SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV - YEAR
(ELECTRONICS & INSTRUMENTATION ENGINEERING)

SEMESTER - I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EE 404	Opto-Electronics Instrumentation	4	-	3	75	25
2.	EE 405	Virtual Instrumentation	4	-	3	75	25
3.	EE 406	Analytical Instrumentation	4	-	3	75	25
4.		ELECTIVE – I	4	-	3	75	25
		PRACTICAL					
1.	EE 435	Instrumentation Simulation Lab	-	3	3	50	25
2.	EE 436	Process Instrumentation Lab	-	3	3	50	25
3.	EE 432	Microprocessors and Microcontrollers Lab	-	3	3	50	25
4.	EE 433	Project Seminar	-	3	3	-	25
		Total	**16**	**12**	**24**	**450**	**200**

Elective – I

EE 415 Automation in Process Control
EE 416 Digital Control System
CS 421 Operating System Concepts
CS 467 Embedded Systems
ME 411 Entrepreneurship
CS 403 Information Security

EE 404

OPTO-ELECTRONICS INSTRUMENTATION

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

UNIT-I

Laser Fundamentals: Mechanisms, Properties of Laser Generation, Optical Feedback, Classification of LASERS: Solid, Liquid, Gas Lasers and their Respective Energy Level Diagrams. Construction of Dye, Nd-YAG, Argon and Carbon dioxide lasers, Characteristics of stabilization, Q-switching and mode locking.

UNIT-II

Laser Instruments: Laser Interferometers, laser strain gauges, Pulse echo technique, Beam modulation telemetry. Laser welding, Laser machining and Laser spectroscopy .Line shape function, lasing threshold, Application of lasers in Engineering and Medicine, Safety with lasers.

UNIT-III

Optical Fiber Fundamentals: Introduction to optical fibers, Fundamentals of Transmission Theory ,Fiber Fabrication and Manufacturing techniques, Fiber Splicing, Connectors and Jointing Technique, Electro-optic, Mechano-optic And Acousto-optic modulation techniques, Losses in Optical fibers.

UNIT-IV

Fiber Optic Instrumentation: Classification And Principle of Fiber optic sensors, Optical Time Domain Reflectometer. Multimode passive and active fiber sensors, phase modulated sensors. Measurement of Current, Voltage, Pressure, Temperature, Displacement, Acceleration, Fluid level using optical fibers.

M.J.C.E.T

UNIT-V

Optoelectronic Devices and Components: Photo diodes, LDRs, PIN diodes, Solar cells, LED's phototransistors, LCD, Plasma Display, Opto-isolators, Photo couplers.

Suggested Reading:

1. Wilson & J.F.B. Hawkes, *Optoelectronics-An Introduction,* Prentice Hall of India. 2nd Edition.
2. Amar K. Ganguly, *Optical & Opto Electronic Instrumentation,* Narosa Publishing House.
3. Shukbir Kumar Sarkar, *Optical fibers And fiber optic Instrumentation,* 2nd Edition, S.Chand & Company.

EE 405

VIRTUAL INSTRUMENTATION

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

UNIT-I

Review of Virtual Instrumentation: Historical perspectives, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT-II

Viprogramming Techniques: VIS and sub-VIS, loops and charts, array, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O.

UNIT-III

Data Acquisition Basics: ADC, DAC, DIO, counters & timers, PC Hardware structures, timing interrupts DMA, software and hardware installation .

UNIT-IV

Common Instrument Interfaces: Current loop, RS232C/RS485, GPIB, System buses, Interface buses, USB, PCMCLA, VXI, SCXI, PXI etc. Networking basics for office & industrial application, VISA and IVI.

UNIT-V

Application of Vi With Analysis Tools: Image acquisition and processing. Motion control. Fourier transforms, power spectrum, correlation methods, windowing & filtering VI applications in various fields

Suggested Reading:

1. Gary Johnson, *Labview Graphical Programming,* Second edition, McGraw Hill, *New York*,1997.
2. Lisa K., Wells & Jeffrey Travis, *Labview for everyone,* Prentice Hall New Jersey .1997.
2. Sokoloff, *Basic concepts of Labview 4,* Prentice Hall, New Jersey, 1998.
3. S. Gupta, J.P. Gupta, *PC interfacing for Data Acquisition & Process Control,* IInd edition, Instrument Society of America, 1994.

