SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV YEAR
(BIO-MEDICAL ENGINEERING)

SEMESTER-I

<table>
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<tr>
<th>S.No.</th>
<th>Syllabus / Ref. No.</th>
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*Syllabus same as EC 351 UE

ELECTIVE II:
1. BM 404 UE Prosthetic Engineering
2. CS 408 UE Database Management Systems
3. EC 423 UE VLSI Technology
4. EE 405 UE Optimization Techniques
5. ME 409 UE Entrepreneurship
6. ME 412 UE Finite Element Analysis

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
### SCHEME OF INSTRUCTION & EXAMINATION

**B.E. IV YEAR**

**(BIO-MEDICAL ENGINEERING)**

**SERVICE COURSES OFFERED TO OTHER DEPARTMENTS**

#### SEMESTER-I

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<td>BM405 UE CE/CSE/ ECE/EEE/ME</td>
<td>Medical Instrumentation <em>(Elective – II)</em></td>
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*WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007*
Advanced Medical Equipment

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

Unit-I
Hospital power distribution system: Design and layout, power factor improvement, maximum demand, safety, metering, booster transformers, isolators. Electrical Safety: physiological affects of electricity, macro-shock and micro-shock hazards, electrical safety codes and standards, electrical safety analyzers, testing the electric systems.

Unit-II
Electrosurgical Equipment: ESU, principles of cutting and coagulation, spark gap, valve and solid state generators, safety features. Introduction to Lithotripsy-Principles and Applications, Physiotherapy Equipment-Short Wave, Microwave and Ultrasound Diathermy, Ophthalmic Instruments-Intraocular Pressure Measurement Contacting and Non-Contacting Types, Refractometer, Ophthalmoscope, Retinoscope, Keratometer.

Unit-III
Audiometry: Common tests and procedures, audiometer. Hearing Aids: Different types, comparison of microphones receivers and amplifiers, cochlear Implants.
Neonatal instrumentation: incubators, aproea monitor, photo-therapy devices.
Haemodialyzer: qualitative requirements, general scheme of operation, types of exchangers, block diagram, electronic control and monitoring.
General anesthesia: information about medical gases and vacuum systems, anesthesia equipment Liquid medical –O₂ systems, Theatre sterility practices.

Unit-IV
Imaging Equipment: Ultrasound, computer aided tomography, magnetic resonance imaging, SPECT, PET: Basic Principle of Operation and Applications. Introduction to Radionuclide Instrumentation-Gamma camera, rectilinear scanner, radioisotopes, mobile C-ARM radiotherapy equipment MRI.

Unit-V
Photonics: Optic fibers: optical fiber waveguides, wave propagation, types of optical fibers, attenuation and dispersion in optical fibers, applications in Endoscopy.

Suggested reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
BM 402 UE

Medical Embedded Systems

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

UNIT – I
Memory interfacing ROM and SRAM
I/O interfacing: I/O mapped I/O scheme. Simple I/O ports (8282)
Peripherals interfacing: Matrix key board, 7 -segment LED’s, DAC, ADC, Centronics parallel printer, CRT data terminal.

UNIT – II
Interfacing of 8086 with programmable peripheral interface chip(8255), Programable communicator chip(8251), Programmable Internal timer chip (8253), Programmable interrupt controller(8259), DMA (8257) controller,

UNIT – III
Interfacing of 8051 – ADC ,DAC, Elevator and simulator ,7 –segment display ,traffic light controller ,LED display, key board interfacing.

UNIT – IV
Interfacing applications of PIC-Analog to digital module, power down (sleep) modes, Programming of PIC, Standard I/O and processor directives, CCS-PIC COMPLIER

UNIT – V
Interfacing of medical sensors, carbondioxide and oxygen sensors, respiration, force, flow, differential voltage and current probes and humidity sensors.

Suggested Reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
Telemedicine

UNIT I
History of Telemedicine, Block diagram of telemedicine system, Definition of telemedicine, Tele health, Tele care, origins and Development of Telemedicine, Scope, Benefits and limitations of Telemedicine.

UNIT II
Types of information: Audio, Video, still Images, text and data, Fax.
Types of Communication and Network: PSTN, POTS, ATN, ISDN, Internet, Wireless Communications: GSM, satellite and Micro Wave. Different modulation techniques, Types of antennas depending on requirements, Integration and Operational issues: system integration, Store-and-forward operation, real-time Telemedicine.

