With effect from the academic year 2010-2011

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

SEMESTER-I

S.No.	Syllabus / Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination			Credits
			Periods per week		Duration in Hours	Maximum Marks		
		THEORY	L/T	D/P		Univ. Exam	Sessionals	
1.	BM401 UE	Advanced Medical Equipment	4	-	3	75	25	4
2.	BM402 UE	Medi embedded systems and RTOs	4	-	3	75	25	4
3.	BM403 UE	Telemedicine	4	-	3	75	25	4
4.	EC421 UE	Digital Signal Processing*	4	-	3	75	25	4
5.	BM 404 UE	Microprocessors and Microcontrollers in Medical Applications	4	-	3	75	25	4
6.		Elective II	4	-	3	75	25	4
PRACTICAL								
1.	BM431 UE	Medi Embedded Systems Lab	-	3	3	50	25	2
2.	BM432 UE	Project Seminar	-	3	-	-	25	2
TOTAL			**24**	**6**		**500**	**200**	**28**

***Syllabus same as EC 351 UE**

ELECTIVE II:

BM	405UE	Prosthetic Engineering
CS	408UE	Database Management Systems
EC	423UE	VLSI Technology
EE	405UE	Optimization Techniques
ME	409UE	Entrepreneurship
ME	412UE	Finite Element Analysis

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV YEAR
(BIO-MEDICAL ENGINEERING)
SERVICE COURSES OFFERED TO OTHER DEPARTMENTS

SEMESTER-I

S.No.	Syllabus / Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration in Hours	Maximum Marks	
		THEORY	L/T	D/P		Univ. Exam	Sessionals
1	BM406 UE CE/CSE/ ECE/EEE/ME	Medical Instrumentation **(Elective – II)**	4	-	3	75	25
TOTAL			**4**	**-**	**3**	**75**	**25**

BM 401 UE

ADVANCED MEDICAL EQUIPMENT

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

OBJECTIVES:

a. To familiarize the latest technologies of modern medicine
b. To make learners able to use use new and updated diagnostic methodologies
c. To make learners capable enough of adopting the methods of recovery and improving health with a service approach

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 euipment Liquid medical –O_2 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 fMRI.

UNIT V

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

Lasers: Emission and Absorption in Radiation, Population Inversion and Threshold condition, Laser Losses, Types of Lasers-CO2, Helium-neon, Nd-Y-Ag lasers, Applications in Surgery, Angiography, and Endoscopy.

Suggested reading:

1. Bronzino Joseph D., *Handbook of Biomedical Engineering*, CRC Press, 1995.
2. Khandpur R.S., *Handbook of Biomedical Instrumentation*, Tata McGraw Hill, 1994.
3. John G.Webster, *Medical Instrumentation: Application and Design*, Jhon Wiley and Sons Inc., 3rd Ed., 2003.
4. Cotton H., *Electrical Technology*, AHW & Co., 1983.

With effect from the academic year 2010-2011

BM 402 UE

MEDI EMBEDDED SYSTEMS AND RTOS

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

OBJECTIVES:

a. Able to write programs to interface with 8085/8086
b. Able to write programs to interface with 8051
c. Know the concept of interfacing PIC microcontroller.

UNIT I

Embedded Systems: Basic concepts, requirements, categories, design challenges Embedded operating system –Types, Hardware architecture, Software architecture, application software, communication software, process of generating executable image, development/testing tools

UNIT II

Embedded System Development --The development process, requirements engineering, design, implementation, integration and testing, packaging, configuration management, management of development projects

UNIT III

The execution environment-memory organization, system space, code space, data space, unpopulated memory space, i/o space, system start up, interrupt response cycle, Functions Calls & Stack Frames, run time environment.

