SYLLABUS

FOR

M.E.

ELECTRONICS AND TELECOMMUNICATION

[DIGITAL SYSTEMS]

AFFILIATED TO

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF
M.E. ELECTRONICS AND TELECOMMUNICATION
(DIGITAL SYSTEMS)
W.E.F. 2010-2011

The scheme of teaching and examination as per university syllabus applicable to M.E. Electronics and Telecommunication (Digital Systems) will be as follows.

STRUCTURE OF
M.E. ELECTRONICS AND TELECOMMUNICATION
(DIGITAL SYSTEMS)
First Year Term-I

Sr. No.	Course Code	Subject	Teaching Scheme Hours/Week		Examination Scheme				
			L	P	Paper Duration (hours)	Maximum marks			
						Paper	Term work	Practical	Oral
1.	ET5301	Digital Integrated Circuits and Systems	3	-	3	100	-	-	
2.	ET5302	Signal Processing and Applications	3	-	3	100	-	-	
3.	ET5303	Embedded Systems	3	-	3	100	-	-	
4.	ET 5304	Biomedical Engineering Systems	3	-	3	100	-	-	
5.	ET 5305	Elective -I	3	-	3	100	-	-	
6	ET 5306	Laboratory Practice –I	-	6	-	-	100	-	50
7	ET 5307	Seminar-I	-	4	-	-	100	-	-
Total			**15**	**10**	**-**	**500**	**200**		**50**
Grand Total			**25**			**750**			

List of subjects for Elective –I

1.ET 5305 (I)	Image Processing and Computer Vision
2.ET 5305 (II)	Computer Architectures
3.ET 5305 (III)	Artificial Intelligence and Neural Networks

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First Year Term-II

Sr. No.	Course Code	Subject	Teaching Scheme Hours/Week		Examination Scheme				
			L	P	Paper Duration (hours)	Maximum marks			
						Paper	Term work	Practical	Oral
1.	ET5308	Computer Networks	3	-	3	100			
2.	ET5309	Digital Communication Systems	3	-	3	100	-	-	-
3.	ET5310	Digital System Design	3	-	3	100	-	-	-
4.	ET5311	Operating System	3	-	3	100	-	-	-
5.	ET5312	Elective -II	3	-	3	100	-	-	-
6.	ET5313	Laboratory Practice -II	-	6	-	-	100	-	50
7.	ET5314	Seminar-II	-	4	-	-	100	-	-
Total			**15**	**10**	**-**	**500**	**200**		**50**
Grand total			**25**		**-**	**750**			

List of subjects for Elective –II

1.	ET5312 (I)	Biomedical Signal Processing
2.	ET5312 (II)	Pattern Recognition and Classification
3.	ET5312 (III)	Nanotechnology

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Second Year Term-I

Sr. No.	Course Code	Subject	Teaching Scheme Hours/Week		Examination Scheme				
			L	P	Paper Duration (hours)	Maximum marks			
						Paper	Term work	Practical	Oral
1.	ET5315	Seminar –III	-	04	-	-	50	-	50
2.	ET5316	Project stage -I	-	18	-	-	100	-	-
Total			**-**	**22**	**-**	**-**	**150**	**-**	**50**
Grand total			**22**		**200**				

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Second Year Term-II

Sr. No.	Course Code	Subject	Teaching Scheme Hours/week		Examination Scheme				
			L	P	Paper Duration (hours)	Maximum marks			
						Paper	Term work	Practical	Oral
1.	ET5308	Project Seminar	-	-	-	-	50	-	-
2.	ET5309	Project stage -II	-	18	-	-	150	-	100
Total			**-**	**18**	**-**	**-**	**200**	**-**	**100**
Grand total			**18**		**300**				

Grand Total: 2000

M.E. ELECTRONICS AND TELECOMMUNICATION
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First Year Term-I

Subject: Laboratory Practice-I

Practical: 6 Hrs. per week	**Term work:** 100 Marks **Oral:** 50 Marks

Detailed Syllabus

Experiments/ Assignments based on

1. Digital Integrated Circuits and Systems
2. Signal Processing and Applications
3. Embedded Systems
4. Biomedical Signal Processing
5. Elective -I

Note: The concerned subject incharge in consultation with head of department should frame minimum of five laboratory assignments, one from each subject.

Subject- Seminar-I

Practical: 4 Hrs. per week	**Term work:** 100 Marks

Detailed syllabus

Seminar on related state of art topic of students of own choice approved by the department.

