UNIVERISITY OF MUMBAI
SCHEME OF INSTRUCTIONS & EXAMINATION
BE (ELECTRONICS ENGINEERING)

Semester VIII

Sr. No.	Subjects	No. of Periods per Week			Duration of Theory Paper(Hrs)	Marks				
		Lectures	Practicals	Tutorials		Theory Paper	Term Work	Practical	Oral	Total
1.	Power Electronics	4	2	-	3	100	25	-	25	150
2.	Data Communication & Networking	4	2	-	3	100	25	-	25	150
3.	Mechatronics	4	2	-	3	100	25	-	25	150
4.	Elective-II	4	2	-	3	100	25	-	25	150
5.	Project-B	-	8	-	-	-	50	-	50	100
Total		16	16	-	-	400	150	-	150	700

Elective II
Advanced Digital Signal Processing
Biomedical Instrumentation
Embedded Systems and Real Time programming
Robotics
Telecom Network Management
VLSI Design

BE ELECTRONICS ENGINEERING
FOURTH YEAR SEMESTER VIII
SUBJECT : Power Electronics

Lectures : 4 Hrs per week
Practical : 2 Hrs per week

Theory : 100 Marks
Term Work: 25 Marks
Oral : 25 Marks

Rationale : The subject of Power Electronics shall create understanding and strong basic concepts in power devices and their applications in industry.

Detailed Syllabus

Power Devices
Construction, ratings, characteristics:- (including SOA Rating) power transistors, SCR, TRIAC, GTO-SCR, IGBT, MCT.

Drive Circuits
Snubbers, MOVs, di / dt inductor, semiconmductor fuses.

Cooling of semiconductor devices
Basic theory – thermal resistance, simple heat sink calculations.
Types of cooling : (a) natural convection (b) forced air cooling (c) liquid cooling (d) vapour phase cooling.

Half wave and full wave uncontrolled and controlled rectifier circuits
With resistive load and R-L load. Output average and RMS voltages, effect of freewheeling diode.

A.C.phase control circuits
Using BJT, OP- Amps, Special IC's such as TCA 785. Firing scheme for 3 phase supply.

Power inverters
Series, parallel and bridge inverter (single phase) working, important waveforms, control circuits and applications.

ATM and Frame Relay
ATM protocol Architecture, logical connections, ATM cells, Transmission of ATM cells, ATM Adaptation layer, Frame Relay, Frame Relay protocol Architecture.

Local Area Network
LAN Applications, LAN architecture, Bus LANs, Ring LANs, Star LANs, Wireless LAN, LAN Bridges, IEEE 802.3 Medium Access control for 10 Mbps and 100 Mbps LAN, Token Ring and FDDI.

ISDN
Architecture, ISDN channels, user Access, ISDN Protocols, Broadband ISDN

Books

Text Books:
1. William Stallings, Data and computer communication – Pearson Education, sixth edition (Topics 2,3,4,6,7,8).
2. Leon Garcia and Widjaja, Communication Networks, Tata McGraw Hill, second edition (Topics 3,4,5).
3. Forouzan, Data Communication and Networking, Tata McGraw Hill, third edition(Topic 1).

Additional Reading:
1. William A Shay-Understanding Data communications and Networks- Thomson Learning.
2.Andrew Tenenbaum, Computer Networks, Prentice Hall of India

Term Work
1. Term work shall consist of at least eight practicals and two assignments covering the topics of the syllabus.
2. A term work test shall be conducted with a weightage of 10 marks.

Oral Examination
An oral examination is to be conducted based on the above syllabus.

BE ELECTRONICS ENGINEERING
FOURTH YEAR semester VII
SUBJECT : Data Communication and Networking

Lectures :4 Hrs per week — Theory :100 Marks
Practical : 2 Hrs per week — Term Work : 25 Marks
Oral : 25 Marks

Rationale: This subject introduces the fundamental concepts of data network architecture. Starting with the key aspects of transmission, interfacing, link control and multiplexing, it covers the internal mechanisms and network interfaces that have been developed to support data communications over long distance networks and over short distance.

Detailed Syllabus

Introduction:
Network, Protocols and standards, line configuration, topology, transmission modes, categories of networks, internetworks, transmission media, transmission impairments, performance of transmission media, the OSI model, TCP/IP, DTE DCE interface.

Multiplexing
FDM, Synchronous TDM, Statistical TDM, Asymmetric Digital subscriber lines, XDSL.