M.J.C.E.T

EE 406

ANALYTICAL INSTRUMENTATION

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

UNIT-I

Review of basic components of analytical instrumentation, Calorimeter and Spectrophotometers, Electromagnetic radiation, Beer-Lamberts Law, Absorption instruments, Calorimeters, Spectrophotometers sources of error and calibration.

UNIT-II

Infra-red Spectrophotometers, infra-red Spectroscopy, Basic components, Types of IR Spectrometry, Sample handling techniques, FT-IR Spectroscopy, Calibration, Mass Spectrometers, Basic mass Spectrometer, Types, Components, Resolution and application of Mass Spectroscopy.

UNIT-III

NMR, Principle of NMR Spectroscopy, Different types of NMR Spectrometers, Chromatography, Basics of Gas Chromatography, Methods of measurement of peak areas, Liquid Chromatography, Types of amino acid analyzers.

UNIT-IV

Electro-mechanical instruments, Electro-chemical cell, Types of electrodes, potentiometers, Conductivity meters, Polar-graphs, pH meters, Principle of measurement, Electrodes, Selective, Ion electrode, Chemically sensitive semi conductor devices, Bio-sensors.

UNIT-V

Industrial gas analyzers, Types, Para-magnetic oxygen analyzer, Magnetic wind instrument, Infra-red gas analyzer, Thermal conductivity analyzer, Analyzer based on gas density, Methods based on ionization.

Environmental pollution monitoring instruments: Air pollution monitoring instruments, Co-So_2-No Wet Chemical air analysis, Water pollution monitoring instruments.

Suggested Reading:

1. H.M.Willard, L.L.Meritt, J.A.Dean, *Instrumental Methods of Analysis,* CBS Publishers, Delhi
2. R.S.Khandpur, *Analytical Instruments,* Tata McGraw Hill, 1989.

M.J.C.E.T

EE 415

AUTOMATION IN PROCESS CONTROL

(Elective-I)

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

UNIT-I

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

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, 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, Filed 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 Housem, New Delhi, 2003.
3. Bela.GLiptak, Instr*ument Engineers Handbook,* 3rd edition, Gulf Publications, 1995.

M.J.C.E.T

EE 416

DIGITAL CONTROL SYSTEMS
(Elective - I)

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

UNIT-I

Sampling and Reconstruction: Introduction, Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.

THE Z – TRANSFORMS: Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms

UNIT-II

Z-Plane Analysis of Discrete-Time Control System: Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.

UNIT-III

State Space Analysis: State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations.

Controllability and Observability: Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

UNIT–IV

Stability Analysis: Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stability test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

UNIT–V

Design of Discrete Time Control System By Conventional Methods: Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

State Feedback Controllers and Observers: Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.

Suggested Reading :

1. K. Ogata, *Discrete-Time Control Systems,* Pearson Education/PHI, 2nd edition.
2. Kuo, *Digital Control Systems,* Oxford University Press, 2nd edition, 2003.
3. M.Gopal, *Digital Control and State Variable Methods,* TM.

M.J.C.E.T

CS 421

OPERATING SYSTEM CONCEPTS
(Elective-I)

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

UNIT-I

Introduction to operating Systems: OS structure and strategies, Process concepts, Threads, Inter process communication. CPU scheduling algorithms. Process synchronization, Critical section problem, Semaphores, Monitors.

UNIT-II

Memory management, Swapping, Contiguous allocation, paging, static and dynamic partition demand paging, page replacement algorithms, thrashing, segmentation, segmentation with paging.

File System Interface: File concept, access methods and protection.

File System Implementation: File system structure, allocation methods, directory implementation.

Unit-III

Deadlocks: Necessary conditions, Resource allocation graph, methods for handling deadlocks, prevention, avoidance, detection and recovery.

Protection: Goals, domain of protection, access matrix.

Security: Authentication, threat monitoring, encryption.

Unit-IV

Device Management: Disk Scheduling methods. Disk management. Device drivers and interfaces. CPU- device interactions I/O optimization.

Unit-V

Introduction to Computer Networks: Network Structure, Network Topology, Communication Structure, Communication Protocols, Robustness, Design Issues, An Example: Networking.

Suggested Reading.

1. Abraham Silberschatz, Peter B Galvin. *Operating System Principles,* Addison Wesley, 2006.
2. William Stallings, *Operating Systems: Internals and Design Principles,* 5th edition, PHI, 2005.
3. Andrew S Tanenbaum, *Modern Operating Systems,* PHI, 1996.
4. *Operating System Concepts and Design,* Milan Milankovic 2nd Edition, McGraw Hill 1992.