Term work

Seminar at the end of first year term-I in full time ME Electronics and Telecommunication (Digital Systems) course shall be the term work submitted by the candidate in the form of a technical essay or a report or analysis and / or design on any current topic in the field of Electronics or in the allied field. The candidates will deliver a talk on that topic and assessment will be made on the basis of term work.

The Term work and presentation will be evaluated by departmental committee consisting of two faculty members of the department appointed by Principal as per the recommendation of the head of the department.

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First Year Term-II

Subject: Laboratory Practice-II

Practical: 6 Hrs. per week	**Term work:** 100 Marks **Oral:** 50 Marks

Detailed Syllabus

Experiments/ Assignments based on

1. Computer Networks
2. Digital Communication Systems
3. Digital System Design
4. Operating System
5. Elective-II

Note: The concerned subject incharge in consultation with head of department should frame minimum of five laboratory assignments, one from each subject.

Subject- Seminar-II

Practical: 4 Hrs. per week	**Term work:** 100 Marks

Detailed syllabus

Seminar on related state of art topic of students of own choice approved by the department.

Term work

Seminar at the end of first year term II in full time ME Electronics and Telecommunication (Digital Systems) course shall be the term work submitted by the candidate in the form of a technical essay or a report or analysis and / or design on any current topic in the field of Electronics or in the allied field. The candidates will deliver a talk on that topic and assessment will be made on the basis of term work.

The Term work and presentation will be evaluated by departmental committee consisting of two faculty members of the department appointed by Principal as per the recommendation of the head of the department.

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Second Year Term-I

Subject -Seminar –III

Practical: 6 Hrs. per week	**Term work:** 100 Marks **Oral:** 50 Marks

Detailed syllabus

Seminar on special topic. The topic should be on any of the area not included in the regular curriculum.
The report should include detailed study of specific concept (i.e. analysis, design and implementation).
This can be a theoretical study or practical implementation approved by the guide and department.

Term work

1. Seminar III should be conducted at the end of second year term-I
2. The term-work of the Seminar-III will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the head of the department.
3. The Seminar-III presentation will be evaluated by the examiners appointed by university, one of which should be guide.
4. Student must submit the seminar report in the form of soft bound copy.
5. The marks of seminar-III should be submitted at the end of the second year term-I to the university.

Subject: Project Stage-I

Practical: 18 Hrs per week	**Term work:** 100 Marks

Detailed syllabus

Project stage-I It is the integral part of the dissertation project. The project should be based on the knowledge acquired by the student during the course work and should contribute to the needs of the society. The project aims to provide an opportunity of designing and building, complete system or subsystem in an area where the student like to acquire specialized skills. Project will consist of a system development in Software/ Hardware. The student should present the progress report of the project. It will consist of problem statement, literature survey; project overview and scheme of implementation.

Term work

The term-work of the project stage-I will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by the Director/Principal of the college as per the recommendation of the head of the department.

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Subject- Project Seminar

	Term work: 50 Marks

1. The Project Seminar should be conducted at the middle of Second Year Term-II
2. The Project Seminar term-work will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the Head of the Department.
3. Student must submit the Project Seminar report in the form of soft bound copy.
4. The marks of seminar-III should be submitted at the end of the Second Year Term-I to the University.

Subject- Project Stage-II

Practical: 18 Hrs per week	**Term work:** 150 Marks **Oral:** 100 Marks

Detailed syllabus

This is continuation of Project Stage-I. The complete system development in software / Hardware carried out using Electronics and Telecommunication Engineering principles and practices is expected. It should be working system either software or hardware or combination of both.

He/ She has to present / publish at least one paper in reputed National / International Journal/ Conference on his/ her project work before submission of his / her Thesis/ Dissertation.

Term work

1. The term-work of the Project Stage-II will be evaluated by departmental committee consisting of guide and two faculty members of the department appointed by Director / Principal of the college as per the recommendation of the Head of the Department.

2. The Project Stage-II oral will be evaluated by the examiners appointed by University, one of which should be guide.

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Term – I

DIGITAL INTEGRATED CIRCUITS AND SYSTEMS

Teaching scheme
Lectures: 3 Hrs. per week

Examination scheme
Theory Paper: 100 Marks (3 Hours)

1.Digital design fundamentals: General implementation procedures, aspects of wired logic and bus oriented structure, linear control system, higher order digital control systems, basic architectural distinction between sequential circuits, Moore Mealy machines, state diagrams, approach to the design of synchronous sequential finite state machines, hazards-transients, static and dynamic hazards, essential hazards, critical, non critical races.

2. VHDL design flow: A simple combinational and sequential logic designs using HDL, common errors, partitioning mechanisms, composite data types, basic input/output operations.

