UNIVERSITY OF MUMBAI
SCHEME OF INSTRUCTION AND EVALUATION (R2007)
Programme: B.E. (ELECTRONICS ENGINEERING)

SEMESTER: VII

Sr. No	Subjects	No. of periods of 1Hour		Duration of Theory Paper in Hours	Marks			
		Lecture	Practical		Theory Paper	Term Work	Oral	Total
1	VLSI Design	4	2	3	100	25	25	150
2	Filter Design	4	2	3	100	25	25	150
3	Power Electronics and Drives	4	2	3	100	25	25	150
4	Communication Networks	4	2	3	100	25	25	150
5	**Elective-II** 1. Wireless communication 2. Advances in Biomedical Instrumentation 3. Micro computer system design 4. Digital Image Processing Design	4	2	3	100	25	25	150
6	**Project -I**		4			25	25	50
TOTAL		20	14	15	500	150	150	**800**

SEMESTER: VIII

Sr. No	Subjects	No. of periods of 1Hour		Duration of Theory Paper in Hours	Marks			
		Lecture	Practical		Theory Paper	Term Work	Oral	Total
1	Advance VLSI Design	4	2	3	100	25	25	150
2	Robotics and Automation	4	2	3	100	25	25	150
3	Embedded Systems and Real-Time Programming	4	2	3	100	25	25	150
4	**Elective-III** 1. Advanced Networking Technologies 2. DSP Processors and architectures 3. Neural Networks & Fuzzy Systems 4. Electronics Product Design	4	2	3	100	25	25	150
5	**Project -II**		8	--		50	100	150
TOTAL		16	16	12	400	150	200	**750**

University of Mumbai			
CLASS: B.E. (Electronics Engineering)		**Semester - VIII**	
SUBJECT: Advanced VLSI Design			
Periods per week	**Lecture**	**04**	
	Practical	**02**	
(each of 60 min.)	**Tutorial**	**-**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical examination		
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**150**

Module	Contents	Hours
Objective	**To introduce advance design concepts, develop basic understanding of analog VLSI field and relate to issues occurring at chip level**	**-**
Pre-requisite	**VLSI Design, DSD I and II, BEC**	**-**
1. Wire interconnect for circuit simulation	Interconnect parameters (Capacitance, Resistance and Inductance) their effect on circuit performance. Electrical wire models (ideal, lumped, lumped rc, distributed rc and transmission line), switching characteristics, transistor sizing, sizing routing conductors, charge sharing and reliability issues. (Numericals on each subtopic expected)	07
2. Sequential logic circuits design	Clocked systems (Single phase, Two phase and four phase clocking), recommended clocking approaches – clocked CMOS – Dynamic CMOS circuits – solutions for charge sharing - Implementation of general	09

	VLSI sequential system components such as Flip Flops, static as well as dynamic latches and Registers. Pipelining concepts	
3.Aritmetic Circuits in CMOS VLSI	Dynamic adders, Fast adders, Wide adders: Carry look ahead, Block generate and propagate, carry save, carry skip, carry save	06
4. Design of memories & programmable logic	CMOS Memory structures – SRAM and DRAM design –Sense amplifier design - Low power design techniques. ROM Arrays and Logic Arrays. EPROM, EEPROM, Flash cell working . Design of basic 6T SRAM Cell with read and write stability criteria	08
5. Timing issues & System Level Physical Design	Timing classification, Synchronous timing basics, clock skew, propagation delay estimation, clock jitter, combined clock skew and clock jitter estimation, synchronous and asynchronous design timing estimations. Clock generation and distribution Crosstalk, Interconnect Scaling, Floor planning & Routing, I/P & O/P Circuit, Power dissipation and consumption, Low power Design considerations.	09
6. Introduction to Analog and Mixed signal design	Building blocks for CMOS amplifiers, CMOS operational transconductance amplifiers. Frequency compensation schemes. Design of fully differential amplifiers, common mode feedback circuits, switched capacitor circuits. Design of sample and hold and comparator circuits.	09

