LIST OF SUBJECTS FOR M.E. (BME) WITH SPECIALIZATION IN BIOMEDICAL ELECTRONICS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Syllabus Ref. No.</th>
<th>Subject</th>
<th>Periods per Week</th>
<th>Revision of syllabus</th>
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<tr>
<td></td>
<td></td>
<td><strong>CORE SUBJECTS:</strong></td>
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<tr>
<td>1</td>
<td>BM 501</td>
<td>Medical Sensors</td>
<td>3</td>
<td>R</td>
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<tr>
<td>2</td>
<td>BM 502</td>
<td>Advanced Medical Imaging</td>
<td>3</td>
<td>R</td>
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<tr>
<td>3</td>
<td>BM 50R</td>
<td>Medi Embedded Systems</td>
<td>3</td>
<td>M</td>
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<tr>
<td>4</td>
<td>BM 504</td>
<td>Diagnostic And Therapeutic Equipment</td>
<td>3</td>
<td>M</td>
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<tr>
<td>5</td>
<td>BM 505</td>
<td>Advanced Biomedical Signal Processing</td>
<td>3</td>
<td>R</td>
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<td>6</td>
<td>BM 506</td>
<td>Electronic System Design</td>
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<td><strong>ELECTIVE SUBJECTS:</strong></td>
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<tr>
<td>1</td>
<td>BM 520</td>
<td>Physiology For Engineers (compulsory to students with ECE, EEE &amp; E&amp;IE backgrounds, and open to BME students)</td>
<td>3</td>
<td>M</td>
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<tr>
<td>2</td>
<td>BM 521</td>
<td>Bioinformatics</td>
<td>3</td>
<td>R</td>
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<tr>
<td>3</td>
<td>BM 522</td>
<td>Medical Informatics</td>
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<td>4</td>
<td>BM 523</td>
<td>Medical Instrumentation (compulsory to students with ECE &amp; EEE backgrounds, and open to BME &amp; E&amp;IE students)</td>
<td>3</td>
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<tr>
<td>5</td>
<td>BM 524</td>
<td>Advanced Biomaterials</td>
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<td>6</td>
<td>BM 525</td>
<td>Biotransport Processes</td>
<td>3</td>
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<td>7</td>
<td>BM 526</td>
<td>Hospital Administration &amp; Management</td>
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<td>8</td>
<td>BM 527</td>
<td>Physiological Control Systems</td>
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<td>9</td>
<td>BM 528</td>
<td>Electromagnetic Biointeraction</td>
<td>3</td>
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<td>10</td>
<td>BM 529</td>
<td>Biostatistics</td>
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<td>11</td>
<td>BM 530</td>
<td>Medical Image Processing</td>
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<tr>
<td>12</td>
<td>BM 531</td>
<td>Enterprise Management</td>
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<td>13</td>
<td>BM 532</td>
<td>Medical Product Design</td>
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<td>14</td>
<td>BM 533</td>
<td>Tissue Engineering</td>
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<tr>
<td>15</td>
<td>BM 534</td>
<td>Bio Nano Technology</td>
<td>3</td>
<td>A</td>
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<td><strong>DEPARTMENTAL REQUIREMENTS:</strong></td>
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<tr>
<td>1</td>
<td>BM 507</td>
<td>Lab-I-Transducers &amp; Biosensors Lab</td>
<td>3</td>
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<tr>
<td>2</td>
<td>BM 508</td>
<td>Lab-II- Embedded Systems Lab</td>
<td>3</td>
<td>R</td>
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<tr>
<td>3</td>
<td>BM 509</td>
<td>Seminar -I</td>
<td>3</td>
<td>R</td>
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<tr>
<td>4</td>
<td>BM 510</td>
<td>Seminar-II</td>
<td>3</td>
<td>R</td>
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<tr>
<td>5</td>
<td>BM 511</td>
<td>Project Seminar and Dissertation</td>
<td>6</td>
<td>R</td>
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<tr>
<td>6</td>
<td>BM 512</td>
<td>Dissertation</td>
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<td>R</td>
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</table>

R – Retained    M – Modified    A – Added Syllabus
With effect from the academic year 2009-2010

BM 504

DIAGNOSTIC AND THERAPEUTIC EQUIPMENT

Instruction 3 Periods per week
Duration of University Examination 3 Hours
University Examination 80 Marks
Sessionals 20 Marks

UNIT – I

UNIT – II
Cardiac Valves, different types – Mechanical and Tissue types.
Angioplasty. Balloon and Stent Angioplasty.
Stents, different types – coil, slotted tubular, drug eluting stents,
Sterilization techniques: Autoclave, Gas, Dry Heat, Radiation, Dry Steam sterilization.
Lithotripsy Systems. Techniques and Equipment

UNIT – III
Intensive Coronary Care Units: Central Monitoring system, Drug Delivery Systems, Intelligent Drug Delivery, Neurological Instrumentation,
Respiratory Care Unit Equipment, Nebulizers, Mechanical Ventilators, CPAP.

UNIT – IV
Perfusion Equipment, Anaesthesia, Ventilators, Heart Lung machine, Fumigators,

UNIT – V
Radio Therapy. Cobalt Unit, Ionization Chambers, Geiger Muller Counters, Gas proportional counters, Scintillation Counters, Solid State Radiation Detectors, Linear Accelerators, Radiation Therapy Stimulator, Treatment planning system.