UNIT IV

Architecture of Kernel, Tasks and Task Scheduler - Task States, Content Switching, Scheduling Algorithms, Rate Monotonic Analysis, Task Management Function Calls. Interrupt Service Routines, Semaphores, mutex, mailboxes, message queues, event registers, pipes, signals, timers, memory management, Priority Inversion Problem

UNIT V

Design methodologies and design flows, case studies- fetal heart rate monitor, versatile drop foot stimulator, myoelectric arm, telemonitoring system

Suggested Reading:

1. Arnold S. Berger, *An introduction to Processes, Tools and Techniques*, CMP books, 2005.
2. Dr.K.V.K.K.Prasad, *Embedded Real time Systems*, Dreamtech Press, 2003.
3. Wayne wolf , "Computers as Components: Principles of Embedded Computer systems design", Morgan Kaufmann Publishers,2000

With effect from the academic year 2010-2011

BM 403 UE

TELEMEDICINE

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

OBJECTIVES:

a. Know Scope, Benefits and Limitations of Telemedicine.

b. Know Security and Standards and their use in Telemedicine Applications

c. Explain basic parts of Teleradiology Systems like Image Acquisition System, Display System, Communication Network, Interpretation.

d. Describe the need of Various Communication Networks, Antennas in Designing the Telemedicine System

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 ISBN) T.120, h.324 (Video phone based PSTN), Video Conferencing.

UNIT IV

Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, Phases of Encryption. Photocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7.
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:

1. Olga Ferrer-Roca, M.Sosa Ludicissa, *Handbook of Telemedicine*, IOS press 2002.
2. A.C.Norris, *Essentials of Telemedicine and Telecare*, John Wiley & Sons, 2002.

With effect from the academic year 2010-2011

EC 421 UE

DIGITAL SIGNAL PROCESSING

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

OBJECTIVES:

a. To know the difference between DFT and FFT
b. Differences between FIR and IIR.
c. Design of FIR and IIR filters.
d. Architecture s of DSP processors and types of DSP processor.

UNIT I

The Discrete Fourier Transform: Discrete Fourier Transform, Fast Fourier transform; Properties of Discrete Fourier Transform. Linear convolution using Discrete Fourier Transform. Periodic convolution.

UNIT II

Computation of Discreet Fourier Transform, Fast Fourier transform; decimation-in-time and decimation-in frequency. FET algorithms for radix-2 case, in place computation, bit-reversal. Finite word length effect in FET algorithms.

UNIT III

FIR Digital Design Techniques. Properties of FIR Digital filters. Design of FIR filters using windows. Realization diagrams of IIR and FIR filters, Finite word length effects.

UNIT IV

Butterworth and Chebyshev approximations. IIR digital filter design techniques. Impulse invariant techniques. Bilinear transform techniques. Digital Butterworth filters. Comparison of FIR and IIR filters. Frequency transformations.

UNIT V

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

Suggested Readings:

1. Emanuel C.Ifeachor, Barrie W.Jervis, *Digital Signal Processing-A, practical approach,* Pearson Education, 2nd Ed., 2002.
2. C.T.Chen, *One –dimensional Digital Signal Processing*, Marcel Dekker Inc., 1979
3. Avtar Singh, S.Srinivasan, *Digital Signal Processing – Implementations using DSP Processors,* Thomson-Engineering, 2004

With effect from the academic year 2010-2011

BM 404 UE

MICROPROCESSORS AND MICROCONTROLLERS IN MEDICAL APPLICATIONS

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

OBJECTIVES:

a. Distinguish between microprocessors and microcontrollers and their applications.
b. To know the hardware circuitry of each processors and microcontroller.
c. To know the assembly level language programming on microprocessors and Microcontroller in medical applications.

UNIT I

8085 Microprocessor: Architecture, Instruction cycle, basic timing diagrams, Addressing Modes, Instruction Set, Memory and I/O interfacing, interrupts, i/o ports and data transfer concepts

UNIT II

Peripheral Interfacing: Programmable peripheral interface chip (8255), Programmable communicator chip (8251), Programmable Internal timer chip (8253), Programmable interrupt controller (8259), DMA (8257) controller Introduction to 32-Bit Microprocessors.

UNIT III

Programming of 8085 Microprocessor: General Programmes, debugging of Programmes, interfacing with 8085- ADC, DAC, seven Segment display, stepper motor, traffic control, digital multiplexer, digital demultiplexer, square wave generation using micro processor

UNIT IV

8051 Microcontroller**:** Architecture, Internal and External Memories, Counters and Timers, Register Set, Synchronous and Asynchronous Serial Communication, Interrupts, Instruction Set, Basic C Programming in 8051 Microcontroller.

UNIT V

Interfacing of medical sensor circuits: Carbon dioxide and oxygen sensors, respiration, force, flow, differential voltage and current probes and humidity sensors.

Suggested Reading:

1. Kenneth J. Ayala, *the 8051 Microcontroller-Architecture, Programming and Applications, 2nd Ed*., Penram International Publishing, 2005.
2. D.V. Hall, *Microprocessors and Interfacing, Programming and Hardware,* Tata Mc-Graw Hill, 1999.
3. Goankar R.J**,** *Micro processor architecture , programmable applications with 8085.*

With effect from the academic year 2010-2011

BM 405 UE

PROSTHETIC ENGINEERING

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

OBJECTIVES:

a. To extend knowledge of the amputee, of lost and remaining functions affecting locomotion, and to collect information on the best possible medical treatment.
b. To improve fitting techniques and practices, including training, so that existing devices might be used with greater comfort and function.
c. To develop improved lower-extremity devices.

UNIT – I

Engineering Concepts in Sensory Rehabilitation, Motor Rehabilitation, Communication Disorders, Computer-Aided Engineering in customized component design. Intelligent prosthetic knee, Hierarchically controlled prosthetic hand, Self-aligning orthotic knee joint. Externally powered and controlled orthotics and prosthetics: FES systems: Restoration of hand function, standing and walking. Hybrid Assistive Systems (HAS). Active Above Knee Prostheses. Myoelectric hand and arm prostheses.

UNIT – II

Wheeled Mobility: Categories of Wheelchairs. Wheelchair Structure and Component Design. Ergonomics of Wheel chair propulsion. Power Wheelchair Electrical Systems. Control. Personal Transportation. Auxiliary devices and systems.

UNIT – III

Sensory augmentation and substitution: Visual system: Visual augmentation. Tactual vision substitution, Auditory vision substitution; Auditory system: Auditory augmentation. Cochlear implantation, Visual auditory substitution, Tactual auditory substitution, Tactual system: Tactual augmentation. Tactual substitution, Augmentative communication, Control and Computer Access: User Interface, Cost-Effectiveness of High – Verses Low – technology Approaches, Intervention and other Issues.

UNIT – IV

Measurement tools and processes: Subjective and Objective measurement methods, Measurements and assessments; measurement Objectives and Approaches; Characterising the human system and subsystems. Characterising tasks. Characterising assitive devices. Characterizing overall systems in high-level-task situations. Decision-Making process: Current Limitations: Quality of measurements, Standards. Rehabilitation service delivery.

UNIT – V

Computer applications in Rehabilitation Engineering: Interfaces in Compensation for visual perception. Improvement of orientation and mobility. Computer-assisted lip reading. Brain-computer interfaces.

Suggested Reading:

1. Robinson C.J., *Rehabilitation Engineering*, CRC Press, 1995.
2. Ballabio E., et al., *Rehabilitation Technology*, IOS Press, 1993.

With effect from the academic year 2010-2011

CS 408 UE

DATA BASE MANAGEMENT SYSTEMS

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

OBJECTIVES:

a. Knowledge of DBMS, both in terms of use and implementation/design
b. Experience with SQL
c. Increased proficiency with the programming language C++
d. Experience working as part of team\
e. Experience with analysis and design of (DB) software

UNIT I

Introduction: database System Applications, Database Systems Versus File Systems, Views of data, Data Models, Database Languages, Database Users, Database Administrators, Transaction Management, Database System Structure, Application architectures. Entity-Relationship Model: Basic concepts, Constraints, Keys, design issues E-R Diagrams, Weak entity Sets, Extended E-R diagrams, Design of an E-R database schema, Reduction of E-R schema to tables, the Unified Modeling Languages.

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

Integrity Constraints: Domain Constraints, Referential integrity, Assertion, Triggers, Security, Authorization, Authorization in SQL, Encryption, Authentication. Relational Database Design: First Norma; Form, Pitfalls in Relational database design, Functional Dependencies, Decomposition, Desirable properties of Decomposition, Second Normal Form, Boyce-Codd Normal Form, third Normal Form.

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

Concurrency Control: Lock-based protocols, Timestamp-based protocols, Validation-based protocols, multiple granularity, Multiversion schemes, Deadlock handling, Insert and delete operations, Weak Level of Consistency, Concurrency in index structures. Recovery System: Failure classification, Storage structure, recovery and atomicity, Log-based recovery, Shadow paging, recovery with concurrent transactions, Buffer management, Failure with loss of non-volatile storage, Advanced recovery techniques, Remote Backup Systems.

Suggested Reading:

1. Abraham Silberschatz, Henry F Korth, S.Sudarshan, *Database System Concepts*, Mc Graw-Hill inc, 4th Ed., 2002,
2. Patrick O'Neil, Elizabeth O'Neil, *Data Base Principles-Programming and Performance*, Morgan Kaufmann, 2nd Ed., 2001.
3. R.Elmasri, Navathe, *Fundamentals of Database Systems*, Addition Wesley, 1994.

With effect from the academic year 2010-2011

EC 423 UE

VLSI TECHNOLOGY

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

OBJECTIVES:

a. Professional training to the students of computer Science, computer applications, computer engineering, physics and electronics students in VLSI Technology and Hardware Description Language

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:

1. David Hodges, Horace G Jackson & Resve A Saleh, *Analysis and design of Digital Integrated Circuits in Deep Submission Technology*, 3rd ed., TMH, 2005.
2. John P.Uymera, *Introduction to VLSI Circuits & Systems*, John Wiley & Sons 2002.
3. JM Rabacy, Achandra Kasan and B.Nikahe, *Digital Integrated Circuits – A design perspective, 2nd Ed.*, HI 2003.
4. SM.SZE, *VLSI, Technology, 2nd Ed.*, Mc Graw Hill Company, 1988.

With effect from the academic year 2010-2011

EE 405 UE

OPTIMIZATION TECHNIQUES

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

OBJECTIVES:

a. Provide students with the tools and mentality of optimization.
b. Present classic and recent research topics in optimization of communication systems.
c. Introduce the tools just in time for the application topics.
d. Train the ability to do original research in academia or industry through final projects that are closely related to students' own research interests.

UNIT I

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

Classical optimization techniques: Single-variable and Multi-Variable optimization without constraints. Multi-variable optimization with equality constraints. Lagrange multiplier method, Multi-Variable optimization with inequality constraints, Kuhn-Tucker conditions.

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:

One-dimensional search methods. Fibonacci method, Golden section method, Direct Search method: Univariate Search and Pattern Search methods, Powell's method.

UNIT IV

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

UNIT V

Dynamic Programming: Multistage design process, Types, Principle of optimality, Computational procedure in Dynamic programming, Examples using Calculus method and Tabular method of solutions.

Suggested Reading:

1. S.S.Rao, *Optimization Theory and Application*, New Age International, 3rd Ed. 1998.
2. Jasbir S.Arora, *Introduction to Optimum Design*, Mc Graw Hill international Ed., 1989
3. S.D.Sharma, *Operational Research*, Kedarnath Ramnath & co., 2004.

