WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007

SCHEME OF INSTRUCTION & EXAMINATION
B.E. IV YEAR (BIO-MEDICAL ENGINEERING)

SEMESTER-II

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### THEORETICAL PRACHTICALS

| 1.    | BM 481 UE | Biomedical Signal Processing Lab | - 3 | 50 | 25 |
| 2.    | BM 482 UE | Seminar | - 3 | - | 25 |
| 3.    | BM 483 UE | Project | - 6 | Viva-voice | Grade* | 50 |

| 16 | 12 | 275 | 175 |

# A student shall get minimum pass marks of 40% in the University Examination independent of sessional marks. However, the sessional and university exam marks of this subject will not be counted for the award of degree.

* Excellent / Very Good / Good / Satisfactory / Unsatisfactory

**ELECTIVE III:**
1. BM 452 UE Medical Imaging Processing
2. CS 457 UE Operating system
3. EC 455 UE Embedded system design
4. EE 451 UE Reliability Engineering
5. ME 455 UE Composite material

**ELECTIVE IV:**
1. BM 453 UE Physiological Systems Modeling
2. BM 454 UE Bioelectricity
3. CS 463 UE Data mining
4. ME 460 UE Robotics
5. LA 454 UE Intellectual Property Rights
WITH EFFECT FROM ACADEMIC YEAR 2006-2007

BM 451 UE

BIOMEDICAL SIGNAL PROCESSING

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

UNIT I

UNIT II
Cardiological signal processing: QRS detection methods, Rhythm analysis, Arrhythmia detection algorithms, Automated ECG analysis, ECG pattern recognition, data compression techniques: ECG acquisition and transmission, Art attack algorithm, Turning point AZTEC, CORES, and the KL transform.

UNIT III
Adaptive noise canceling: Principles, LMS adaption algorithm, noise canceling methods to enhance ECG monitoring. Fetal ECG monitoring, Electrosurgical interference cancellation and donor heart interference cancellation.

UNIT IV
Prony’s methods: Original Prony’s methods, Prony’s method based on the least squares estimate, Analysis of evoked potential using Prony’s method, Use of Prony’s method for Phonocardiography.

UNIT V
VLSI in digital signal processing: High performance VLSI signal processing, VLSI application in medicine, VLSI sensors for Biomedical signals, VLSI tools. Selection of custom, ASIC, or off-the-shelf components.

Suggested Reading:
WITH EFFECT FROM ACADEMIC YEAR 2006-2007

BM 452 UE
MEDICAL IMAGE PROCESSING

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

UNIT I

UNIT II
Image operations: Gray level Transformation –image negatives, image subtraction, contrast enhancement, thresholding, histogram techniques, filtering- lowpass and high pass in spatial and frequency domain, derivative filters, homomorphic filters.

UNIT III
Radiography and CT: X-rays: interaction of X-ray beam with tissue –ray detection, data acquisition in CT, Images reconstruction, computed axial tomography, generation of CT, spiral CT, mammography, computed radiography(CR).

UNIT IV
Magnetic resonance imaging: Image acquisition and reconstruction, interaction with tissue, slice selection, basic pulse sequences, fast imaging methods, functional imaging, fMRI, Diffusion tensor imaging.

UNIT V
Ultraasonic imaging and nuclear imaging: physics of acoustic waves, waves propagation in tissues, generation and detection of ultrasound, B-mode, M-mode, TM-mode processing – Data acquisition and reconstruction of Doppler image –pulsed wave Doppler, NMI-Radio active decay modes, data acquisition, PET SPECT.

Suggested Reading:
CS 457 UE

OPERATING SYSTEMS

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

UNIT I
Introduction to operating systems: OS structure and strategies process concept, threads, inter process communication, CPU scheduling algorithms. Process synchronization, critical section problem, semaphores, monitors.