M.J.C.E.T

CS 467

EMBEDDED SYSTEMS
(Elective-I)

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

UNIT-1

Introduction to embedded systems, Characteristics and quality attributes of embedded systems, Challenges in embedded system design, Application and domain specific embedded systems.

UNIT-II

Embedded System Architecture: Instruction set architecture, CISC and RISC instruction set architecture, basic embedded processor/ microcontroller architecture, CISC examples Motorola(68HC11), RISC example-ARM,DSP processor, Harvard architecture microcontroller example-PIC.

UNIT-III

Embedded Computing Platform: programming for embedded systems using C, Device drivers, Program modeling concepts.

Process of Embedded System Development: Embedded software development on microcontroller platform, Network-based embedded applications and embedded control applications.

UNIT-IV

Operating System for Embedded System: Real time operating systems based embedded system design, Introduction to embedded systems design with micro C/OS-II and Vx works.

Performance Issues of an Embedded System: CPU performance, Analysis and optimization of CPU power consumption, Program execution time, Energy and power, Program size.

UNIT-V

Embedded Systems Development Environment: IDE, cross compilation, Disassembler, Simulators, Emulators and debugging, Target hardware debugging, Boundary scan.

Product enclosure design and development tools, Embedded product development life cycle-different phases and approaches of EDLC. Trends in embedded industry.

Suggested Reading:

1. Shibu K V, *Introduction to Embedded Systems*, Tata McGraw Hill, 2010.
2. Raj Kamal, *Embedded Systems Architecture, Programming & Design*, Tata McGraw Hill, 2010.
3. Dr.K.V.K.K. Prasad, *Embedded/Real time Systems: Concepts, Design and Programming*, Dreamtech Press, (2004).

M.J.C.E.T

ME 411

ENTREPRENEURSHIP

(Elective-I)

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

UNIT-I

Indian Industrial Environment – competence; Opportunities and Challenges, entrepreneurship and Economic growth, Small Scale Industry in India, Objectives, linkages among small, medium and heavy industries,types and forms enterprises.

UNIT-II

Identification and characteristics of Entrepreneurs, Emergence of First generation entrepreneurs, environmental influence and women entrepreneurs. Conception and evaluation of ideas, their sources and decision making, Choice of Technology – Collaborative interaction for Technology development.

UNIT-III

Project formulation, Analysis of market demand, Demand supply gap, Financial and Profitability analysis and Technical analysis. Project financing in India.

UNIT-IV

Project Management during construction phase, project organization, project planning and control using CPM-PERT techniques. Human aspects of project management. Assessment of tax burden.

UNIT-V

Behavioral aspects of entrepreneurs: Personality – determinants, attributes and models, leadership concepts and models. Values and attitudes. Motivation aspects, change behavior.

Time Management: Various approaches of time management, their strengths and weaknesses. The urgency addiction and the time management matrix.

Suggested Reading:

1. Vasant Desai, *Dynamics of Entrepreneurial Development and Management*, Himalaya Publishing House, 1997.
2. Prasanna Chandra, Project – *Planning, Analysis, Selection, Implementation and Review,* Tata Mc Graw Hill Publishing Company Ltd., 1995.
3. B.Badhai, *Entrepreneurship for Engineers*, Dhanpath rai & Co., Delhi, 2001.
4. Stephen R. Covey and A.Roger Merril, *First Things First*, Simon and Schuster, 2002.
5. Robert D. Hisrich and Michael P.Peters, *Entreneurship,* Tata Mc Graw Hill ed.,

M.J.C.E.T

CS 403

INFORMATION SECURITY

(Elective - I)

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

UNIT-I

Introduction: History, critical characteristics of information, NSTISSC security model, Components of an information system, Securing the components, balancing security and access, The SDLC, The security SDLC

Need for Security: Business needs, Threats, Attacks-secure software development

UNIT-II

Legal, Ethical and Professional Issues: Law and ethics in information security, relevant U.S laws-international laws and legal bodies, Ethics and information security

Risk Management: Overview, Risk Identification, risk assessment, Risk Control strategies, selecting a risk control strategy, Quantitative versus qualitative risk control practices, Risk management discussion points, recommended risk control practices

UNIT-III

Planning for Security: Security policy, Standards and practices, Security blue print, Security education, Continuity strategies.

Security Technology: Firewalls and VPNs: Physical design, firewalls, protecting remote connections.

