With effect from the academic year 2012-2013

SCHEME OF INSTRUCTION&EXAMINATION
(BIO-MEDICAL ENGINEERING)
B.E.II YEAR (SEMESTER-I)

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THEORY

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PRACTICALS
BM 201 UE

ANATOMY

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

COURSE OBJECTIVES: To study systemic anatomy i.e., the structure and position of the systems in the human body like the respiratory, circulatory, digestive, urinary, reproductive, endocrine and nervous systems.

UNIT-I

UNIT-II
Nervous System: Classification into Central Nervous System (CNS), Peripheral Nervous System (PNS), Autonomic Nervous System (ANS).

UNIT-III
Respiratory system: Various parts of Respiratory System-Trachea, Bronchial tree, Lungs.

UNIT-IV
Digestive System: Parts of Digestive System. Important parts of Gastro Intestinal Tract (GIT) and associated glands.

UNIT-V
Endocrine Glands: Location, Descriptions and functions-Thyroid, Pituitary, Pancreas, Supra renal, Parathyroid-Important relations, Secretions.

Suggested Readings:
WITH EFFECT FROM THE ACADEMIC YEAR 2012-2013

BM 202 UE

PHYSIOLOGY

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

COURSE OBJECTIVES: This course is designed such that the student is exposed to various mechanisms involved in the normal functioning of human body underlining the basic working principles of different biological processes with Engineering tools. It deals with the overall functional orientation of a living organism which has undergone a variably rapid change all through its process of evolution. Casting a systematic array of different systems such as respiratory, circulatory, neuromuscular mechanisms, stimuli propagation etc, emphasizing on the clinical importance of the same.

UNIT-I
GENERAL PHYSIOLOGY
Evolutionary aspects of biological systems, Thermodynamics of biological systems, Digital and analog molecules, Patterning of activity, Active and Passive process, Molecular homeostasis(molecular plasticity),Endogenous feed forward circuitry, Development and consolidation, stratified stabilities, Homogenous and Heterogeneous integration of Bio-molecules, Organelles, Integration of Organelles, Cells, Membrane Physiology, Transport across cell membrane, genesis of membrane potentials, Nernest equation, Resting membrane potential, Goldman-Hodgkin-Katz equation, Cable properties(Local signaling-Analog Potentials(Digital mode),Hodgkin-Huxley model, Differential equations of action potentials, Voltage-Clamp and Patch-clamp methods, Signal Processing-Synapse, signal Transduction, Neuro transmitters, Biological amplification and filtration, Signal Integration(Input-sensory),Centers of Integration-Spinal Cord, Brain Stem, Cerebral Cortex, Motor System(Output)-Organization-Cortical, Sub cortical and spinal, Reflex process, NMJ, Smooth muscle, Cardiac Muscle, Skeletal muscle, Excitation-Contraction coupling, Sarcomere-Contractile Unit, Motor Unit, Frequency and Intensity related summation(temporal and Multi motor unit Summation),Tetanus, Load, Fatigue, EMG.

UNIT-II
CARDIOVASCULAR SYSTEM
Conducting system of the Heart, ECG, Blood as Non-Newtonian fluid, Dynamics of peripheral circulation, Resistance and Impedance, Streamline and Turbulent flow, Raynold’s Number, Poisulle equation, Bernoulli equation, B.P., Control systems- Neurohumoral regulation, applied aspects.

UNIT-III
RESPIRATORY SYSTEM
Biophysics of Transport Across Respiratory Membrane, Perfusion and Diffusion limited process, Ventilation, Alveolar, Shunt and Dead space equations, Ventilation-perfusion inequalities, Physiological and anatomical shunts and dead spaces, Biophysics of transport of gasses in the blood, hemoglobin-oxygen association and dissociation curve, Haldane and Bohr effect, Applied aspects, Ventilators.
UNIT-IV
RENAL SYSTEM
Regulation of volume and composition of Body fluids, Clearance equations, Biophysics of Filtration, Re-absorption and secretion, Counter current Multiplication and Exchange, Acid-Base Balance, regulation of Body Temperature-Physical and Physiological process, applied aspects, Dialysis, etc.
ENDOCRINE SYSTEM AND REPRODUCTIVE SYSTEM
Hormonal regulation of Body functions, Overview of Reproductive Physiology.

UNIT-V
NERVOUS SYSTEM
Higher functions of Brain(Perception, Rule of special senses, Learning and memory), Cybernetics of living systems, Neuro-Endocrine Control System, Servo mechanism, Posture and equilibrium, Motor skills, Neural Network related to the cognitive functions of the brain, near field(EEG) and Far Field Potentials(Evoked Potentials).

Suggested Readings:
2. Best and Taylor, *Physiological basis of Medical Practice.*
BM 203 UE

BIOCHEMISTRY

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

COURSE OBJECTIVES: To study the basic chemical reactions occurring inside the cell which are responsible for the physiological activity of the body are studied under this disciplinary course. This also includes the clinical study of the pathology through different techniques of analysis like the analysis of blood, urine, cerebro spinal fluid etc. This study also enlightens the students with the basic course of reactions occurring with the DNA and RNA which determine the characteristic features of the human.

UNIT-I

UNIT-II
Broad chemical nature of enzymes-Isolation and study of the properties of enzymes. Study of enzyme kinetics by spectrophotometry. Diagnostic and Therapeutic uses of enzymes.

UNIT-III

UNIT-IV
Chemical composition of blood-Separation of serum proteins and lipoproteins by electrophoresis and ultracentrifugation. Acid-Base balance and biochemical measurements of acid-base and electrolyte status of the patients. Urine Analysis.

UNIT-V
General methods of biochemical analysis carried out in the estimation of blood constituents, such as glucose etc. Principles and different methods of chromatography-fluorometry, flame photometry, Applications of isotopes in biochemistry.

Suggested Readings:
EC 202 UE  

CIRCUIT ANALYSIS  
(Common to ECE and BME)  

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

COURSE OBJECTIVES:  
Students are exposed to analysis of physical circuits through the use of Kirchhoff's laws and ideal circuit element models. Strong emphasis is placed on the formulation of nodal equations for linear circuits as a foundation. Transient analysis of second order circuits with unit step inputs and switched dc sources is emphasized to promote understanding of time-domain linear circuit response. Finally, students will master concepts of coupled inductors and transformers.  

UNIT-I  

UNIT-II  

UNIT-III  
Response of RLC networks to exponential excitation, quality factor, damping ratio, Bandwidth of resonant circuits, sinusoidal excitation, steady state response, impedance and admittance functions, responses related to S-Plane location of roots.  

UNIT-IV  
Circuit analysis using Laplace Transforms, basic theorems of Laplace transforms, Laplace transform of periodic signals, unit, step, ramp and impulse functions, initial and final value theorems, solutions using Laplace transforms.  

UNIT-V  
Network Topology, Graph, tree, Tie set and cut set matrix, impedance matrix formulation of node and loop equations using Tie set and cut set, Schedule quality.  

Suggested Reading:  
1. Valkenberg M.E Van, Network Analysis, PHI, New Delhi, 1996  
3. Choudary Roy D, Network and Systems, New Age India, 1999
EC 221 UE

ELECTRONIC ENGINEERING-I
(Common to EEE and BME)

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

COURSE OBJECTIVES: The study of components and circuits used to construct items such as audio amplifiers, radio transmitters and computer circuits. Students learn about elementary electronic components, diodes, application of diodes, rectifiers, filters, transistors, and types of transistors, different applications of transistors (CB, CE, CC amplifiers) integrated circuits (like operational amplifiers: inverting and Non-inverting amp, summing circuits etc.) and computer circuitry (digital systems) and different types of digital families.

UNIT-I
Semiconductor Diodes: Mobility and conductivity, electrons and holes in an intrinsic semiconductor, donor and acceptor impurities, the volt-ampere characteristic. The open-circuited p-n junction, the diode as a circuit element, the load-line concept, the p-n junction as a rectifier, principles of Half-wave and full-wave rectification, ripple and regulation, capacitor filters.

UNIT-II
Bipolar Junction Transistor and Transistor Biasing Circuits: The Junction transistor, Current components, the transistor as an amplifier, the common base, common emitter and common collector configurations, operating point, fixed-bias, emitter stabilized basis circuits, voltage-divider bias, DC bias with voltage feed back. Amplification in the AC domain, BJT Transistor modeling parameter: Zi, Zo, Av, Ai. The hybrid equivalent model, small-signal analysis of transistor amplifier using h-parameters for CE CB CC configurations.