Text books

1. John P. Uyemura, *Introduction to VLSI Circuits and systems*, John Wiley & sons.
2. Sung-Mo Kang & Yusuf Leblebici, *CMOS Digital Integrated Circuits - Analysis & Design*, Second Ed., MGH
3. Jan M Rabaey, *Digital Integrated Circuits - A Design Perspective*, Prentice Hall
4. D.Razavi, *Design of Analog CMOS circuits,* McGraw Hill

Additional Reading

1. Neil H.E. Weste, Kamran Eshraghian, *Principles of CMOS VLSI Design: A system perspective*, Addison Wesley publication.
2. Fabricius, Eugene D, *Introduction to VISI Design.* TMH
3. P.R. Gray & R.G. Meyer, *Analysis and design of analog integrated circuits*, John Wiley

Proposed Practical list

Suggested list of experiments using CAD tools such as Magic, Microwind, Tanner tools, Xilinx ISE etc.

1. Simulation of resistance and capacitance estimation
2. Simulation of CMOS amplifiers
3. Layout and Simulation of memory structures
4. Layout and Simulation of flip-flop structures
5. Simulation of fast adder circuits

Term work:

The term work should contain at least 6 CAD programs and assignments covering the whole syllabus, duly recorded and graded.

The distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal) : 15 marks.

Test (at least one) : 10 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Oral Examination:
Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6. No question should be asked from pre-requisite module

University of Mumbai			
CLASS: B.E. (Electronics Engineering)		**Semester – VIII**	
SUBJECT: Robotics and Automation			
Periods per week (Each of 60 min.)	**Lecture**	**4**	
	Practical	**2**	
	Tutorial	**-**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical examination	**-**	**-**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**

	Total		**150**

Module	Contents	Hours
Objective	This course familiarizes students with the concepts and techniques in robot manipulator control and in hardware components for automation like Programmable Logic Controllers and also confident enough to evaluate, choose and incorporate robots and PLC in engineering systems.	-
Pre-requisite	1) Matrix Algebra 2) Fundamentals of Image Processing 3) Fundamentals of Controllers	-
1	**Introduction to Robotics** Automation and Robots, Classification, Application, Specification, Notations.	05 hrs
2	**Direct Kinematics** Dot and cross products, Co-ordinate frames, Rotations, Homogeneous Co-ordinates, Link co-ordinates, Arm equation ((Three axis, Four axis, and Five axis robots)	12 hrs
3	**Inverse Kinematics & Workspace Analysis** General properties of solutions, Tool configuration, Inverse Kinematics of Three axis, Four axis and Five axis robots Workspace analysis of Four axis and Five axis robots, Work envelope, Workspace fixtures.	09 hrs
4	**Trajectory Planning and Task Planning** Trajectory planning, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion. Task level programming, Uncertainty, Configuration space, Gross motion planning, Grasp planning, Fine-motion Planning, Simulation of Planar motion, Source and goal scenes, Task planner simulation.	08 hrs

5	**Robot Vision** Image representation, Template matching, Polyhedral objects, Shape analysis, Segmentation, Iterative processing, Perspective transformation, Structured Illumination.	06 hrs
6	**Programmable Logic Controller** Discrete-State Process Control, Relay Controllers background, hardwired control system definition, Ladder Diagram Elements and examples, Relay Sequencers, advantages of Programmable Logic Controller (PLC),Evolutions of PLCs , Block diagram of PLC system – symbols used – relays and PLC Software Functions, logic functions – OR, AND, Comparator, Counters review, PLC Design, PLC Operation, Programming of PLCs – different methods – ladder STL and CSF, ladder programming of simple system like traffic light controller, conveyers, list of various PLCs available.	08 hrs

Text Books:

1. Robert Shilling, Fundamentals of Robotics-Analysis and control, Prentice Hall of India
2. Fu, Gonzales and Lee, Robotics, McGraw Hill
3. J.J, Craig, Introduction to Robotics, Pearson Education
4. Curtis D. Johnson, Process Control Instrumentation Technology, PHI Publication, Eighth Edition

Reference Books:

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
7. George L Balten Jr., Programmable Controllers , Tata McGraw Hill publications

List of Practicals

These experiments can be performed using

1) Use of Contol-X simulation Control of X-Y Position Table manually and thru Programming.