3. Simulation: Necessity of simulation, basic design issues of simulators, synthesis tools, net list and its analysis, constraints, optimization techniques.

4. Fault models, testing and verifications: CMOS, transmission time, propagation delay, power consumption, realization of boolean functions using CMOS gates and CMOS processing.

References

1. W.I. Fletcher, "An Engineering Approach to Digital Design". EEE Prentice Hall of India
2. D.L.Perry, "VHDL" Tata McGraw Hill Publications.
3. S. Brown and Z. Vranesic, "Fundamentals of Digital Logic with VHDL Design", Tata McGraw Hill 2002.
4. K. Martin "Digital Integrated Circuit Design" Oxford Press 2000
5. Pucknell and Kamran "Basic VLSI Design" EEE Prentice Hall of India 3rd Edition
6. Allen and Holberg "CMOS Analog Circuit Design". Oxford Pub. (2nd Edn.)

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Term – I

SIGNAL PROCESSING AND APPLICATIONS

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1. Overview of DSP: FIR filters, IIR filters, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation.
2. Linear prediction and optimum linear filters: Stationary random process, forward- backward filters, linear prediction, solution of normal equation.
3. Multirate DSP: Sampling rate conversion, poly phase filters multistage decimator and interpolator.
4. **Quadrature mirror filter, digital filter banks:** Adaptive filters and spectral estimation. Minimum mean square criterion, LMS algorithm, recursive least square algorithm, DFT in spectral estimation.
5. Applications of DSP and multirate DSP: Voice processing, sub band coding of speech signals, sampling, A/D and D/A conversion, dual tone multi frequency and other applications.

References

1. J.G.Proakis and D.G.Manolakis, "Digital signal processing: Principles, algorithm and applications", Macmillan publication.
2. E.C.Ifechor and BW.Jervis, "Digital signal processing: A practical approach", Pearson education.
3. S.K.Mitra, "Digital signal processing", Tata McGraw Hill.
4. A.V.Oppenheim, R.W.Schafer, 'Discrete Time Signal Processing' John Wiley.
5. J.R. Johnson, ' Introduction to Digital Signal Processing Prentice Hall 1992
6. D.J.Defatta and J.G.Dulas. Hodgekiss, 'Digital Signal Processing' J. Wiley and Sons Singapore, 1988
7. L.R.Rabiner and B. Gold - 'Theory and Applications of Digital Signal Processing', Prentice Hall, 1992

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Term – I

EMBEDDED SYSTEMS

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1.Embedded systems: Introduction ,definitions ,design steps, processor technology, IC technology, design technology, design productivity gap, custom single purpose processor design, RT level design, FSMD, data paths, optimization, instruction set simulators for simple processors, state machine and concurrent process models, HCFSM, PSM, interupts device drivers.

2. Architectural features of ARM: Processor modes register organization, exceptions and its handling, memory, memory-mapped I/Os, ARM and THUMB instruction sets, addressing modes, DSP extensions, ARM sample codes.

3.ARM7/9 core: H/W architecture, timing diagrams for memory access, co-processor interface, debug support, scan chains, embedded real time ICE, hardware and software breakpoints **b**uses, AMBA, ASB, APB, case study of Intel XSCALE architecture or samsung ARM implementations, development tool like compilers, debuggers, IDE etc.

4. Real-time operating systems: Introduction, structures, features, multitasking operating systems, scheduler algorithms, priority inversion, commercial operating systems. Embedded software development tools, debugging techniques.

5.CaseStudy:Micro-cosii / Linux: Resource management**,** CPU, memory, device, IO, Information management.

References

1. A. N. Sloss, Symes and D. W. Chris, "ARM System Developer's Guide: Designing and Optimizing", Morgan Kaufman Publication.
2. B. Venkataramani and M. Bhaskar, "Digital Signal Processors", Tata McGrawHill
3. S.Furber, " ARM System-on-Chip Architecture", Pearson Education
4. F. Vahid and T.Givargis, "Embedded System Design", Wiley
5. Technical references on www.arm.com
6. Raj Kamal, "Embedded System Design", Tata McGrawHill
7. Technical reference manuals from Texas Instruments
8. S. Heath, " Embedded System Design"2nd edition ,ESPN series for design Engineers

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Term – I

BIOMEDICAL ENGINEERING SYSTEMS

Teaching scheme	Examination scheme
Lectures: 3 Hrs. / Week	Theory Paper: 100 Marks (3 Hours)