UNIT II
Memory management, swapping, contiguous allocation paging, static and dynamic partition demand paging, page replacement algorithms, thashing segmentation, segmentation with paging.
File system interface – file concept, access methods, and protection. File system implementation.
File system structure, allocation methods, directory implementation.

UNIT III
Deadlocks: necessary conditions, resource allocation graph, methods for handing deadlocks, prevention avoidance, detection and recovery.
Protection-golas, domain of protection, access matrix.

UNIT IV

UNIT V
Case studies: unix operating system – general architecture. Unix system calls, unix shell files and directories in unix.
Window NT- General architecture. The NT Kernal. The NT Executive.

Suggested Reading:
1. Abraham sliberschatz, peter b galvin., operating system concepts, Addison Wesley., 2003.
EC 455 UE
EMBEDDED SYSTEM DESIGN

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

UNIT I
Introduction to 8051 and operating modes – addressing modes – instruction set – on chip memories – on chip timers& counters, serial ports – interrupt control.

UNIT II
(Preliminary treatment with 8051 microcontroller)
ISA bus protocol – input-output addressing – direct memory access – arbitrations: priority arbitration. Daisy chain arbitration, network oriented arbitration..

UNIT III
Introduction to MC 68 HC 11 operating modes – programmers model – addressing modes – instruction set – on chip memories – on chip I/O ports, ND converters. Timer System..

UNIT IV
(Preliminary treatment with MC 68 HC 11 series microcontroller)

UNIT V

Suggested Reading:

1. Mohammmed ali mazidi, Janice Gillespie mazidi, the 8051 microcontroller and embedded system, Pearson education Asia, 2000.

WITH EFFECT FROM ACADEMIC YEAR 2006-2007
EE 451 UE

RELIABILITY ENGINEERING

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

UNIT I

UNIT II
Failure and causes of failue. Failure rate and Failure density. Reliability function MTTF. Bath tub curve for different ystems. Parametric methods or above distributions. Non-parametric methods from filed data.

UNIT III
Reliability lock diagram.series and paraller system . net work reduction technique,examples, evalution of failure rate, MTITE and reliability, active and stand by redundancy , r out of n configuration. Non-series- parallel systems. Path based and cut set methods.

UNIT IV
Availability, MTFR and NTBF Markov models and state transition matrices. Reliability modes for single component, two component. Load sharing and standby systems. Reliability and Availability models of two unit paraller system with repair and standby system with repair.

UNIT V

Suggested Reading:

4. Endrenyi, Reliability modeling in electric power system, john wiley &sons, 1978.
ME 455 UE

COMPOSITE MATERIALS

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

UNIT I
Introduction: Fibres, matrix materials, interfaces, polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon fibre composites.

UNIT II
Micromechanics of composites:
Mechanical properties production of elastic constant, micromechanical approach, halpin-tsal equations, tranverse stresses.
Thermal properties: hygrothermal stresses, mechanics of load transfer from matrix to fibre.

UNIT III
Micromechanics of composites:
Elastic constants of a lamina, relation between engineering constants and reduced stiffness and compliance, variation of lamina properties with orientation, analysis of laminated composites, stresses and strains with orientation.

UNIT IV
Inter-laminar stresses and edge effects. Simplified composite beam solutions. Bending of laminated beams.
Tensile and compressive strength of unidirectional fibre composites, fracture mode in composite: single and multiple fracture, de-bonding, fibre pullout and de-lamination failure, fatigue of laminate composite. Effect of variability of fibre strength.

UNIT V
Strength of an orthotropic lamina: maximum stress theory, maximum strain criteria, maximum work (Tsai-Hill) criterion, quadratic interaction criteria. Designing with composite materials.
Measurement of constituent material properties: fibre tests, matrix tests.
Measurement of basic composite properties: tensile test, compressive test, a plane shear test, interlaminar shear test, flexure test.

Suggested Reading:
BM 453 UE

PHYSIOLOGICAL SYSTEMS MODELING

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

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
Tracer dynamics: Organ compartment model to relate Organ volume and flow-rate to monitored trace concentration, administration and its time profile. Model for measuring carbohydrate metabolism from monitoring of intravenously injected glucose.