Data Link Control
Flow control, Error detection-two dimensionalparity checks, internet checksum, CRC. Error control, transmission efficiency of ARQ protocols, HDLC, point to point protocol.

Circuit switching
Circuit switching networks, circuit switches-space division switches, time division switches, time-space-time switches, routing in circuit switching networks, control signaling, SS&.

Packet Switching Networks
Network services and internal network operation, packet networktopology, Datagram and Virtual circuits, Routing in packet networks, shortest path algnorithms- The Bellman-Ford algorithm, dijkstra's algorithm, other routing approaches, congestion control.

ATM and Frame Relay
ATM protocol Architecture, logical connections, ATM cells, Transmission of ATM cells, ATM Adaptation Layer, Frame Relay, Frame Relay protocol Architecture.

Local Area Network
LAN Applications, LAN architecture, LANs, Ring LANs, Star LANs, Wireless LAN, LAN Bridges, IEEE 802.3 Medium Access control for 10 Mbps and 100 MBBS LAN, Token Ring and FDDI.

ISDN
Architecture, ISDN channels, User Access, ISDN Protocols, Broadband ISDN

BOOKS

Text Books:

1. William Stallings, Data and computer communication – Pearson Education, sixth edition (Topics 2, 3, 4, 6, 7, 8).
2. Leon Garcia and Widjaja, Communication Networks, Tata McGraw Hill, second edition (Topics 3,4,5).
3.Forouzan, Data Communication and Networking, Tata McGraw Hill, third edition (Topic1).

Additional Reading :

1. William a shay understanding data communications and networks- Thomson Learning.

2. Andrew Tenebaum, Computer Networks, Prentice Hall of India.

TERM WORK

1. Term work shall consist of at least eight practicals and two assignments covering the topics of the syllabus.

2. A term work test shall be conducted with a weightage of 10 marks.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus.

B.E.ELECTRONICS ENGINEERING
FOURTH YEAR semester VIII
SUBJECT:Mechatronics

DETAILED SYLLABUS

Introduction to Mechatronics

Mechatronics key elements ,Mechatronics design process ,approaches in Mechatronics.

Modeling & simulation in Mechatronics

Simulation & block diagrams ,analogous and impedance diagram ,electrical systems ,mechanical translation system, mechanical rotational system ,electromechanical coupling ,fluid systems.

Sensors and transducers

Introductions to Sensors and transducers sensors for motions and positions ,measurement ,force, torque and tactile sensors ,flow sensors ,temperature sensing devices ,ultrasonic sensors ,range sensors ,active vibration control ,using magneto strictive transducers ,fiber optics devices in Mechatronics.

Actuating devices

Direct current motor ,permanent magnet stepper motor ,fluid power actuation ,fluid power design elements ,piezoelectric ctuators.

Hardware components for Mechatronics

Transducer signal conditioning and devices for data conversation , programmable controllers.

Signal system and controls

Introduction to signals ,systems and controls ,system representation ,linearization of non linear system ,time delays ,measures of system performance .,root locus and bode plots.

Real-time interfacing

Introductions ,elements of data acquisition and control system ,overview of I/O processes ,installation of I/O card ,and software, installation of application software ,examples of interfacing.

Closed loop controllers

Continuous and discrete processes ,control modes ,two step modes , proportional modes ,derivative control ,integral control ,PID controllers ,digital controller ,control system performance ,controller tuning ,velocity control and adaptive control.

Advanced applications in Mechatronics

Sensors for condition monitoring , Mechatronics control in automated manufacturing ,artificial intelligence in Mechatronics ,Fuzzy logic application in Mechatronics ,Microsensors in Mechatronics.

BE ELECTRONICS ENGINEERING
FOURTH YEAR semester VIII

Subject: Elective-II, Advanced Digital Signal Processig

Lectures: 4 Hrs per week

Theory : 100 Marks Term Work: 25 Marks
Oral : 25 Marks

Rationale: This subject provides a comprehensive treatment of signal processing algorithms for modeling discrete time signals, designing optimum filters and estimating the power spectrum of a random process.