1.Introduction to biomedical signals: Nature of biomedical signals, examples of biomedical signals–EMG,ECG, EEG, ERPs,PCG,VMG, VAG, objectives of biomedical signal analysis, difficulties in biomedical signal analysis, concurrent, coupled, and correlated processes, illustration of the problem with case-studies. filtering for removal of artifacts- illustration of the, problem with case-studies,
2.Filters and applications: Time-domain filters, frequency-domain filters, optimal filtering, wiener filter, adaptive filters for removal of interference, selecting an appropriate filter, application: removal of artifacts in the ECG, event detection, detection of events and waves, correlation analysis of EEG channels, cross-spectral techniques.The matched filter, detection of the P wave, homomorphic filtering, application- ECG rhythm analysis, identification of heart sounds, wave shape and waveform complexity, analysis of event-related potentials, morphological analysis of ECG waves, envelope extraction and analysis of activity, application- normal and ectopic ECG beats, analysis of exercise ECG. Frequency-domain characterization The fourier spectrum, estimation of the power spectral density function, measures derived forms PSDs.
3. Modeling biomedical systems: Point Processes Parametric System, Modeling Autoregressive of All pole Modeling, Pole-Zero Modeling, Electromechanical Models of Signal Generation, Application-Heart-rate Variability, Spectral Modeling and Analysis of PCG.
4.Analysis of nonstationary signals: Time-variant systems, fixed segmentation, adaptive segmentation, use of adaptive filters for segmentation, application-adaptive segmentation of EEG signals, adaptive segmentation of PCG signals. pattern classification and diagnostic decision , pattern classification, supervised pattern classification, unsupervised pattern classification, probabilistic models and statistical decision , logistic regression analysis ,the training and test steps, neural networks, measures of diagnostic accuracy and cost, reliability of classifier and decisions

References

1. R. M. Rangayyan "Biomedical Signal Analysis- A case study approach", Wiley publications.
2. E. N. Bruce, "Biomedical Signal Processing and Signal Modeling", Wiley publications.

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Term – I

ELECTIVE-I

IMAGE PROCESSING AND COMPUTER VISION

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1. Image perception: Monochrome and color vision models, image sampling and quantization, two dimensional orthogonal transforms: FT, FFT, WHT, Haar transform, KLT, DCT.
2. Image enhancement: Filters in spatial and frequency domains, histogram-based processing, homomorphic filtering, image restorations-convolution, restoration using inverse filtering and Wiener filtering, maximum entropy-based methods.
3. Color image processing: Color models, color transformation, smoothing, sharpening, color segmentation**,** morphological image processing, dilation and erosion, basic morphological algorithms.
4. Image segmentation: Point, line and edge detection, edge linking and boundary detection, thresholding, region based segmentation.
5. Image attributes representation: Description - boundary descriptors, regional descriptors, object recognition patterns and pattern classes, recognition based on decision, theoretic and structural methods.

References

1. R.C.Gonzalez and R.E.Woods, "Digital Image Processing", Pearson Education.
2.R.E.Woods and S.L.Eddins, "Digital Image Processing using Mat lab", Pearson Education.
3. M. Sonka, V. Hlavac,R. Bole, "Image Processing , Analysis and Machine Vision",
4.W.K.Pratt "Digital Image Processing", John Wiley and Sons

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Term – I

ELECTIVE-I

COMPUTER ARCHITECTURES

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1.Overview of parallel processing and pipelining processing: Architectural classification, applications of parallel processing, instruction level parallelism and thread level parallelism, explicitly parallel instruction computing (EPIC) architecture, case study of Intel Itanium Processor (IA64), performance analysis.

2.Pipeline architecture : Principles and implementation of pipelining, classification of pipelining processors, general pipelining reservation table, design aspect of arithmetic and instruction pipelining, pipelining hazards and resolving techniques, data buffering techniques, job sequencing and collision, advanced pipelining techniques, loop unrolling techniques, out of order execution, software scheduling, trace scheduling, predicated execution, speculative loading, register stack engine, software pipelining, VLIW (Very Long Instruction Word) processor, Case study: superscalar architecture- Pentium, Ultra SPARC

3.Vector and array processor: Basic vector architecture, issues in vector processing, vector performance modeling, vectorizers and optimizers, Case study: cray architecture SIMD computer oganization masking and data network mechanism, Inter PE Communication, interconnection networks of SIMD, static Vs dynamic network, cube hyper cube and mesh interconnection network.