Suggested Reading:
WITH EFFECT FROM ACADEMIC YEAR 2006-2007

BM 454 UE

BIOELECTRICITY

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

UNIT I
Basic Electromagnetic theory:

UNIT II
Action potentials and propagation:

UNIT III
Electrophysiology of skeletal muscle and neuromuscular junction:

UNIT IV
Electro-physiology of Heart:
Properties of Cardiac muscle, Heart vector, electrical activity of the heart. Standard leads, lead vectors. Recording of the ECG from the surface. Dipole theory of the heart. Relationship between the different ECG leads.

UNIT V
Application of Bio-Electric Phenomena:
Functional Neuro-muscular stimulation, impedance plethysmography, measurement of resistance of isotropic & anisotropic tissue and Electro encephalography.

Suggested Reading:
CS 463 UE

DATA MINING

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

UNIT I
Data Warehousing: Introduction, What is a DWH. Definition, Multidimensional data model, OLAP operations, Warehouse schema, DWH architecture, Warehouse server, Metadata OLAP engine, DWH Backend process.

UNIT II

UNIT III
Clustering Techniques : Introduction, Clustering Paradigms, Partitioning algorithm, K-Medoid algorithm, CLARA, ALARANS, Hierarchical Clustering, DBSCAN, BIRCH, CURE, Categorical Clustering algorithms, STIRR, ROCK, CACTUS,
Other Techniques : Introduction, What is a NN, Learning in NN, unsupervised Learning, data mining using NN : A case study, genetic algorithm, Rough sets, support vector machines.

UNIT IV

UNIT V

Suggested Reading:
1 Arun K Pujari, Data Mining Technique, University Press, 2001.
2 Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, 2006.
3 Rajeev Paride, Principles and implementation of Data Warehousing, Firewall Media, 2006
ME 460 UE

ROBOTICS

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

UNIT I

UNIT II

UNIT III
Jacobian for direct and inverse kinematics. Trajectory planning for robots. Trajectory control based on incremental inverse kinematics of kinematics of equations, Static force analysis, stiffness.

UNIT IV
Newton – Euler formulation of dynamic equation. Lagrange formulation. Inertia tensor. Control schemes, individual joint control and disadvantages. Control through computed torques.

UNIT V

Suggested Reading:

LA 454 UE

INTELLECTUAL PROPERTY RIGHTS

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

UNIT I
The salient features of the TRIPS Agreement. The two international institutions – (i) the world intellectual property organization (ii) the world trade organization.

UNIT II
History of the patent system. Patents in all fields of technology.
  i. patent on genetic resources patent on chemicals, designs, patent based on software, business methods, internet patent, etc.
  ii. exception to exclusive rights conferred to a patent holder.
  iii. Ground for revocation f patent.
  iv. Remember for infringement of a patent.

UNIT III

UNIT IV
Nature and scope of protection of design rights, protection of layout designs (topographies) of integrated circuits , protection of undisclosed information, protection of trade marks, domain names and geographical indications.

UNIT V
Practical aspects – drafting of a patent. Some exercises on the preliminary rules on preparing an application seeking a patent.

Suggested Reading:

WITH EFFECT FROM ACADEMIC YEAR 2006-2007

CE 459UE
ENVIRONMENTAL STUDIES

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

UNIT I
Environmental studies: definition, scope and importance, need for public awareness.
Natural resources: water resources; use and over utilization of surface and ground water,
floods, drought, conflicts over water, dams- benefits and problems. Effects of modern
agriculture, fertilizer-pesticide problems, water logging salinity.
Energy resources; growing energy needs, renewable and non-renewable energy sources.
Land resources; land as a resource, land degradation soil erosion and desertification.

UNIT II
Ecosystems: concept of an ecosystem, structure and function of an ecosystem, producers,
consumers and decomposers, energy flow in ecosystem, food chains, ecological
pyramids, aquatic ecosystem(ponds, streams, lakes, rivers, oceans, estuaries).