UNIT-IV

Security Technology: Intrusion detection, Access control and other security tools: Intrusion detection and prevention systems, Scanning and analysis tools, Access control devices.

Cryptography: Foundations of cryptology, cipher methods, Crypryptographic Algorithms, Cryptographic tools, Protocols for secure communications, Attacks on cryptosystems

UNIT-V

Implementing Information Security: information security project management, technical topics of implementation , Non- technical aspects of implementation, Security certification and accreditation

Security and Personnel: Positioning and staffing security function, Employment policies and practices, internal control strategies.

Information security Maintenance: Security management models. The maintenance model, Digital forensics

Suggesting Reading:

1. Michael E. Whitman and Hebert J Mattord, *Principles of Information Security,* 4th edition, Ed. Cengage Learning 2011
2. Thomas R Peltier, Justing Peltier, John Blackley, *Information Security. Fundamentals,* Auerbacj Publications 2010
3. Detmar W Straub, Seymor Goodman, Richard L Baskerville, *Information Security. Policy proceses and practices,* PHI 2008
4. Marks Merkow and Jim Breithaupt, *Information Security. Principle and Practices,* Pearson Education, 2007.

M.J.C.E.T

EE 435

INSTRUMENTATION SIMULATION LAB

Instruction	3	Periods per week
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 IRC 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 LabView
10. Design of Temperature Monitoring System Using Lab View
11. Simulation of Transmission & Reception of Digital Data Using LabView

Atleast ten experiments should be completed in the semester.

EE 436

PROCESS INSTRUMENTATION LAB

Instruction	3	Periods per week
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 Converter
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 Value 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

At least ten experiments should be completed in the semester

M.J.C.E.T

EE 432

MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

(Common to EEE and EIE)

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

List of Experiments:

For 8086:

Section 1 : Using MASM/TASM

1. Programs for signed/unsigned multiplication and division.
2. Programs for finding average of N 16-bit numbers.
3. Programs for finding the largest number in an array.
4. Programs for code conversion like BCD numbers to 7-Segment.
5. Programs for compute factorial of a positive integer number

Section 2 : Using 8086 Kit (Interfacing)

1. 8279 – Keyboard Display: Write a small program to display a string of characters.
2. 8255-PPI: Write ALP to generate triangular wave using DAC.
3. 8253- Timer/Counter: Application of different modes.
4. 8251-USART: Write a program in ALP to establish Communication between two processors.
5. Traffic Signal Controller.

For 8051:

Section 3: Using 8051 Kit (Simple Programs)

1 Data Transfer – Block move, Exchange, sorting, Finding largest element in an array.

2 Arithmetic Instructions: Multibyte operations.

3 Boolean & Logical Instructions (Bit manipulations).

4 Programs to generate delay, programs using serial port and on-Chip timer/Counter.

5. Use of JUMP and CALL instructions.

Section 4 : Program Development using 'C' cross compiler for 8051

1. Square Wave Generation using timers.
2. Interfacing of keyboard and 7-segment Display Module.
3. ADC interfacing for temperature monitoring.
4. DAC interfacing for Generation of Sinusoidal wave.
5. Stepper motor control (clockwise, anticlockwise and in precise angles)

List of Equipment:

1. 8086 Kit (with inbuilt assembler/disassembler).
2. MASM/TASM Software.

M.J.C.E.T

EE 433

PROJECT SEMINAR

Instruction	3	Periods per week
Duration of University Examination	3	Hours
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 are to be 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 or PC or Slide projector followed by a 10 minutes discussion.
3. Submit a report on the seminar topic with list of references and slides used.

Seminars are to be scheduled from 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 discussion.

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV - YEAR
(ELECTRONICS & INSTRUMENTATION ENGINEERING)

SEMESTER - II

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EE 452	Electronic Instrumentation Systems	4	-	3	75	25
2.		ELECTIVE-II	4	-	3	75	25
3.		ELECTIVE-III	4	-	3	75	25
4.	ME 472	Industrial Administration & Financial Management	4	-	3	75	25
		PRACTICAL					
1.	EE 481	Digital Signal Processing Lab	-	3	3	50	25
2.	EE 482	Project	-	6	Viva Voce	Gr*	50
3.	EE 483	Seminar	-	3	3	-	25
		Total	**16**	**12**	**18**	**350**	**200**

* ***Excellent / Very Good / Good / Satisfactory / Unsatisfactory***

M.J.C.E.T.