UNIT III
Data Exchanges: Network Configuration, Circuit and packet switching, H.320 series (Video phone based ISDN) T.120, h.324 (Video phone based PSTN), Video Conferencing.

UNIT IV
Ethical and legal aspects of Telemedicine: Confidentiality and Law, patient rights and consent, access to medical Records, Consent treatment, jurisdictional Issues, Intellectual property rights.

UNIT V
Tele radiology: Basic parts of Teleradiology system: Image Acquisition system, Display system, Communication network, Interpretation. Tele Pathology: Multimedia databases, color images of sufficient resolution: Dynamic range, spatial resolution, compression methods, Interactive control of colour, Controlled sampling, security and confidentiality tools. Tele cardiology, Teleoncology, Telesurgery.

Suggested Reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
BM 421 UE

Digital Signal Processing

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
DSP Processors: Computer architecture for signal processing, General purpose DSP processors, TMS 320C 54XX processor – Architecture, addressing modes, Instruction set

Suggested Readings:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
Microcontrollers And RTOs Concepts

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

Unit-I - 8086 Microprocessor:

Unit-II - 8051 Microcontroller:
Architecture, Internal and External Memories, Counters and Timers, Register Set, Synchronous and Asynchronous Serial Communication, Interrupts, Instruction Set, Basic Assembly Language Programming in 8051 Microcontroller.

Unit-III –PIC Microcontroller:
Architecture, memory organization, interrupts and reset, input and output ports, timers, Synchronous and Asynchronous Serial Communication.

Unit-IV – Rabbit 3000 Microprocessor:
Introduction to Rabbit 3000 Microprocessor, Instruction Set, Interrupts Overview: Interrupts Details, Writing an Interrupt Service, Routine Polled Vs Interrupt Driven Serial Communication, Multitasking: Cooperative-Multitasking, Preemptive-Multitasking, Programming in Dynamic C.

Unit-V – Real-Time Operating System Concepts:

Suggested Reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
BM 404 UE

Prosthetic Engineering

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

Suggested Reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
BM 408 UE

Data Base Management Systems

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

UNIT – I

UNIT – II
Relational Model: Structure of related databases, Relational Algebra, Extended Relational Algebra Operators, Extended relational algebra operations, Modification of the database, Views, the Tuple relational calculus, The Domain relational calculus. Structured Query Languages: Basic Structure, Set operations, Aggregate functions, Null values, Nested sub queries, Views, Complex Queries, Modification of the database, Joined relations, Data-definition languages, Embedded SQL, Dynamic SQL.

UNIT – III

UNIT – IV
Indexing and Hashing: Basic Concepts, Ordered indices, B+ Tree index files, B-Tree index files, Hashing, Dynamic Hashing, comparison of ordered and Hashing, Index definition in SQL, Multiple-Key Access. Transactions: Transaction concept, Transaction state, implementation of atomicity and durability, Concurrent executions, Serializability, Recoverability, Implementation of isolation, transaction definition in SQL, Testing for serializability.

UNIT – V

Suggested Reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
VLSI Technology

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

UNIT – I
Overview of CMOS & BiCMOS technologies, MOS & BiCMOS Transistor Models, IC fabrication, MOS inverter characteristics.

UNIT – II
IC Layout Design of basic structures & simulation, static MOS Gate circuits.

UNIT – III
Sub-system Design: Arithmetic circuits in CMOS and ROM, SRAM & DRAM Arrays.

UNIT – IV
Process Technology – I

UNIT – V
Process Technology – II
Polysilicon Film Deposition, Diffusion, Ion implantation and Metallization VLSI Process Integration-CMOS IC technology.

Suggested Reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
EC 405 UE

Optimization Techniques

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

UNIT – I
Introduction to Classical Optimization Techniques: Statement of optimization problem, Objective function, Classification of Optimization problem.

UNIT – II
Linear Programming: Standard form, formulation of the LPP, Solution of simultaneous equations by pivotal condensation, Graphical methods, Simplex algorithm, Big M Method, Two phase Simplex method, Duality principle, Dual Simplex method.

UNIT – III
Non-linear Programming:

UNIT – IV
Gradient Method: Steepest Descent, conjugate Gradient and Quasi-Newton method, Fletcher-Reeves method of Conjugate gradients.