Suggested Reading :
BM 520

PHYSIOLOGY FOR ENGINEERS
(Compulsory to students with EEE, E&EI & ECE back grounds)

Instruction 3 Periods per week
Duration of University Examination 3 Hours
University Examination 80 Marks
Sessionals 20 Marks

UNIT – I

UNIT – II

UNIT – III

UNIT – IV

UNIT – V
Suggested Reading:
2. Mount castle Textbook of medical physiology Better World Books, IN, USA
3. Walter F. Boron, Textbook of medical physiology, W.B. Saunders Company
4. Zipes, Jalife, Cardiac Electrophysiology
5. Eric R. Kandel, Principles of Neural Science, Elsevier science division
6. un Kimura, Electrodiagnosis in diseases of nerve and muscle, W.B. Saunders Company
With effect from the academic year 2009-2010

BM 525

BIOTRANSPORT PROCESSES

Instruction 3 Periods per week
Duration of University Examination 3 Hours
University Examination 80 Marks
Sessionals 20 Marks

UNIT - I

UNIT - II
Heat transfer systems. Modes of heat transfer, conduction, convection and radiation. Heat production, heat loss to the environment, role of blood circulation in internal heat transfer, models for heat transfer within the body.

UNIT - III

UNIT - IV

UNIT - V
Compartmental models. Approaches to pharmacokinetic modeling and drug delivery, one and two compartmental models. Physiological applications-intravenous injection, constant intravenous infusion, determination of regional blood flow volumes and blood flow rates.

Suggested Reading:
BM 528

ELECTROMAGNETIC BIOINTERACTION

Instruction 3 Periods per week
Duration of University Examination 3 Hours
University Examination 80 Marks
Sessionals 20 Marks

UNIT-I
Electromagnetic Spectrum, Exposure and absorption parameters, International guidelines, Currents induced in standing human being for vertically polarized plane wave exposure conditions, contacts hazards in VLF to HF band, thermal implications of high SARs. Coupling of human body to RF magnetic fields, Radio Frequency protection guide (RFPG).

UNIT-II

UNIT-III
Role of Experimental Techniques and Instrumentation in bioelectromagnetics: Irradiation systems for bioeffects experiments, Far-field exposure techniques, Instrumentation, Measurements of internal fields and radiofrequency absorption in biological systems, Instruments for measuring Specific Absorption Rates.

UNIT-IV
EM energy absorption in human and animals: Measurement techniques, Free space irradiation conditions, Ground effects, SAR exposure assessment and safety guidelines. Biological effects and Health implications: Effects due to extremely LF and 60 Hz fields.

UNIT-V
Biological effects of millimeter wave radiation: Experimental approaches, frequency specific effects, genetic systems, cellular and sub cellular effects. Electromagnetic methods for medical applications.

Suggested Reading:
With effect from the academic year 2009-2010

BM 534

**BIO NANO TECHNOLOGY**

<table>
<thead>
<tr>
<th>Instruction</th>
<th>3 Periods per week</th>
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<tbody>
<tr>
<td>Duration of University Examination</td>
<td>3 Hours</td>
</tr>
<tr>
<td>University Examination</td>
<td>80 Marks</td>
</tr>
<tr>
<td>Sessionals</td>
<td>20 Marks</td>
</tr>
</tbody>
</table>

**UNIT-I**

*Introduction to Nanotechnology:* Nanomaterials, Fullerenes and carbon forms. Nanoparticles and Colloids, structure and bonding in nanoparticles, Nanomaterials fabrication by Bottom-up and Top down approaches, Classification of nanodevices based on the characteristics, Quantum dots and their properties.

**UNIT-II**

*Carbon nanotubes:* Carbon nanoparticles, types of carbon nanotubes, single-walled, multi-walled, torus, nanobud, properties of carbon nanotubes, and synthesis by Arc discharge, laser ablation, chemical vapor deposition techniques.

**UNIT-III**

*MEMS & NEMS:* Definition of MEMS, materials for MEMS (Silicon, Polymers and metals) and their properties, Deposition processes, Photolithography, and etching processes, Limitations of MEMS, NEMS, difference between MEMS and NEMS, properties of NMES, fabrication processes, applications.

**UNIT-IV**


**UNIT-V**

*Bio molecular nanotechnology:* Nanorobots and their application, nanosensors based on biomolecules such as DNA and proteins, nanoparticles for gene delivery systems, Computational genes, Biosensors for Glucose and measurement, Optical biosensors and their application.

**Suggested Books:**

With effect from the academic year 2009-2010

BM 503

MEDI-EMBEDDED SYSTEMS

Instruction  3 Periods per week
Duration of University Examination  3 Hours
University Examination  80 Marks
Sessionals  20 Marks

UNIT-I
Embedded Systems: Basic concepts, requirements, categories, Hardware architecture, Software architecture, Communication software, Development-Design technology, IC technology, processor based technology, Design life style, Processor development. Embedded operating system—Types. Microprocessor vs. Microcontroller.

UNIT-II

UNIT-III

UNIT-IV
Process, task, thread, ISR. Operating system services—goals structures. Kernel, Process Management, Memory management, device management. File systems. Input-output sub systems, task scheduling models. Round Robin, preemptive, real time scheduling. Inter process communication and synchronization. Semaphores, priority inversion, dead lock, message queues, mail boxes, pipes, virtual sockets, RPCs

UNIT-V

Suggested Reading: