

ગુજરાત જાહેર સેવા આયોગ

જા.ક્રમાંક - ૯૦/૨૦૧૫-૧૬

સરકારી ઇજનેરી કોલેજ ખાતેના બાયોમેડીકલ એન્જીનીયરીંગના સહાયક પ્રાધ્યાપક, વર્ગ -૨
પ્રાથમિક કસોટીનો અભ્યાસક્રમ (ભાગ-૧ સામાન્ય અભ્યાસ)

માધ્યમ - ગુજરાતી

કુલ પ્રશ્નો-૧૦૦

કુલ ગુણ-૧૦૦

૧.	ગુજરાતની ભૌગોલિક, આર્થિક અને સામાજિક ભૂગોળ
૨.	ગુજરાતનો સાંસ્કૃતિક વારસો - સાહિત્ય, કલા, ધર્મ અને સ્થાપત્યો.
૩.	ભારતની ભૂગોળ-ભૌગોલિક, આર્થિક, સામાજિક, ખેતી, કુદરતી સંશાધનો અને વસતી અંગેની બાબતો.
૪	વિશ્વ ભૂગોળની સામાન્ય ભૌગોલિક માહિતી
૫.	ભારતનું બંધારણ: (૧) આમુખ (૨) મૂળભૂત અધિકારો અને ફરજો (૩) રાજ્યનિતીના માર્ગદર્શક સિદ્ધાંતો (૪) સંસદની રચના (૫) રાષ્ટ્રપતિની સત્તા (૬) રાજ્યપાલશ્રીની સત્તા (૭) ન્યાયતંત્ર (૮) અનુસૂચિત જાતિ, અનુસૂચિત જનજાતિ અને સમાજના પછાત વર્ગો માટેની જોગવાઈઓ (૯) એટર્ની જનરલ (૧૦) નીતિ આયોગ (૧૧) પંચાયતી રાજ (૧૨) નાણા પંચ (૧૩) બંધારણીય સંસ્થાઓ - ભારતનું ચૂંટણી પંચ, સંઘ લોક સેવા આયોગ, રાજ્ય સેવા આયોગ, કોમ્પ્રોલર અને ઓડિટર જનરલ
૬.	ભારતની અર્થવ્યવસ્થા
૭.	ભારતનો ઇતિહાસ
૮.	સામાન્ય વિજ્ઞાન, પર્યાવરણ તથા ઈન્ફર્મેશન એન્ડ કોમ્યુનિકેશન
૯.	સામાન્ય બૌદ્ધિક ક્ષમતા કસોટી
૧૦.	ખેલ જગત
૧૧.	માહિતી (મેળવવાનો) અધિકાર અધિનિયમ ૨૦૦૫
૧૨.	ગુજરાતી વ્યાકરણ (૧) જોડણી (૨) સમાનાર્થી-વિરુદ્ધાર્થી શબ્દો (૩) સંધિ (૪) સમાસ (૫) રૂઢિપ્રયોગ અને કહેવતો
૧૩.	English Grammar (1) Tenses, Gerund and Participles. (2) Agreement between Verb and Subject, order of words, punctuations etc. (3) Usage of Articles, Nouns, Pronouns, Adjectives, Prepositions, Auxiliaries, Conjunctions and Question Tag etc. (4) Idioms and Phrasal Verbs. (5) Active and Passive Voice. (6) Common Errors of Usage.
૧૪.	પ્રાદેશિક, રાષ્ટ્રીય અને આંતરરાષ્ટ્રીય મહત્વના બનાવ.

જા.ક્રમાંક - ૯૦/૨૦૧૫-૧૬

સરકારી ઇજનેરી કોલેજ ખાતેના બાયોમેડીકલ એન્જીનીયરીંગના સહાયક પ્રાધ્યાપક, વર્ગ -૨

પ્રાથમિક કસોટીમાં સંબંધિત વિષયનો અભ્યાસક્રમ (ભાગ-૨)