Detailed Syllabus
Discrete – Time random processes
Spectral Factorization
Minimum phase signals & systems
Partial energy & Minimum delay property
Spectral factorization theorem
Spectral Estimation by Classical Methods
The periodogram
The modified periodogram
Barlett, Welch & Blackman – Tuckey approach
Signal Modeling
The Least-Squares method
The Pade Approximation
Linear prediction
Levinson Recursion
Schur Algorithm
Lattice realization
Spectral Estimation by Parametric Techniques
Wienear filtering
FIR wiener filters

Books
Text Books
Additional Reading:
1.S.M.Kay, Modem spectral Estimation, Prentice Hall, 1988
2.S.J.Orfanidis, Optimum Signal Processing: An Introduction, second edition, McGraw-Hill, International,1990.

Term work
1. Term work shall consist of at least 10 practicals/assignments covering the topics of the syllabus.
2. A term work test shall be conducted with a weightage of 10 marks.

Oral Examination
An oral examination is to be conducted based on the above syllabus.

BE ELECTRONICS ENGINEERING

Fourth year semester VIII

Subject : Elective –II. Embedded Systems and Real Time Programming

Lectures: 4 Hrs per week Theory : 100 Marks

Practical : 2 Hrs per week Term Work: 25 Marks Oral: 25 Marks

Rationale : Embedded systems have permeated all industries and even our homes. They are a combination of hardware and software and run critical shall provide crucial knowledge required to understand, analyze and design embedded systems and real-time programming.

Detailed Syllabus

Introduction to Embedded systems

Software Embedded into a system.

Processor and Memory Orgaization

Structural Units in a Processor, Selection for an embedded System, Allocation of memory to program segments and Blocks and memory map of a system, direct memory Access, interfacing Processor, memories and I/O Devices.

Devices and Buses for Device Networks

I/O Devices, Timer and Counting Devices, Serial Communication using the I^2C, CAN and Advanced I/O buses between the networked multiple devices using the PCI, PCI-X and Advanced buses.

Device Drivers and Interrupts Servicing Mechanism

Device drivers, parallel port device drivers in a system, serial port device drivers in a system, device drives for internal programmable timing devices, interrupt servicing (Handling) Mechanism, context and the periods of context switching, deadline and interrupt latecy.

Programming Concepts and Embedded Programming I c and C++

Software Programming in Assembly Langauage (ALP) and in High Level language C,C program elements: Header and source files and preprocessor directives, program elements: Macros and Functions, Program Elements: Data Types, Data structures, modifiers, statements, loops and pointers, queues, stacks, lists and ordered lists, embedded programming in C++, C program complier and cross compiler, source code engineering tools for embedded C/C++, optimization of memory needs.

Program modeling concepts for software-Development Process

Modeling processes for software analysis before software implementation, programming models for event controlled or respose time constrained real time programs.

Software Engineering Practices in the Embedded Software Development Process

Software algorithm Complexity, software development process life cycle and its models, software analysis, software design, software implementation, software testing, validating and

debugging, real time programming issues during the software development process, software project management, software maintenance, unified modeling language(UML).

Inter-Process Communication and Synchronization ofprocesses, tasks and threads
Multiple processes in an application, problem of sharing data by multiple tasks and routines, inter process communication.

Real Time Operating Systems
Operating system services, I/O subsystems, network operating systems, real time and embedded system operating systems, interrupt routines in RTOS environment: handling of interrupt source call by the RTOSs, RTOS task scheduling models, interrupt latency and response times of the tasks as performance metrics, performance metrics in scheduling models for periodic, sporadic and aperiodic tasks, IEEE standard POSIX 1003. 1b functions for standardization f RTOS and inter-task communication functions, list of basic actions in a preemptive scheduler and expected times taken at a processor, fifteen-point strategy for synchronization between the processes, ISRs, OS unctions and tasks and for resource management.

Hardware-software Co-design in an embedded system
Embedded system project management, embedded system design and co-design issues in system development process, design cycle in the development phase for an embedded system, uses of target system or its emulator and in circuit emulator(ICE), uses of software tools for development of an embedded system, use of software tools for development of an embedded system, the software build process for embedded systems- preprocessing, compiling cross compiling, linking, locating loading on the target, uses of oscilloscopes and logic analyzers for system hardware tests, issues in embedded system design.

Books
Text books:
1.Rajkamal, Embedded systems-architecture, programming and design, tata Mcgrawhill, first edition, 2003.
2.Sriram lyer and pankaj Gupta, embedded realtime systems programming, tata mcgraw hill, firstedition 2003.

Additional Reading:
1.Qing li and caroline Yao, real-time concepts for Embedded systems, cmpbooks press, first edition, 2003.