4. Parallel algorithms for array processors: Matrix multiplication. sorting, FFT multiprocessor architecture loosely and tightly coupled multiprocessors, processor characteristics of multiprocessors, inter processor communication network, time shared bus, crossbar switch, multiport memory model, memory contention and arbitration techniques, cache coherency and bus snooping, massively parallel processors (MPP), COW's and NOW's Cluster and Network of Work Stations), chip multiprocessing (CMP), case study of IBM Power4 Processor, inter processor communication and synchronization.

5.Multithreaded architecture : Multithreaded processors, latency hiding techniques, principles of multithreading, issues and solutions, parallel programming techniques: message passing program development, synchronous and asynchronous message passing, message passing parallel programming, shared memory programming, data parallel programming, parallel software issues.

References

1.K.I. Hwang, F. A. Briggs, “Computer Architecture and Parallel Processing” McGraw-Hill international Edition

2.K. Hwang, “Advanced Computer Architecture”, Tata McGraw-Hill Edition

3.V.Rajaraman, L Sivaram Murthy, “Parallel Computers”, Prentice Hall

4.W. Stallings, “Computer Organization and Architecture, Designing for Performance” Prentice Hall, Sixth edition

5. K. Hwang, “Scalable Parallel Computing” McGraw-. Hill

6.H. Stone, “ High performance computer Architecture” Prentice Hall of India

7.R.Y. Kain , “Advanced Computer Architecture” Hardcover

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Term – I
ELECTIVE-I

ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1.Introduction: Artificial intelligence introduction- foundation of A.I., history , intelligent agents, agent architecture, A.I. application(E Commerce and Medicine), A.I. representation, properties of internal representation futures of A.I. production system and issue in design of search programs. Logic programming: introduction to logic, logic programming, forward and backward reasoning, forward and backward chaining rules.

2.Heuristic search techniques: Heuristic search, hill climbing, best first search, mean and end analysis, constraint satisfaction, A* and AO* Algorithm.
game playing- Minmax search procedure, alpha beta cutoffs, waiting for quiescence, secondary search. Knowledge representation, basic of knowledge representation paradigrams, prepositional logic, inference Rules in Prepositional Logic, Knowledge representation using Predicate logic: predicate calculus, predicate and arguments, ISA hierarchy frame notation, resolution, natural dedication.

3.Knowledge representation using non monotonic logic: TMS(Truth Maintenance system), statistical and probabilistic reasoning ,fuzzy logic, structure knowledge representation ,semantic net ,frames, script, conceptual dependency learningand planning: learning types of learning (Rote, Direct instruction Analogy, Induction, Deduction)planning- block world, strips, implementation using goal stack, nonlinear planning with goal stacks, hierarchical planning, least commitment strategy.

4. Advance AI Topics: Natural language processing, introduction, steps in NLP, syntactic processing, ATN, RTN, semantic analysis, discourse and pragmatic processing, perception: perception, action, robot architecture introduction to neural networks and perception –qualitative analysis. neural net architecture and applications.

5. Expert system: Utilization and functionality, architecture of expert system, knowledge representation, two case studies on expert systems.

References

1.E. Rich , K. Knight: "Artificial Intelligence" McGraw-Hill
2. E. Charniak, D. Mcdermott: "Introduction to Artificial Intelligence". Pearson
3. K. Mehrotra , S. Rawika , K.Mohan : "Artificial Neural Network". Prentice Hall
4. H. A. Simon, "The Sciences of the Artificial", MITPRESS, 3rd Edition (2nd Printing), 1995.
5.I. Bratko: "Prolog Programming For Artificial Intelligence", 2nd Edition Addison Wesley ,1990
6.S.Russell and P. Nerving:" Artificial Intelligence : A Modern Approach", Prentice Hall ,2nd Edition

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Term – II

COMPUTER NETWORKS

Teaching scheme	Examination scheme
Lectures: 3 Hrs. / Week	Theory Paper: 100 Marks (3 Hours)

1. Network design issues: Data in support of network design, network design tools, protocols and architecture. VOIP system architecture, protocol hierarchy, structure of a voice endpoint, protocols for the transport of voice media over IP networks. providing IP quality of service for voice, signaling protocols for VOIP, PSTN gateways, VOIP applications. Introduction, challenges, SCSI protocols and architecture: RAID, Backup and mirroring, fiber channel attached storage. network attached storage including NFS, CIFS and DAFS, management of network storage architectures. New storage protocols, architectures and enabling technologies.

2. **Introduction to CDMA and spread spectrum system**: CDMA standards, system architectures of wireless communication systems, physical, network and data link layer of CDMA, wireless LAN standards: IEEE 802.11b, ARPA. overview of information theory. lossless compression, run-length encoding, facsimile compression, string-matching algorithms. lossy compression: DCT, wavelet compression.