માધ્યમ - અંગ્રેજી

કુલ પ્રશ્નો-૧૦૦

કુલ ગુણ-૨૦૦

Sr. No	Topic	Syllabus
1	Life Science	Elements of human anatomy, Terms related to Anatomy, Anatomical plane, Anatomical position Cell and Tissues, Physical Structure of the Cell, Types of tissue, its location, properties & function Skeletal muscle system, Structure & formation of Bone, Young bone, Adult bone, Types of the bone, Blood supply to the bone, applied anatomy of the bone, Joints & its types, applied anatomy of joints, Muscle & its types, Muscle fasciculi, Applied anatomy of muscle. Thorax & Respiratory System, Thoracic cavity diaphragm, sternum, rib & rib cage, vertebral column, Vertebra, structure of respiratory tract, pleura, and lungs. Cardiovascular System, Structure of Heart, Heart valves, Arteries, Veins, blood supply of heart coronary circulation. General physiology, Functional System of the cell & its organelle, Homeostasis, Endocytosis, Exocytosis. Membrane physiology, Nerve & Muscle, Transport of Ions and Molecules through the cell membrane; Membrane Potentials and Action Potentials; Inhibition of Excitability, Recording Membrane potentials and Action potentials, skeletal muscle, Sarcomere, EMG, Neuron, neuromuscular transmission. Body Fluid, Blood and its composition and function. Various Cells and their structures. Numbers Cell counting, Haemoglobin and its estimation, Anaemia, Haemostatic, Blood Group. Respiratory system, Mechanism of Respiration, Pulmonary Ventilation, Pulmonary Volumes and Capacities. Transport of Gases, Pulmonary function testing. Artificial Respiration, hypoxia. The Heart, Heart muscle, heart as a pump, Heart sound & blood pressure, cardiac cycle, Cardiac output. Conduction system of the heart, ECG, Arrhythmia, Special Senses, Vision, structure of Eye, optic nerve, Mechanism of accommodation, Visual acuity, Ophthalmoscope, Colour vision, Perimeter Hearing, structure of ear, Tympanic membrane, cochlea, Hearing mechanics and abnormality, Deafness, Audiometry. Nose, sense of smell Tongue, sense of taste, Excretory system, Brief structure of kidney, Size, shape & location of kidney. Blood supply to kidney, nerve supply to the kidney, ureter, bladder, Structure of skin. Digestive system, Size, shape, location various organ of digestive system Nervous System, Outline of Cranial and Spinal nerves. Structure of Spinal Cord and different Brain parts. Vertebral column and cranial cavity Reproductive system, male reproductive organs, female reproductive organs. Excretory system, Function of kidney, urine formation, Concentration and Dilution of Urine, micturition, Renal Function Tests, Dialysis, Artificial Kidney, Function of skin. Digestive system, organs of digestive system, movement of gastro intestinal tract, mastication, deglutination, physiological activities in mouth, pharynx, oesophagus,

		stomach, pancreas, liver, gall bladder, small and large intestine, Digestion and absorption. Nervous System, Neuron, Neuroglia cell, Synapse, Receptors, Sensorytract, motor tract, reflex arc, EEG. Reproductive System, Spermatogenesis; Ovarian cyclephysiology. Physiology of menstruation, Pregnancy and Contraception. Endocrine system, endocrine glands, physiological action of the hormones secreted by pituitary, thyroid, parathyroid, islets of Langerhans, adrenal, testes, ovaries, biofeedback mechanism of hormone regulation.
2	Basic Electronics & Advance Electronics	Energy Bands in Solids, Transport Phenomena in Semiconductors, Junction – Diode Characteristics, Diode Circuits, Transistor Characteristics, Transistor at Low Frequencies, Transistor Biasing and Thermal Stabilization, Field Effect Transistors, Power Circuits and Systems. Transistor at High Frequencies, Transistor at High Frequencies, Feedback Amplifiers, Stability and Oscillators, Operational Amplifiers, Logic Families, Analog To Digital And Digital To Analog Converters.
3	Circuits And Networks	Circuit Variables and Circuit Elements, Nodal Analysis and Mesh Analysis of resistive Circuits, Circuit Theorems, Time domain response of First order RL and RC circuits, Time domain response of Second order linear circuits, Initial Conditions, Laplace Transform Analysis, Circuit Applications, Laplace Transform Analysis, Transfer Function Applications, Two –Port Networks, Introduction to Network Topology.
4	Digital Logic Design	Binary System, Boolean Algebra and Logic Gates , Simplification of Boolean Functions, Combinational Logic Combinational Logic With MSI AND LSI, Sequential Logic, Registers Transfer Logic & Micro-Operation, Registers, Counters and the Memory unit, Processor Logic Design, Control Logic Design.
5	Micro-processor and Interfacing & Micro-controller And Interfacing	introduction to Microprocessor, Microprocessor systems with bus organization, Microprocessor Architecture & Operations, Memory, I/O Device, Memory and I/O Operations 8085 Microprocessor Architecture, Address, Data and Control Buses, Pin Functions, Demultiplexing of Buses, Generation of Control Signals, Instruction Cycle, Machine Cycles, T-States, Memory Interfacing. Assembly Language Programming Basics, Classification of Instructions, Addressing Modes, 8085 Instruction Set, Instruction and Data Formats, Writing, Assembling & Executing A Program, Debugging The Programs, Decision Making, Looping, Stack & Subroutines, Developing Counters and Time Delay Routines, Code Conversion, BCD Arithmetic and 16-Bit Data Operations. Interfacing Concepts, Ports, Interfacing of I/O Devices, Interrupts in 8085, Interfacing of Data Converters (D-To-A and A-To-D), Programmable Interfacing Devices Like 8279 Keyboard/Display Interface, 8255A PPI, 8253/8254 Timer, 8259A PIT, 8237 DMA Controller, Serial I/O Concepts, SID and SOD, 8251A USART. Interfacing of above chips With 8085, Programming them In Deferent Modes, Practical Applications, 8051 Microcontrollers, 8051 Assembly Language Programming, Jump, Loop, And Call Instructions, I/O Port Programming, 8051 Addressing Modes, Arithmetic and Logic Instructions and Programs, 8051 Programming in C, , 8051 Hardware