2) Use of Contol-X simulation Control of Conveyor manually and thru Programming. Programming using sensors and conveyor.

3) Use of Contol-X simulation Program for bottling plant experiment using Conveyer and Pneumatics

4) Use of PLC simulation build a basic circuit using a NORMALLY OPEN INPUT and a NORMAL OUTPUT.

5) Use of P-Simulator design a pneumatic circuit using a double acting cylinder and 5/2 Air Spring Valve to open the main gate of a factory which can be controlled by a security personnel from the security room.

6) Use of H-Simulator design a Hydraulic circuit by using a single acting cylinder to open or close the flush guard door of CNC lathe. The operator can open or close the door at the time of loading or unloading the component.

Term work:

Term work shall consist of minimum six experiments and a written test.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 15 marks.

Test (at least one) : 10 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Oral Examination:
Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Theory Examination:
1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature.
(e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6.No question should be asked from pre-requisite module

University of Mumbai			
CLASS: B.E. (Electronics Engineering)		**Semester – VIII**	
SUBJECT: Embedded Systems and Real-Time Programming			
Periods per week (Each of 60 min.)	**Lecture**	**4**	
	Practical	**2**	
	Tutorial	**-**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical examination	**-**	**-**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**150**

	Detailed Syllabus	Hours
1.	Introduction to Embedded systems, Design Metrics, Examples of embedded systems, hardware/software co-design, Embedded micro controller cores (ARM, RISC, CISC, and SOC), embedded memories, sensors and interfacing techniques, Architecture of Embedded Systems.	04
2.	Introduction to MSP 430 RISC Controllers, parallel I/O, external interrupts. Introduction to ARM 7 instruction set, addressing modes, operating modes with ARM core, ARM7 TDMI modes, ADC, Timers, Interrupt structure. Byte ordering (LE, BE), Thumb mode normal mode instructions changes, Pipeline utilization with all register allocations, Floating to fixed point conversion fundamentals. System design with ARM as key processor. DSP features of ARM Core Digital Signal Controllers -DSC differences with conventional micro controllers	12
3	Serial communications: SCI, SPI, Timing generation and measurements. Analog interfacing and data acquisition. Hardware Interrupts: - Various C ISR Declaration syntaxes - Interrupt Vectors, Priorities and Nesting - Tick Timer Interrupt as heart-beat of embedded system 7-Seg LED, Segment-LCD, Alphanumeric LCD, Graphic LCD displays Communications and Networks - RS485 (2 and3 wire)and Modbus Protocol (Intro only) - Ethernet and TCPIP Stack (Features and Usage only) - CAN features and protocol	08

4	Software Programming in Assembly Language (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 Compiler and Cross-Compiler, Source Code Engineering Tools for Embedded C/C++, Optimization of Memory Needs.	08
5.	Real-time concepts, real-time operating systems, Required RTOS services/capabilities (in contrast with traditional OS). Real-world issues: blocking, unpredictability, interrupts, caching, Benefits of using RTOS - Concepts of Tasks/Threads/Process - Multitasking - Task Scheduling - Task management - Inter-task communication and Synchronization: - Device Drivers - How to choose an RTOS	10
6	Fundamentals of Design and Development, Program Modelling tools Testing and Debugging methodologies Applications of Embedded Systems: case studies - Consumer and Home - Industrial and Automation - Medical - Robotics - Access Control Systems (Smart Cards, RFIDs, FingerScan)	06

Text Books:

1. Rajkamal, Embedded Systems - Architecture, Programming and Design, Tata McGraw Hill, Second edition, 2009
2. Shibu K V , Introduction to Embedded Systems , Tata Mc Graw Hill, 2009
3. Sriram Iyer and Pankaj Gupta, Embedded Realtime Systems Programming, Tata McGraw Hill, first edition, 2003

Additional Reading:

1. Embedded Microcomputer Systems -Jonathan W. Valvano – Thomson
2. An Embedded Software Primer – David E. Simon – Pearson Education
3. Embedded real time system, Dr. K.V.K.Prasad, Dreamtech Press.