UNIT-III
The junction field-effect transistor, Pinch-off voltage, volt-ampere characteristics, the FET small-signal model, the Metal-Oxide-Semiconductor FET(MOSFET). Small signal analysis of common source, common gate, and common-drain amplifiers. FET Biasing.

UNIT-IV

UNIT-V
Digital (Binary) Operation of a system, The OR gate, The AND gate, The NOT, or Inverter circuit, The INHIBIT(ENABLE) operation, The EXCLUSIVE OR circuit DeMorgan’s laws. The NAND and NOR Diode Transistor logic gates, Transistor-Transistor Logic(TTL) gates, Output stages, Resistor-Transistor Logic(RTL) and Direct-Coupled Transistor Logic(DCTL)
Suggested Reading
BM 231 UE

ANATOMY LABORATORY

Instruction: 3 Periods per week
University Examination: 50 Marks
Sessional: 25 Marks
Credits: 2

1. Histology-Slides of primary tissues of body
2. Study of Gross anatomy of the human body
3. Study of dissected Upper Limb
4. Study of dissected Lower Limb
5. Study of dissected Brain
6. Study of dissected Thorax-Heart
7. Study of dissected Thorax-Major Blood Vessels
8. Study of dissected Thorax-Various parts of respiratory system-Trachea, Lungs.
9. Study of dissected abdomen-Digestive organs.
10. Study of dissected abdomen-Other abdominal organs.
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1. Recording of B.P. and effects of Physical exertion and posture on this parameter.
2. Recording of mechanical response of the muscle on application of induced electric signal.
4. Study of rate of conduction of nerve impulse.
5. Spirometry-recording tidal volume, inspiratory reserve volume, expiratory reserve volume, vital capacity and index and effect of posture on vital capacity.
6. Isolated heart perfusion by Legendraff Technique (demonstration).
7. Isolated frog’s heart perfusion and effects of ions (Mg, ca, K) using slow micro-injector demonstration).
8. Test of hearing using Tuning Fork.
9. Test of vision:
   a) Acuity of vision           b) Colour vision
   c) Ophthalmoscopy           d) Error of refraction
10. Recording of EMG, ECG and EEG by polygraph (Demonstration).
11. Examination of sensory system.
12. Examination of motor system.
13. Recording of action potential and its display on oscilloscope (Demonstration).
WITH EFFECT FROM THE ACADEMIC YEAR 2012-2013

BM 233 UE

BIOCHEMISTRY LABORATORY

Instruction: 3 Periods per week
University Examination: 50 Marks
Sessional: 25 Marks
Credits: 2

2. Study of Chromatography of amino acids.
4. Study of Spectrophotometry.
5. Study of pH meter.
7. Quantitative estimation of glucose.
11. CSF Analysis.
WITH EFFECT FROM THE ACADEMIC YEAR 2012-2013

ELECTRONICS ENGINEERING LAB-I

Instruction: 3 Periods per week
University Examination: 50 Marks
Sessional: 25 Marks
Credits: 2

1. Identification of different types of diodes, resistors, capacitors and transistors.
2. Usage of multimeter, CRO, function generator, LCR meter, power supplies and bread board.
3. Testing of resistors, capacitors, diodes and transistors.
4. Characteristics of Semi-conductor Diodes (Si, Ge and Zener)
5. Characteristics of Bipolar-junction Transistors (only CB and CE) (only Static Characteristics)
6. Characteristics of Field effect Transistors
7. Rectifiers:
   a) Half-wave Rectifier
   b) Full-wave Rectifier without Filters
   c) Half-wave Rectifier with Filters
8. Regulators:
   a) Series and Shunt Regulators
   b) Regulators ICs
   c) SMPS Circuits for power supply regulation
9. Clipping and clamping circuits using diodes
10. Operational amplifier applications:
   a) Inverting
   b) Non-inverting
   c) Summing circuit
   d) Log Amplifiers
   e) Precision Rectifiers etc.,
11. Truth table verification of AND, OR, NOT, NAND, NOR, XOR, XNOR