		Connection and Intel Hex File, 8051 Timer Programming in Assembly and C, 8051 Serial Port Programming in Assembly and C, Interrupts Programming in Assembly and C, LCD and Keyboard Interfacing, ADC, DAC, and Sensor Interfacing, 8051 Interfacing to External Memory, RTC Interfacing and Programming, Motor Control, Relay, PWM, DC and Stepper Motors.
6	Biomaterials & Implants	Introduction To The Use Of Non-Pharmaceutical Biomaterials, Polymers, Metals, Metallic Alloys & Ceramics, Composite Bio-Materials, Mechanical Properties, Bio –Compatibility, Implant Surgical Devices, Rehabilitation Devices Used For Physiological Functions Of Human Body Systems-Improvement Or Replacement.
7	Biomedical Transducers	Generalized Instrumentation Scheme, Transduction Principles, Temperature Transducers, Pressure Transducers, Flow Transducers, Displacement Transducers, Nuclear Radiation Transducers, Bioanalytical Sensors, Bio potential Measurement, Introduction to smart sensors, MEMS and Nano Sensors.
8	Signals And Systems	Signals and systems, time-domain analysis of continuous-time systems, time-domain analysis of discrete-time systems, discrete-time system analysis using the z-transform, continuous time signal analysis, the Fourier transform, sampling, the bridge from continuous to discrete.
9	Analytical & Optical Instrumentation	Principle involved in Biochemical, Pathological & microbiological laboratory techniques in clinical diagnosis. Instrumentation techniques, Analytical techniques like Spectro photometry, Calorimetry, Auto analysis, Semi auto analysis, gas & electrolyte analysis, flame photometry, chromatography, Chromatography, Electrophoresis, Glucometer, Measurement of pH, RIA units. PCR units, ELISA reader, Dispenser & washer, Pulse-oximetry, Capnography, Arterial blood analysis etc. and their significance in different diagnosis and prognosis of various clinical disorders. Microscopy - simple, compound, binocular, trinocular, dark ground microscopy Phase contrast microscopy, electron microscopy, CCTV, microphotography & projection etc& their importance in clinical diagnosis Special microscopy like endoscopy. Use of fibre optics. Incubators, autoclaves, centrifuges, hot air oven, Balances, Auto pipettes, microtome, Processing like automatic tissue processing ("Histokinette"), Laboratory counters; Anaerobic apparatus, Laminar flow tables, Spectrophotometer, Colorimeter, Auto analyzer, Semi auto analyzer, flamephotometer, Glucometer, pH meter, RIA units. PCR units, ELISA reader, Dispenser & washer, Pulse-oxymeter, Arterial blood analyzer. Endoscopes. Microscopes of various types including electron microscope. Chromatograph, Electrophoresis apparatus. Blood Gas Analyzers, Blood PCO2 Measurement; Measurement of blood PCO2; Complete Blood Gas Analyzer, Blood cell counter.
10	Bio-Medical Control Theory	Introduction to Control system, Mathematical Modelling, Transient Response, Basic Control Systems, Root Locus, Frequency Response.
11	Bio-Medical	Introduction to signals and systems. Transform Analysis of Linear Time-