Suggested Laboratory Experiments

Minimum Six experiments covering topics in the Syllabus

- Interfacing keyboard, LED, LCD Displays
- Programming should be using Suitable IDE and Embedded C
- Serial Communication

Term work:

Term work shall consist of minimum six experiments, Assignments and a written test.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 15 marks.

Test (at least one) : 10 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Oral Examination:
Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Theory Examination:
1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature.
(e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6.No question should be asked from pre-requisite module

University of Mumbai			
CLASS: B.E. (Electronics Engineering)		**Semester – VIII (Elective)**	
SUBJECT: Advanced Networking Technologies (ELECTIVE)			
Periods per week (Each of 60 min.)	**Lecture**	**4**	
	Practical	**2**	
	Tutorial	**-**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical examination	**-**	**-**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**150**

Objectives:
Objective of this course is to make students familiar with data communication technologies and how to use them to: Design, Implement, Operate, Manage enterprise networks.

Module	Contents	Hours
1	**Networking Fundamentals:** Overview of Internetworking architecture models: The OSI model, TCP/IP protocol Suite, Addressing, IP versions subneting and supernating. Internetworking Protocols and standards, Standards Organizations, Internet Standards, Connectors, Transceivers and Media converters, Network interface cards and PC cards, Repeaters, Hubs, Bridges, Switches, Routers and Gateways etc. Hardware selection.	08
2	**Optical Networking:** SONET/SDH Standards, devices, DWDM, frame format, DWDM, Performance and design considerations.	06
3	**LAN Technologies:** Wireless LANs technology and IEEE 802.11 Standard. **WAN Technologies :** **Frame** FR concept, FR specifications, FR design and VoFR and Performance and design considerations **ATM** The WAN Protocol: Faces of ATM, ATM Protocol operations. (ATM cell and Transmission) ATM Networking basics, Theory of Operations, B-ISDN reference model, PHY layer, ATM Layer (Protocol model), ATM layer and cell, Traffic Descriptor and parameters, Traffic Congestion control defined, AAL Protocol model, Traffic contract and QoS, User Plane overview, Control Plane AAL, Management Plane, Sub S3 ATM,ATM public services. " "	10
4	**Network Design:** Network layer design, access layer design, access network capacity, network topology and Hardware and completing the access network design.	08
5	**Network Security:** Security threats, safeguards and design for network security **Enterprise Network Security:** DMZ, NAT, SNAT, DNAT, Port Forwarding, Proxy, Transparent Proxy, Packet Filtering and Layer 7 Filtering.	08
6	**Network Management and Control**	08

	Documentation, OAM & P, RMON, Designing a network management solution. Monitoring and control of network activity and network project management.	

Text Books:

1. Data Network Design by Darren Spohn, 3e McGraw Hill publications
2. Data Communication and Network Security by Carr and Snyder, McGraw Hill Publications.
3. Communication Networks by Leon-Garcia and Indra Widjaja, 2e, Tata McGraw-Hill Publications.
4. Information Security by Mark Stamp and Deven Shah by Wiley Publications.
5. Behrouz A Forouzan, Data communications and Networking 4th Edition, McGraw-Hill Publication.
6. William Stallings, Data Computer Communications, Pearson Education

Reference Books:

1. Eldad Perahita ,Next Generation wireless LANS, Cambridge Publication
2. Computer Networking by J. F. Kurose and K. W. Ross, Pearson Education
3. Local Area Networks by Gerd Keiser, McGraw-Hill Publication.

Proposed Practical list:

1. Network Monitoring and Traffic Analysis: NMAP and NTOP
2. Remote Login Service: SSH
3. Network Traffic Modeling using Etherape
4. Firewall Design using IPTables

Term work:

Term work shall consist of minimum six experiments, tutorials and a written test.

The distribution of marks for term work shall be as follows,
Laboratory work (Experiments and Journal) : 15 marks.
Test (at least one) : 10 marks.
The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Oral Examination:
Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Theory Examination:
1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature.
(e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any

module other than module 3.)

5. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6. No question should be asked from pre-requisite module

University of Mumbai			
CLASS: B.E. (Electronics Engineering)		**Semester – VIII (Elective)**	
SUBJECT: DSP PROCESSORS AND ARCHITECTURES			
Periods per week	**Lecture**	**4**	
	Practical	**2**	
(each of 60 min.)	**Tutorial**	**-**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical examination		
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**150**

Objective	The DSP algorithms are better implemented on DSP processors having specially tailored architectures. It is therefore essential for a DSP systems designer to understand these processors and apply them in system design.
Pre-requisite	Fundamentals of Discrete time signal processing

Module	Contents	Hours
1	**FUNDAMENTALS OF PROGRAMMABLE DSPs** Multiplier and Multiplier accumulator, Modified Bus Structures and Memory access in P-DSPs, Multiple access memory , Multi-ported memory , VLIW architecture, Pipelining , Special Addressing modes in P-DSPs , On chip Peripherals, Computational accuracy in DSP processor	6
2	**ADSP PROCESSORS** Architecture of ADSP-21XX and ADSP-210XX series of DSP processors	6
3	**TMS320C5X PROCESSOR** Architecture, Assembly language syntax, Addressing modes Assembly language Instructions - Pipeline structure, Operation Block Diagram of DSP starter kit Application Programs for processing real time signals.	8
4	**PROGRAMMABLE DIGITAL SIGNAL PROCESSORS:** Data Addressing modes of TMS320C54XX DSPs,Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program	12

	Control,, On-Chip peripherals, Interrupts ofTMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors	
5	**ADVANCED PROCESSORS** Code Composer studio -Architecture of TMS320C6X - architecture of Motorola DSP563XX – Comparison of the features of DSP family processors.	8
6	**IMPLEMENTATION OF BASIC DSP ALGORITHMS:** An FFT Algorithm for DFT Computation, ,Computation of signal spectrum, FIR Filters, IIR Filters, interpolation Filters, Decimation filters, Adaptive Filters	8

Text- Books:

- B. Venkata Ramani and M. Bhaskar, Digital Signal Processors, Architecture, Programming and TMH, 2004.
- Avtar Singh, S.Srinivasan DSP Implementation using DSP microprocessor with Examples from TMS32C54XX -Thamson 2004
- E.C.Ifeachor and B.W Jervis,Digital Signal Processing A Practical approach, Pearson Publication
- Digital signal processing, Salivahanan. Ganapriya, TMH ,second Edition

Reference Reading:

- DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.
- Digital signal processing-Jonathen Stein John Wiley 2005
- S.K. Mitra, Digital Signal Processing, Tata McGraw-Hill Publication, 2001

.**Suggested list of Experiments /simulations**

1. Numbers representation. Fixed Point Representation (Qx, IQ Format).
2. Effect of sampling rate on waveform generation using DSP processor(Using CCS)
3. DFT computation using DSP processor
4. FIR filter design using MATLAB and find finite word length effect
5. .FIR filter design using DSP processor
6. IIR filter design using MATLAB and find finite word length effect
7. IIR filter design using DSP processor
8. Analysis of speech signal
9. Application Development using CCS. Examples Signals Acquisition, DTMF tone detection techniques and the Goertzel algorithm, A GMSK Modulator Implementation

Term Work: The term work shall consist of at least six assignments and experiments on DSP processors /simulations covering the whole of syllabus, duly recorded and graded.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 15 marks.

Test (at least one) : 10 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Oral Examination:
Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus

Theory Examination:

1. Question paper will be comprise of total 7 questions, each of 20 marks.

2. Only 5 questions need to be solved.

3. Question number 1 will be compulsory and will cover all modules.

4. Remaining questions will be mixed in nature. (e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)

5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

6. No question should be asked from pre-requisite module.

University of Mumbai

CLASS: B.E. (Electronics Engineering)		Semester – VIII(Elective)	
SUBJECT: NEURAL NETWORKS & FUZZY SYSTEMS			
Periods per week (each of 60 min.)	**Lecture**	**3**	
	Practical	**2**	
	Tutorial	**-**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical examination		
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**150**

Objective	This course covers basic concepts of artificial neural networks, fuzzy logic systems and their applications. Its focus will be on the introduction of basic theory, algorithm formulation and ways to apply these techniques to solve real world problems.
Pre-requisite	Knowledge of basic probability and statistics with the . Programming skills in one of the following would be desirable: Matlab,, C, C++ ,Java.