UNIT III
Biodiversity: genetic species and ecosystem diversity, bio-geographical classification of
India. Value of biodiversity, threats to biodiversity, endangered and endemic species of
India, conservation of biodiversity.

UNIT IV
Environmental Pollution: causes, effects and control measures of air pollution, water
pollution, soil pollution, noise pollution, thermal pollution and solid waste management.
Environment protection act: Air, water, forest & wild life acts, issues involved in
enforcement of Environmental legislation.

UNIT V
Social issues and the Environmental: water conservation, watershed management, and
Environmental ethics. Climate change global warming acid, rain, ozone layer depletion.
Environmental protection act, population explosion.

Suggested Reading:

1. A. K. De, Environmental chemistry, Wiley astern Ltd
BM 481 UE

BIOMEDICAL SIGNAL PROCESSING

Instruction : 3 Periods per week

Duration of University Examination : 3 Hours

University Examination : 50 Marks

Sessional : 25 Marks

1. Use of DSP processors-6X and 2X series for
   (i) Generation of basic signals.
   (ii) Linear and circular convolution
   (iii) Realization of FIR and IIR filters
   (iv) Finding DFT and IDFT of given sequence
   (v) Plotting the power spectral density.

2. Computation of convolution and correlation sequences.
3. Signal averaging improvement in the SNR Using coherent and incoherent averaging.
4. Exponential averaging.
5. data polishing: mean and trend removal
6. design of IIR and FIR Filter
7. PSD Estimation
8. AR Modeling for Predictive Filters
9. LMS Based Algorithm for Adaptive Noise Canceling
10. Data Compression Techniques: AZTEC, TP, CORTES, KL Transform
11. Template matching algorithm for QRS detection
12. Classification of EEG waves.
Instruction:

Oral presentation is an important aspect of engineering education. The objective of the seminar course is to motivate a student to do a systematic and independent study of state-of-art topics in a broad area of his/her interest.

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

Students are to be exposed to following aspects of seminar presentations.

1. Literature survey
2. Organization of material to be presented
3. Preparation of OHP/Slides/PC Presentation
4. Technical writing.

Each student is required to:

1. submit one page synopsis of the seminar talk for display on notice board of the department.
2. give a 20 minutes presentation with the aids of an OHP/PC/Slide projector, followed by a 10 minutes discussion.
3. Submit the report is on the seminar topic presented along with list of reference and slides/transparencies used.

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

Sessional marks will be awarded jointly or independently by at least two faculty members. The awards are on the basis if the oral presentation made, written materials submitted, active participation of the student in the proceeding as well as involvements in the discussions.
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BM 483 UE

PROJECT

Instruction : 6 Periods per week
Duration of University Examination : Viva-Voce
University Examination : Grade
Sessional : 50 Marks

Solving a real life problem’ should be the focus of U.G. project. Faculty members should propose the project briefs (scope and references) well in advance, which should be made available to the students at the department library. The project could be classified as hardware, software, modeling, and stimulation. It should involve one or many elements of techniques such as analysis, design, and synthesis.

The department will appoint a project coordinator who will coordinate the following:

- Grouping of students (max. 3 in a group)
- Allotment of projects and project guides
- Project monitoring at regular intervals

All projects allotment is to be completed by the 2nd week of 4th year 1st semester, so that students get sufficient time for completion of the project.

All projects will be monitored at least twice in a semester through students’ presentation. Sessional marks are to be based on the Grades/Marks, awarded by a monitoring committee comprising of faculty members as well as by the supervisor.

Efforts should be made that some of the projects are carried out in industries with the help of industry coordinators. Problems can also be invited from the industries to be worked out through U.G. projects.

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

* Excellent / Very Good / Good / Satisfactory / Unsatisfactory

Note: Three periods will be assigned to each project guide irrespective of the number of projects guided.