3.**Internate security :**A model for internet security, security attacks, services, internet standards and RFCs, cryptography, conventional encryption, principles and algorithms, cipher-block, modes of operation, location of encryption devices , key distribution ,Public key cryptography principles and algorithms, RSA algorithm.

4.Packet switched networks and ISDN:OSI and IP models, ethernet (IEEE 802.3), Token ring (IEEE 802.5), Wireless LAN,(IEEE 802.11) FDDI, DQDB, SMDS: Internetworking with SMDS**,**ISDN - overview, interfaces and functions, layers and services - signaling system 7 -broadband ISDN architecture and protocols, ATM and frame relay ,

5.Advanced network architectures: IP forwarding architectures overlay model, multi protocol label switching (MPLS),integrated services in the internet, resource reservation protocol (RSVP),differentiated services

References

1. A. Kershenbaum, “Telecommunications Network Design Algorithms”, Tata McGraw Hill.
2. R. Ramaswami, K.Shivrajan, “Optical Networks”, Morgan Kaufmann.
3. B. Douskalis, “IP Telephony: The Integration of Robust VoIP Services”, Pearson Ed. Asia.

4. J .Warland, P.Varaiya, “High-Performance Communication Networks”, Morgan Kaufmann, 1996.
5. W.Stallings, “High-Speed Networks: TCP/IP and ATM Design Principles”, Prentice Hall, 1998.
6. V.Garg ,K. Smolk, J.Vilkes,”Applications of CDMA in wire less Communication”.
7. W. Stalling: Network security, essentials- Pearson education Asia publication.
8. W.Stallings,”ISDN and Broadband ISDN with Frame Relay and ATM”, 4th Edition, Pearson education Asia, 2002.
9. L. Gracia, Widjaja, “Communication Networks ", Tata McGraw-Hill, New Delhi, 2000.
10. S. Kasera, P. Sethi, “ATM Networks ", Tata McGraw-Hill, New Delhi, 2000.
11. R. Handel, M. N.Huber, Stefan Schroder ,”ATM Networks”,3rd Edition, Pearson education Asia, 2002.
12. J. Walrand and P. Varaiya ,”High Performance Communication Networks”, 2nd Edition, Harcourt and Morgan Kauffman,London,2000.
13. W.Stallings,”High-speed Networks and Internets”, 2nd Edition, Pearson Education Asia, 2003.

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Term – II

DIGITAL COMMUNICATION SYSTEMS

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1.Overview of digital modulation techniques: BPSK,DPSK,QPSK,M-Ary PSK, QASK

2.Information source coding for discrete sources: Mathematical models for information, a logarithmic measure of information: average and mutual information, entropy, coding for discrete sources-coding for discrete memory-less sources, discrete stationary sources, shanon-fano and huffman algorithms, arithmetic coding, transform based lossy coding, DCT, quantization

3.JPEG and MPEG standard : JPEG standard and its modes, color image coding, B/W and color television standards, video compression, motion estimation and compensation, block matching algorithms and criteria, MPEG standard-1, 2, 4, audio coding, psychoacoustic models, ADPCM , MPEG-Audio, dolby audio.

4. Channel coding and codes : Channel coding channel models, channel capacity, linear block codes, error correction and detection capability, usefulness of the standard array, cyclic codes, block codes examples such as hamming codes convolution codes, convolutional encoding and decoding algorithms such as Viterbi, sequential and feedback, RS codes and turbo codes

References

1.K.Bhaskaran, “Image and Video Compression standards and Algorithms”, Kluwer Academic press
2.S.Bernard Sklar, “Digital Communication: Fundamentals and Applications”, Pearson Education Asia.
3. S. Haykins, “Digital Communication”, edition II, Wiley.
4.B.P.Lathi, “Modern Digital and Analog Communication Systems”, edition III, Oxford press
5.R.R.Gulati, “Television Engineering”, Prentice Hall of India

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Term – II

DIGITAL SYSTEMS DESIGN

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1.Designing of various units of processor: Control and data path units of a processor, hard wired control unit, memory and IO interface, parallel hardware units, design issues of CISC and RISC Practical design issues.
2.Large scale system design: ASM charts for designing the digital systems, practical issues such as clock skew, synchronous and asynchronous inputs and switch bouncing.
3.Testing and design for testability : Circuit testing fault model, specific and random faults, testing of sequential circuits, BIST, built in logic block observer (BILBO), signature analysis, CAD tools.
4.Reliable design and fault analysis: Hazard analysis failure modes and effect analysis, hazard and operability, fault tree analysis. reliability of digital system
5.Estimation: Estimating digital system reliability, transmission lines reflections and terminations system integrity**,** network issues for digital systems. formal verifications of digital system and nano computing, model-checking, binary decision diagram, theorem proving, circuit equivalence. introduction to nanometer scale cellular array, carbon nanotube, fundamental of gates using nan cascade.