Module	Contents	Hours
1	**Introduction:** Biological neurons, McCulloch and Pitts models *of* neuron, Types of activation function, Network architectures, Knowledge representation Learning process: Error-correction learning, Supervised learning, Unsupervised learning, Learning Rules	08
2	**Single Layer Perception:** Perception convergence theorem, Method steepest descent - least mean square algorithms	08
3	**Multilayer Perception:** Derivation of the back-propagation algorithm, Learning Factors.	06
4	**Radial Basis and Recurrent Neural Networks:** RBF network structure theorem and the reparability of patterns, RBF learning strategies, K-means and LMS algorithms, comparison of RBF and MLP networks, Hopfield networks: energy function, spurious states, error performance	08
5	**Neuro-dynamics :** Attractors, Neurodynamical model, Adaptive Resonance theory , Towards the Self Organizing Feature Map. Brain-state-in- a-box model,	08
6	**Fuzzy logic:** Fuzzy sets, Properties, Operations on fuzzy sets, Fuzzy relation Operations on fuzzy relations, The extension principle, Fuzzy mean Membership functions, Fuzzification and defuzzification methods, Fuzzy controllers	10

Text- Books:

- Simon Haykin, *"Neural Network* a - *Comprehensive Foundation",* Pearson Education
- Dr.S.N.Sivanandam,Mrs S.N. Deepa Introduction to Soft computing tool Wiley Publication
- Satish Kumar Neural Networks:A classroom Approach Tata McGraw-Hill
- Zurada J.M., *"Introduction to Artificial Neural Systems,* Jaico publishers
- Thimothv J. Ross, "Fuzz *V Logic with Engineering Applications",* McGraw
- Ahmad Ibrahim, *"Introduction to Applied Fuzzy Electronics',* PHI
- Rajsekaran S, Vijaylakshmi Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithms, PHI

Reference books

- Hagan, Demuth, Beale, 'Neural Network Design', Thomson Learning
- Christopher M Bishop Neural Networks For Pattern Recognition ,Oxford Publication
- William W Hsieh Machine Learning Methods in the Environmental Sciences Neural Network and Kernels Cambridge Publication
- Dr.S.N.Sivanandam,Dr.S.Sumathi Introduction to Neural Network Using Matlab Tata McGraw-Hill

List of experimental: using C/C++ or Matlab or java

- Single layer perceptron neural network
- Multi layer perceptron neural network
- Back propagation neural network
- Radial basis and recurrent Neural network
- Fuzzification and de fuzzification

Term Work:

The term work shall consist of at least six assignments and experiments using MATLAB Or C/C++ or Java covering the whole of syllabus, duly recorded and graded.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) : 15 marks.

Test (at least one) : 10 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Oral Examination:

Oral will be based on any experiment performed from the list of experiment given in the syllabus and the entire syllabus.

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules.
4. Remaining questions will be from the same module or mixed in nature.
(e.g.- suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
5. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.
6. No question should be asked from pre-requisite module

University of Mumbai			
CLASS: B.E. (Electronics)		**Semester – VIII (Elective)**	
SUBJECT: ELECTRONIC PRODUCT DESIGN			
Periods per week (Each of 60 min.)	**Lecture**	**4**	
	Practical	**2**	
	Tutorial	**-**	
		Hours	**Marks**
Evaluation System	**Theory Examination**	**3**	**100**
	Practical examination	**-**	**-**
	Oral Examination	**-**	**25**
	Term Work	**-**	**25**
	Total		**150**