Term work
1.Term work should consist of at least eight practicals and assignments covering the topics of the syllabus.
2.A term work test must be conducted with a weightage of 10 marks.

Oral Examination
An oral examination isto be conducted based on the above syllabus.

B.E. ELECTRONICS ENGINEERING FOURTH YEAR semester VIII .

SUBJECT: Elective -II, Robotics

Theory: 100 'Marks Term Work: 25 Marks Oral: 25 Marks

Rationale: This course familiarizes students with the concepts and ,techniques in robot manipulator control, enough to evaluate to choose, and incorporate robots in engineering systems.·

DETAILED SYLLABUS

Robotic Manipulation

Automation and Robots, Classification, Application, Specification, Notations .

Direct Kinematics

Dot and cross products, Co-ordinate frames, Rotations, Homogeneous, Coordinates, Link co-ordination arm equation, (Five-axis robot, Four axis robot, Six axis robot).

Inverse Kinematics'

General properties of solutions tool configuration Fiv~ axis robots, Three-Four axis, Six axis robot (Inverse kinematics).

Workspace analysis and trajectory planning work envelop and examples, workspace fixtures, Pick and place operations, Continuous path motion, In~erp6lated motion, Straight-line motion.

Robot Vision

Image representation, Template matching, Polyhedral objects, Shane analysis, Segmentation (Thresholding, region labeling, Shrink operators, Swell operators, Euler numbers, Perspective transformation, Structured Illumination, Camera calibration).

Task Planning

Task level programming, Uncertainty, Configuration, Space, Gross motion, Planning, Grasp planning, Fine-motion Planning, Simulation of Planer motion, Source and goal scenes, Task planner simulation.

Moments of Inertia.

Principles of NC and CNC Machines.

Text Books:

1. Robert Shilling, Fundamentals of Robotics-Analysis and control, Prentice Hall of India
2 .. Fu, Gonzales and Le~, Robotics, McGraw Hill
3. J.J, Craig, Introduction to Robotics, Pearson Education

Additional Reading:

1. Staughard, Robotics and AI, Prentice Hall of India
2. Grover, Wiess, Nagel, Oderey, "Industrial Robotics", McGraw Hill
3. Walfram Stdder, Robotics and Mechatronics,
4. Niku, Introduction to Robotics, Pearson Education
5. Klafter, Chmielewski, Negin, Robot Engineering, Prentice Hall of India
6. Mittal, Nagrath, Robotics and Control, Tata McGraw Hill publications

-

TERM WORK

1. Term work should consist of at least 10 practicals and assignments covering the topics of the syllabus.
1. A term wo·rk test shall be conducted with a weightage of 10 marks.

ORAL EXAMINATION

An oral examination is to be conducted based on the above syllabus

BE ELECTRONICS ENGINEERING
FOURTH YEAR semester VII
SUBJECT: Elective –II, Telecommunication Network Management

Lectures: 4 Hrs per week
Practical : 2 Hrs per week

Theory : 100 Marks
Term Work: 25 Marks
Oral: 25 Marks

Rationale: Telecommunication systems have grown extremely large in size and complexity. Effective management solutions have been in use to run these complex networks efficiently. This subject introduces principles and practice for effective management of telecommunications networks.

Detailed syllabus
Foundations
Network management standards, network management model, organization model, information model, abstract syntax notation I (ASN.1), encoding structure, macros, functional model.

Network management application functional requirements
Configuration management, fault management, performance management, error correlation technology, security management, accounting management, common management, report management, polity based management, service level management, management service, community definitions, capturing the requirements, simple and formal approaches, semi formal and formal notations.

Telecommunication management network (TMN) architecture
Terminology, functional architecture, information architecture, physical architecture, TNN cube, TMN and OSI.

Common management information service element (CMISE)
CMISE model, service definitions, errors, scooping and filtering features, synchronization, functional units, association services, common management information protocol (CMIP) specification.

Information Modeling for TMN
Rationale for information moeling, management information model, object oriented modeling paradigm, structure of management information, managed object class definition, management information base (MIB).

Simple network management protocol (SNMP)
SNMPV managed networks, SNMP models, organization model, information model, SNMPv2, communication model, functional model, major changes in SNMPv2, structure of management information (SMI), MIB, SNMPv2 protocol, Compatibility with SNMPv1, SNMPV3: architecture, applications, MIB security, remote monitoring (RMON) SMI and MIB, RMON1 and RMON2.