References :

1. Z. Kohavi, "Switching Theory and Finite Automata" , Prentice Hall
2.N.Balabanian, "Digital Logic Design Principles", Wiley
3.S.Brown, "Fundamental of Digital Logic", Tata McGraw-Hill
4. J.F.Wakerly, "Digital Design Fundamentals", Prentice Hall
5.D. Patterson , J. Hennessy, "Computer Organization and Design," Morgan Kaufmann Publishers, 1994.
6.D. Winkel ,F.Prosser, "The Art of Digital Design: An Introduction to Top-Down Design," Prentice-Hall, Inc., 1980.
7.K. Hwang, "Computer Arithmetic: Principles, Architecture, And Design", Wiley 1979

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OPERATING SYSTEM

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1.Evolution of operating system: Batch, timesharing, multiprogramming, multi tasking and distributed and real time. Unix O.S. Fundamentals: system concepts, system components, O.S. services, system calls, system Programs, system structures, virtual machines. process concept, interleaved I/O and CPU burst; process states; O.S. services for process management, co-operating processes , thread, inter process communication scheduling algorithm, multi-processor scheduling.
2.Real time scheduling and synchronization: Need for inter process synchronization, critical section problem, , H/W support for mutual exclusion, semaphores classical problems of synchronization critical region and conditional, critical regions : Monitors, deadlock- principle, detection, prevention and avoidance, messages for inter process communication and synchronization, classical problems in concurrent programming viz. producer/consumer/reader/writer with and without bounded buffer. Contiguous and non-contiguous, paging.
3. Segmentation: Concepts of segmentation, virtual memory, management of virtual memory: demand paging performance of demand paging page replacement algorithms thrashing. file organization, concept of files and directories, hierarchical structure of file, space allocation, Free space management.
4. Security issues and protection mechanism: Goals of protection domain of protection access matrix implementation of access matrix revocation of access rights security problems authentication program threats, system threats, threat monitoring.

References

1. A. Silberschatz, P. B. Galvin; “Operating System Concepts, Addition Wesley Publishing Company.
2. M. Milenkovic, “Operating System Concepts and Design”, McGraw Hills.

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Elective II
BIOMEDICAL SIGNAL PROCESSING

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1. Introduction: Cell structure, basic cell function, origin of bio-potentials, electric activity of cells, bio transducers, physiological parameters and suitable transducers for its measurements, operating principles and specifications for the transducers to measure parameters like blood flow, blood pressure, electrode sensor, temperature, displacement transducers.

2. Cardiovascular system: Heart structure, cardiac cycle, ECG (electrocardiogram) theory (B.D.), PCG (phonocardiogram**).**EEG, X-Ray, Sonography, CT-Scan, The nature of biomedical signals.

3. Analog signal processing of biosignals: Amplifiers, transient protection, interference reduction, movement artifact circuits, active filters, rate measurement. averaging and integrator circuits, transient protection circuits. introduction to time-frequency representations- e.g. short-time fourier transform,
spectrogram, wavelet signal decomposition.

4. Biomedical applications: Fourier, Laplace and z-transforms, autocorrelation, cross correlation, power spectral density. software based medical signal detection and pattern recognition

5.Examples of biomedical signals: Removal of artifacts, speech and pathology of vocal tract/ cords, perpetual coding of audio signal, and data compression, spatio-temporal nature of bioelectric signals, specific digital technique for bioelectric signals, detection of events and waves, characterization of signals in frequency domain, modeling biomedical system, pattern classification, medical imaging

References

1. W. J. Tompkins, “Biomedical Digital Signal Processing”, Prentice Hall of India, 2000
2. R. M. Rangayyan, “Biomedical Signal Analysis: A Case study approach”,IEEE Press, 2001
3. S Kandpur, Handbook of Biomedical Instrumentation, second edition, Tata McGraw-Hill Publication,2003
4. E. N. Bruce, “Biomedical signal processing and signal modeling”, New York: John Wiley, 2001.
3. W. J. Tompkins, “Biomedical Digital Signal Processing”, Prentice Hall
4. M. Akay, “Time Frequency And Wavelets in Biomedical Signal Processing”, Piscataway, NJ: IEEE Press, 1998.
5. Cromwell, weibell, pfeiffer , “Biomedical Instrumentation And Measurements”, 2nd edition, Pearson education.