Module	Contents	Hours
Objective	**To cover product design & development stages and total coverage of product assessment by introducing the basics of reliability and quality of electronic product and then discusses the various modes and causes of failure.**	-
1	**Product Design and development** Introduction, An overview of product development & product assessment, Pilot production batch, Concept of availability, Screening test , Environmental effects on reliability, Redundancy, Failsafe system, Ergonomic & aesthetic design considerations, Packaging & storage Estimating power supply requirement (Power supply sizing), Power supply protection devices Noise consideration of a typical system, Noise in electronic circuit, Measurement of noise Grounding, Shielding and Guarding	12hrs

	Enclosure sizing & supply requirements & materials for enclosure and tests carried out on enclosure Thermal management and its types	
2	**PCB designing** Layout, PCB sizes, Layout – General rules & parameters. Recommendations for decoupling & bypassing. Design rules for digital circuit PCB & analog circuit PCBs Noise generation, Supply & ground conductors Multilayer boards Component assembly & testing of assembled PCB, Bare board testing. Component assembly techniques Automation & computers in PCB design, Computer aided design , Design automation Soldering techniques, Solderability testing Study of packages for discrete devices & ICs, IC reliability issues. Parasitic elements Calculations of parasitic elements in high speed PCB. High speed PCB design and points to be considered for designing the high speed PCBs Mounting in presence of vibration. SMD assemblies Board layout check list. Tests for multilayer PCB Cable	12hrs
3	**Hardware design and testing methods** Logic analyzer, its architecture & operation and Use of logic analyzer Spectrum analyzer Network analyzer, Oscilloscope , DSO trigger modes Examples using MSO Signal integrity issues Use & limitations of different types of analysis Monte Carlo analysis	6hrs

4	**Software design and testing methods** Introduction Phases of software design & Goals of software design Methods of program flow representation Structured program construct Testing & debugging of program Software design Finite state machine Decision to use assembly & / or high level language for software development Assembler Compilers, Compilers design Simulators, CPU Simulators Emulators	6hrs
5	**Product testing** Environmental testing for product. Environmental test chambers & rooms. Tests carried out on the enclosures Electromagnetic compatibility (EMC) with respect to compliance. Electromagnetic compatibility (EMC) testing . Conducted emission test (time domain methods). Radiated emission test Basics on standard used. Instrument specifications	6hrs
6	**Documentation** PCB documentation- Specifying laminate grade, drilling details, PCB finish- Tin, solder, gold, silver plating, hot air leveling, and bare board testing. Understanding advantages and limitations of each Product documentation- bill of materials, Production test specification- a case study for real circuit, Interconnection diagram- A case	6hrs

	study., Front and rear panel diagrams for selected product Manuals- Instruction or operating manual, Service and Maintenance manual, Fault finding tree Software documentation practices- For C programmes, Assembly programmes with particular focus on development of programme by several engineers simultaneously.	

Recommended Books:

Text

1. Electronic Product Design, R.G.Kaduskar, V.B.Baru, Wiley India

Reference

1. Printed Circuit Board design and technology – Walter C Bosshart Tata McGraw –Hill-CEDT
2. Handbook of Printed Circuit manufacturing – Raymond H. Clark (Van Nostrand Reinhold Company, New York)
3. Electronic testing and fault diagnosis –G.C. Loveday (Ah wheeler Publication, India)
4. Electronics Engineers reference book 5th Edition – Edited by F.F. Mazda Butterworths Publication Co., UK)
5. Principles of Reliable Soldering Techniques, Sengupta R., New Age International

Term work:

Term work shall consist of minimum four experiments & 3 tutorials and a written test.

The distribution of marks for term work shall be as follows,

Laboratory work (Experiments and Journal) : 15 marks.

Test (at least one) : 10 marks.

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term-work.

Oral Examination:

Oral will be based on any experiment performed from the list of experiment and the entire syllabus.

Theory Examination:

1. Question paper will comprise of total 7 questions, each of 20 marks.
2. Only 5 questions need to be solved.
3. Questions will be analytical and design oriented.
4. Question number 1 will be compulsory and cover all modules.