Network management examples:
ATM integrated local management interface, ATM MIB, M1, M2, M3, M4, interfaces, ATM digital exhange interface management , digital subscriber loop (DSL) and Asymmetric DSL (ADSL) technologes, ADSL configuration management, performance management.

Network management Tools: Network statistics management, network management system, management platform case studies: OPENVIEW, ALMAP.

Books
Text Books:
1.Mani Subramanian, network management: Principles and practice, Addison Wesley, pearson education asia publication.
2.Lakshmi Raman, fundamentals of telecommunication network management, IEEE Communication society, prentice hall of India edition, 1999.
3.Airdarous Salah, Plevyak Thomas, Telecommunication Network Management: Technologies and Implementations, prentice Hall of India.
4.Haojin Wang, henry haojin wang, haijiang haojin wang, telecommunication network management.

Additional Reading:
Term work
1.Term work shall consist of at least 10 practicals and two assignments coverning the topics of the syllabus.
2. A term work test shall be conducted with a weightage of 10 marks.

Oral Examination
An oral examination is to be cnducted based on the above syllabus.

BE ELECTRONICS ENGINEERING
FOURTH YEAR semester VIII

SUBJECT : Elective –II, VLSI Design

Lectures : 4 Hrs per week
Practical: 2 hrs per week

Theory : 100 Marks
Term work : 25 Marks
Oral : 25 Marks

Rationale : This subject lays a strong foundation for understanding VLSI circuits and their performance. Design of different CMOS integrated devices is covered in great detail along with testing.

Detailed Syllabus

Circuit Characterization and Performance Estimation
Resistance and capacitance estimation, switching characteristics, CMOS gate transistor sizing, power dissipatin, sizing routing conductors, charge sharing designing margining yield and reliability.

System Specification Using Verilog HDL
Basic concepts, structural gate level modeling, switch level modeling design hierarchies, behavioral and RTL modeling.

Arithmetic Circuit in CMOS VLSI
Bit adder circuits, Ripple carry adders, carry look ahead adders, high speed adders, multipliers.

Design of Memories and Programmable Logic
The static RAM, SRAM, Dynamic RAM, ROM ARRAYS, logic ARRAYS.

System Level Physical Design
Large scale physical design, interconnected delay modeling, crosstalk, interconnected scaling, floor planning & Routing, I/P & O/P Circuit, power dissipation and consumption, low power design considerations.

VLSI clocking and system design
Clocked flipflop, CMOS clock styles, pipelined systems, clock generation and distribution, system design considerations.

CMOS Testing
The need for testing, manufacturing test principles, design strategies for test, clip level test techniques, system level test techniques, layout design for improved testability.

Books

Text Books:

1.Neil H.E. Weste Kamran E.shraghian, principles of CMOS VLSI design: A system perspective, Addison Wesley publication
2.John P.Vyemura, introduction to VLSI circuits and systems, john wiley & sons
3.Samir Palnitkar, verilog HDL, A guide to Digital Design and Synthesis, pearson education.

Additional Reading:

Term Work

1.Term work shall consist of at least 10 practicals and two assignments covering the topics of the syllabus.
2.A term work test shall be conducted with a weightage of 10 marks.

Oral Examination

An Oral examination is to be conducted based on the above syllabus.

BE ELECTRONICS ENGINEERING

FOURTH YEAR semester VIII

SUBJECT : Project - B

Lectures: 4 Hrs. per week — Theory:100 Marks

Practical : 2 Hrs per week — Term work : 25 Marks

Oral : 25 Marks

Rationale: Project allows the student to work independently to put the knowledge of electronics engineering theory into practice.

Detailed Syllabus

In continuation of semester VII work, the student group shall collect all necessary information and analyze it, build/facricate a rototype or develop necessary software and / or hardware or work on a mathematical/empirical model. The group shall test the hardware/software or the mathematical model/empirical developed vigorously by known testing methods.

The student group shall prepare and submit a report on the project shall be prnted on A4 size a paper and hard bound and prepared in academic style. Broadly the report shall have these parts: introduction, literature review, data collection and analysis, experiments conducted, design prototype development/software implemented, mathematical/empirical model and conclusions.

Acquaintance with survey and research methods and their usage in conducting a systematic investigation and style of Report reparation and presentation shall form basis of evaluation.

Term work

Term work shall consist of the above mentioned activities which shall be evaluated and shall carry a weightage of 25 marks.

Oral Examination

An oral examination shall be conducted based on the presentation by the group.