ME 409 UE

ENTREPRENEURSHIP

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

OBJECTIVES:

a. The purpose of this paper is to prepare a ground where the students view entrepreneurship as a desirable and feasible career option. In particular the paper seeks to build the necessary competencies and motivation for a career in entrepreneurship.

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

Behavioral aspects of entrepreneurs: Personality – determinants, attributes and models, leadership concepts and models. Values and attitudes. Motivation aspects, change behaviour.

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

Suggested Reading:

1. Vasant Desai, *Dynamics of Entrepreneurial Development and Management*, Himalaya Publishing House, 1997.
2. Prasanna Chandra, Project – *Planning, Analysis, Selection, Implementation and Review,* Tata Mc Graw Hill Publishing Company Ltd., 1995.
3. B.Badhai, *Entrepreneurship for Engineers*, Dhanpath rai & Co., Delhi, 2001.
4. Stephen R. Covey and A.Roger Merril, *First Things First*, Simon and Schuster, 2002.
5. Robert D. Hisrich and Michael P.Peters, *Entreneurship,* Tata Mc Graw Hill ed., 2002.

ME 412 UE

FINITE ELEMENT ANALYSIS

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

OBJECTIVES:

a. Understand the basic assumptions of Linear Static Finite Element Analysis (FEA)
b. Understand basic FEA terminology
c. Be familiar with some of the limitations of Linear Static FEA
d. Comprehend considerations of the solid or planar CAD model relevant to the FEA model
e. Be able to run a basic FEA analysis

UNIT I

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Boundary conditions. Strain Displacement relations, Stress-strain relations. One Dimensional problems: Finite element modeling, coordinates and shape functions, Potential Energy approach: Assembly of Global stiffness matrix and load vector, Finite element equations. Treatment of boundary conditions, Quadrate shape functions.

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 nodded, 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 Axisymmetrix solids subjected to Axisymmetrix loading with triangular elements.

UNIT IV

Two dimensional four nodded 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

Dynamic Analysis: Formulation of finite element model, element matrices, evaluation of Eigen values and Eigen vectors for a stepped bar and a beam. Time dependent field problems: Application to one dimensional heat flow in a rod. Finite element formation to three-dimensional problems in stress analysis. Convergence requirements and geometric isotropy. Local, natural and global coordinates. Introduction to Finite Element Analysis Software.

Suggested Reading:

1. Tirupathi, R.Chandraputla and Ashok D. Belegunde, *Introduction to Finite Elements in Engineering*, Pearson Education, 3rd Ed., 2002.
2. Rao S.S., *The Finite Element Methods in Engineering*, Pergamon Press, 1989.
3. Segerlind L.J., *Applied Finite Element Analysis*, Wiley Publication, 1984.
4. Reddy J.N., *An Introduction to Finite Element Method*, McGraw Hill Co., 1984.

With effect from the academic year 2010-2011

BM 406 UE

MEDICAL INSTRUMENTATION

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

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

OBJECTIVES:

a. Understand the operation, application, and underlying physiological principles associated with a variety of diagnostic, therapeutic and analytical medical devices used routinely in hospitals.
b. Know the basic electrical and electronic components and circuit behavior.
c. Understand applicable codes, standards, and the intrinsic hazards associated with many of these devices.

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.
Electrochemical transducers. Potentiometric sensors, Ampero-metric sensors, Electro-Chemical gas sensors.
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:

1. John G.Webster, *Medical Instrumentation-Application and Design,* John Wiley and Sons Inc., 3rd Ed., 2003.
2. Khandpur R.S., *Hand Book of Biomedical Instrumentation,* Tata Mc Graw Hill Pub Co. Ltd., 2nd Ed., New Delhi, 2003.
3. Joseph J.Carr and John M.Brown, *Introduction to Biomedical Equipment Technology,* Pearson Education, 2001.

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 2010-2011

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.