5. Remaining questions will be mixed in nature. (e.g. - Suppose Q.2 has part (a) from, module 3 then part (b) will be from any module other than module 3.)
6. In the question paper, weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

B. E. Electronics Engineering **Semester VIII**	
Subject – Project -II	
Project Hour: 8 Hrs/week	Term work: **50 marks** Oral / Practical/ Presentation / Demonstration examination: **100 marks** Total marks= **150 marks**
Note: One faculty will not guide more than 3 projects in a semester. For every group allotted to faculty the load is considered as 2 Hour per group per week, be specified in the time table of faculty.	
Rationale: Project allows the student to work independently to put the knowledge of **Electronics engineering** theory into practice.	
Detailed description	
In continuation to the efforts taken towards building the project in VII semester, during VIII semester, students are expected to complete their project idea and meet the set goals and compile the project report. **FINAL PROJECT REPORT** Your guide will give you specific instructions as to the expected content of your final report. The report should cover the progress that has been made, including results obtained, graphical data, design drawings, and a statement of conclusions and recommendations (if applicable). Details of theory, experimental data, computer programs, purchased materials, sources and suppliers etc., must be included. Your report must be sufficiently complete that a student continuing your project would benefit from your report and would not be required to duplicate any of your work. **PROJECT MARKING SCHEME** A project used to assign marks in three general categories, as explained below. Achievement in each of these areas is critical to a successful project. **Project Goals & Achievements (20%):** Guide will evaluate both the difficulty of the goals and whether the goals were achieved. Although projects will differ, it is always extremely important to set goals at the start of a project and work toward these goals. The project goals should be set in collaboration with the guide and an effort should be made to establish a realistic scope for the project. In some cases, it may become apparent as the project progresses that the original goals need to be adjusted and a modified set of goals must be set. **Final Report Quality & Content (40%):** This is an evaluation of the quality of the final report based on the report format, the clarity of communication and the analytical content. **Student Organization, Creativity & Effort (40%):** This portion of the evaluation reflects the student's performance, with emphasis on effort, organization,	

creativity and initiative.

Project Report Outline

The hard-bound report will contain following details:

- Title
- Certificate
- Acknowledgement (if any)
- Table of Contents
- List of Figures
- Abstract
- Introduction
- Literature Survey
- Mathematical Modeling/ Analysis and Design
- Implementation
- Result and Discussion
- Conclusion and Future Scope
- Reference
- Appendix (optional)

Term work

Term work shall consist of the above mentioned activities which shall be evaluated and shall carry a weightage of 50 marks

Oral Examination

The oral examination shall be conducted on the basis on presentation/ practical / demonstration given by the students and shall carry a weightage of 100 marks

B.E. Electronics Engineering	
VII-Seventh Semester (R2001) -Old	Equivalent VII-Seventh Semester (R2007)-Revised
1. Basics of VLSI	VLSI Design
2. Instrumentation Systems	Electronic Instrumentation Systems (TE, VI sem R-2007)
3. Digital Communication	Digital Communication and Coding Techniques (TE, V sem R-2007)
4. Filter Theory and Applications	Filter Design
5. Elective – I	
Wireless Communication	Wireless communication
Image Processing	Digital Image Processing Design
Microprocessor System Design	Micro computer system design
DSP Architecture	DSP Processors and architectures (VIII – R2007)
Process Control Instrumentation	No Equivalent*

*** Student needs to appear in the same subject of R-2001**

B.E. Electronics Engineering	
VIII-Eighth Semester (R2001) - Old	Equivalent VIII-Eighth Semester (R2007)-Revised
1. Power Electronics	Power Electronics and Drives(VII –R2007)
2. Data Communication & Networking	Communication Networks
3. Mechatronics	No Equivalent*
4. Elective – II	
VLSI Design	Advance VLSI Design
Robotics	Robotics and Automation
Telecom Network Management	No Equivalent*
Embedded System	Embedded Systems and Real-Time Programming
Advance DSP	No Equivalent*
Bio-medical Instrumentation	Advances in Biomedical Instrumentation

*** Student needs to appear in the same subject of R-2001**