentation.

- Literature Survey
- Organization of the material
- Presentation of OHP slides/PC presentation
- Technical writing

Each student is required to:

1. Submit a one page synopsis before the seminar talk for display on the notice board
2. Give a 20 minutes presentation through OHP, PC, Slide projector followed by a 10 minute discussion.
3. Submit a report on the seminar topic with a list of reference and slides used.

Seminars are to be scheduled from the 3rd week to the last week of semester and any change in schedule should be discouraged.

For award of Sessional marks students are to be judged by at least two faculty members on the basis of an oral and written presentation as well as their involvement in the discussions.

EE 485

INSTRUMENTATION ENGINEERING COMPUTER SIMULATION LAB

Instruction per week	3 Periods
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 marks

Simulation experiments should be conducted in the following areas using MATLAB /Simulink
with DSP Tool Box & Control System Tool Box/ PSpice / MiPower /SABER /Labview etc.

1. Verification of Network theorems (i) Thevinin's theorem (ii) superposition theorem (iii)
   Maximum power transfer theorem

2. Transient responses of Series RLC, RL and RC circuits with Sine and Step inputs.

3. Series and Parallel resonance.

4. Bode plot, Root-Locus plot and Nyquist plot.

5. Transfer function analysis (i) Time response for Step input (ii) Frequency response for
   Sinusoidal input.

6. Design of Lag, Lead and Lag-Lead compensators.

7. Design & Simulation of Pressure Monitoring System Using Lab View

8. Simulation of Tank Level Control System Using Lab View

9. Analysis of an ECG Waveform Using Lab View

10. Design of Temperature Monitoring System Using Lab View

11. Simulation of Transmission & Reception of Digital Data Using Lab View

Atleast ten experiments should be completed in the semester.

EE 486

PROCESS INSTRUMENTATION LAB

Instruction per week	4 Periods
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 marks

List of Experiments:

1. Calibration of Current to Voltage and Voltage to Current Converters .

2. Calibration of Current to Pressure and Pressure to Current Converters
3. Calibration of Temperature Control Loop
4. Calibration of Pressure Control Loop
5. Calibration of Flow Control Loop
6. Calibration of Level Control Loop
7. Application of PLC in Process Control
8. Tuning of Control Modes (P, PI, PID)
9. Study of Control Valve Characteristics
10. Calibration of Pressure Gauge by Using Dead Weight Tester
11. Application of Solenoid Valve in Process Control
12. Ratio Control System
13. Study of Interacting & Non-interacting Systems
14. Calibration of Pneumatic Amplifier
15. Hydraulic Logic Controllers -AND, OR, NOR, NAND Gates & Inverters
16. Measurement of Voltage, Temperature, Pressure & Flow Using Hall Effect Sensors.

Atleast ten experiments should be completed in the semester.