UNIT – V

Suggested Reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
Entrepreneurship

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

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

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

UNIT – III
Project formulation, Analysis of marked demand, Demand supply gap, Financial and Profitability analysis and Technical analysis. Project financing in India.

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

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

Suggested Reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
Finite Element Analysis

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

UNIT – I

UNIT – II
Analysis of trusses and frames: Element stiffness matrix for a truss member. Analysis of Plane truss with number of unknowns not exceeding two at each node. Analysis of frames with two translations and a rotational degree of freedom at each node. Analysis of Beams: Element stiffness matrix for two noded, two degrees of freedom per node beam element.

UNIT – III
Finite element modeling of two dimensional stress analysis with constant strain triangles and treatment of boundary conditions. Finite element modeling of Axisymmetric solids subjected to Axisymmetric loading with triangular elements.

UNIT – IV
Two dimensional four noded isoparametric elements and numerical integration. Steady state heat transfer analysis: One dimensional analysis of a fin and two dimensional analysis of this plate. Analysis of a uniform shaft subjected to torsion.

UNIT – V

Suggested Reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
ME 405 UE

Medical Instrumentation
(Elective for CE/CSE/ECE/EEE/ME)

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

UNIT – I
Origin of bio-potentials – ECG, EEG, EMG, EOG, ENG, ERG, EGG.
Bio-potential Electrodes: Half cell potential, Offset voltage, Types of External, internal and Microelectrodes.
Biosensors – Enzyme-based biosensors, immuno sensors, microbial sensors.

UNIT – II
Medical display devices and recorders, Basic requirements for the display and recording of biopotentials signals. PMMC writing systems, General features of ink-jet, thermo-sensitive and optical recorders, Oscilloscopes – Medical, multi-beam & non-fade display systems.

UNIT – III
Analytical Instrumentation, Methods of Chemical analysis, Absorption Photometry, Emission Photometry, Fluorometry, chromatography for blood gas analysis, Colorimeters, Spectrophotometers, electrophoresis, auto analyzer.

UNIT – IV
ECG: Block diagram & circuits, electrode placement, lead configuration, Types of ECG recorders, Blood pressure measurement: Direct and indirect methods, Blood flow measurement: Electromagnetic & Ultrasonic techniques. Heart sounds: Origin, phonocardiography

UNIT – V
ECG: Block diagram & circuits, electrode placement, Evoked potentials and their measurement. EMG-Block diagram & circuits, electrode placement, Nerve conduction velocity determination, EMG stimulators.

Suggested Reading:

WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007
BM 431 UE

Medi Embedded Systems Lab

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

1. Interfacing with 8085 microprocessor and 8051 microcontroller
   a) Traffic light controller
   b) 7-segment display
   c) Analog to Digital Converter
   d) Matrix keyboard
   e) LCD display
   f) Digital to Analog Converter
   g) Stepper motor
   h) DC- motor

2. Interfacing of matrix sensors to PIC microcontroller
   a) Heart rate monitor
   b) ECG sensor
   c) Carbon dioxide and oxygen sensors
   d) Ion selective sensors
   e) Analog interfacing of rabbit core modules
   f) OP 7200 LCD display controller
WITH EFFECT FROM THE ACADEMIC YEAR 2006-2007

BM 432 UE

Project Seminar

Instruction: 3 Periods per week
Sessional: 25 Marks

The Objective of the project seminar is to actively involve the student in preparation of the final year project with regard to following components

- Problem definition and specifications
- Literature survey, familiarity with research journals
- Board knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of bar (activity) charts.
- Presentation - Oral and Written.

The Department can initiate the work related to project allotment at the end of III year 2nd semester and finalize it in the first two weeks of the IV year 1st semester.

First 4 weeks of IV year 1st semester will be spend on special lectures by faculty members, research scholars and PG students of the department and invited lectures by engineers from industries and R&D institutions. The objective of these preliminary talks will be to expose students to real life practical problems, and methodology to solve the technical problems.

Seminar schedule will be prepared by the coordinator for all the students from 5th week to the last week of the semester which should be strictly adhered to.

Each student will be required to

1. Submit a one page synopsis before the seminar for display on notice board.
2. Give a 20 minutes presentation followed by 10 minutes discussion.
3. Submit a technical write-up on the talk delivered.
4. Actively participate in the seminars.

At least two teachers will be associated with the evaluation of the project seminar for the award of the Sessional marks, which should be on the basis of performance on all the three items stated above.

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