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Elective II

PATTERN RECOGNITION AND CLASSIFICATION

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1. Introduction to pattern recognition: Pattern recognition methods, pattern recognition system design, statistical pattern recognition – classification, principle, classifier learning, neural networks for pattern classification. Basics of image processing - sampling, two dimensional transforms, image enhancement, smoothening, sharpening, edge detection, image segmentation, boundary extraction.
2 Shape analysis: Shape representation, irregular shape representation, shape representation in image processing , shape representation by convex hull , SPCH algorithm for convex hull finding, stair- climbing method for simple polygon finding , properties of the simple polygon, sklansky's algorithm for convex hull finding, Convex Hull Based Shape Representation, Boundary and Convex Hull, Description Function, Feature Extraction and Shape Classification, Measurements, Feature Extraction, Shape Classification, Examples of Shape Analysis, Fractals, Self-similarity, Fractal Dimension, Multi-fractals, Fractals Based Shape Representation, Boundary and Fractal Dimension, Region and Fractal Dimension. Introduction to Roundness / Sharpness Analysis.
The Problem of Roundness Analysis, The Problem of Circle and Arc Detection, Hough Transform, Definition of Hough Transform, Algorithm of Hough Transform, Circular Hough Transform, Algorithms for Circular Hough Transform Curve Detection, Basic Method, Directional Gradient Method, Centre Method, Gradient Centre Method, Radius Method, Threshold Function , Sharp Corners, Examples of Roundness/Sharpness Analysis.
3.Orientation analysis: Problem of Orientation Analysis , Development of Orientation Analysis, Directed Vein Method, Directed Vein Image, Orientation of a Vein, Algorithm, Convex Hull Method, Principal Component Transformation, Theory of Principal Component Transformation, Orientation by Principal Component Transformation, Theory of Moments, Central Moments, Orientation by Moments, Examples of Orientation Analysis, Introduction to Arrangement Analysis, Aggregates, Examples of Arrangements, Extended Hough Transform, Hough Transform, Extension of Hough Transform, Simplified Extended Hough Transform, Arrangement Features, Orientation and Position, Description in Hough Space, Feature Extraction, More Arrangements , Measurements , More Features Description and classification of arrangements.

4.Pattern recognition systems: Design cycle, learning and adaptation, Statistical Pattern recognition, parametric and nonparametric techniques, neural networks and their related parameters, stochastic search, evolutionary methods, Machine learning, unsupervised learning and clustering methods

References

1.R. Duda, P. Hart, David Stork," Pattern Classification", Second EditionJohn Wiley and Sons Inc., 2005

2.R. Shinghal, "Pattern Recognition: Techniques and Applications", Oxford University Press, 2006

3.D. Luo, "Pattern Recognition and Image Processing "Harwood publishing , England

4.M. Sonka, V. Hlavac, R. Boyle, "Image Processing, Analysis and Machin Vision", 2/e, Thomson Learning.

5. Jr. Parker ," Algorithms for Image Processing and Computer Vision", John Wiley

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Elective II

NANOTECHNOLOGY

Teaching scheme	Examination scheme
Lectures: 3 Hrs. per week	Theory Paper: 100 Marks (3 Hours)

1. Introduction: Nanoscale, definition of nanotechnology; consequences of the nanoscale for technology and society. beyond moore's law. nano-scale 1D to 3D structures; Technologies for the Nanoscale, Nano-scale fabrications; Nan manipulation. Nanolithography Nanoscale Materials and Applications
Nano composites; Nano-scale Electronics; Safety issues with nanoscale powders; Quantum wells, wires, dots and nanoparticles; Nano-scale bio and medical applications; Applications in energy, informatics, medicine, etc
2. Different approaches: "Top-down" approach: Nanolithography,
CVD, MEMS, "Wet deposition" techniques (LB, spincoating, dip-coating) "Bottom up approach" – Sol-gel processing, colloidal. Nanoparticles,organic nanomaterial and self assembly Structure and properties characterization of nanomaterial (Diffraction techniques, spectroscopy and modeling)
3. Imaging Techniques: Scanning and transmission electron microscopy, scanning probe microscopy techniques

. **References**

1. C.P. Poole Jr. and Franks. J. Qwens," Introduction to Nanotechnology",
2. B. Bhusan, "Handbook of Nanotechnology" springer
3. L.L. Shaw, "Processing and Properties of Structural Nonmaterial" Wiley publications
4. Y. Gogotsi, "Nano materials Handbook" CRC press 2006.