	Signal Processing	Invariant System, Structures for Discrete Time Systems, Filter Design Techniques, Discrete-Fourier Transform, Computation of Discrete-Fourier Transform, Introduction to DSP processor architecture and its Applications. Biomedical Signal Analysis.
12	Diagnostic Instrumentation	Cardiovascular diseases and their diagnosis, respiratory disorders and their diagnosis, GI tract disorders their diagnosis, metabolic disorders and their diagnosis, nervous system disorders and their diagnosis, ocular disorders and their diagnosis, auditory disorders and diagnosis, obstetric & gynaecological problems and their diagnosis like USG & endoscopy. Biotelemetry and their clinical significance. electrocardiograph, electroencephalograph, instruments for measurement of physiological parameters, electronic manometer, electro-sphygmomanometer, electronic stethoscope, blood flow meter, thermometer, tonometer, auto- refractrometer, spirometer, audiometer, diagnostic x-ray machine, diagnostic ultrasound.
13	Therapeutic Instrumentation	DC Defibrillator, Dialysers, Principle of surgical diathermy. Electrosurgical equipments and techniques. Electrotomy, fulguration, coagulation, dessication. Electro surgery units, spark gap valve, solid-state generator. Construction and working of surgical diathermy machine, electrodes used. Safety aspects like burns, high frequency current hazard, and explosion hazard, operating principle of surgical diathermy analyzer. Basic concepts about LASER. LASER coherence. Its principle of operation, properties, gain medium, pumping mechanism and resonator design. Types of LASER, pulsed ruby laser, ND YAG laser, argon laser and CO2 laser. Applications of laser in medicine, control of gastric haemorrhage by photocoagulation, retinal detachment. Short-wave, diapulse, and microwave, ultrasonic therapy, circuit description, application and dosage control. Electrotherapy, diagnosis, electrical stimulation for pain relief, apparatus and current waveforms, electrodes. Spinal cord stimulator and cerebral stimulation, Neonatal instrumentation, Incubator, Anaesthesia machine, Cardiovascular and vascular surgery, catheters, heart lung machine, octopus, monitors, coronary angiography, balloon angiography, stents.
14	Biomechanics	Mechanics of Blood flow-Heamorheology., Mechanics of muscle. Mechanics of cardiovascular & pulmonary system, Nature and Mechanism of biological control system. Feedback control and its components. Control of body temperature, Control of Blood pressure, Heart rate. Control of secretion. Control of movements etc. Biomechanics of solids, Fundamentals of Physiological fluid mechanics, Mass transfer & Bio heat transfer, Locomotion and muscle biomechanics.
15	Hospital Management & Clinical Technology	Various Aspects of Hospital Services, Organization Of Bio-Medical Engineering Department, Support Services, Hospital Management, General Management Functions, Management Information System For Hospital, Material Management, Personnel Management & Quality Management & Audit Maintenance Management, Waste Management, Cost Control & Financial Management.
16	Image Processing	Basics of Image processing, Image Enhancement, Image Segmentation, Image transforms, Morphological Image Processing, Image Compression,

		Representation and Description.
17	Intellectual Property Rights And Bioethics	Importance of IPR, Patentable subject matter, Novelty and Public Domain, Intellectual Property Right and Developing World, Intellectual Property Management, Case studies- Basmati rice, Neem, Patent Claims and Legal decision-making process, Brief Study International conventions and Treaties (WIPO), patenting a biological material. Introduction of Patents and patent application process (national and International), Trade Secrets, Copy Rights, Geographical Indicators, Trade Marks, PBR in UPOV, GATT and TRIPS. Introduction to bioethics, Bioethics, Value of life, Professional ethics in biomedical.
18	Medical Imaging Technology	Fundamentals of Physics and Radiation, Imaging with X-Rays, X-ray Diagnostic Methods, Computed Tomography, Imaging with Ultrasonography, Developments in Ultrasound technique, Biological effects of Radiation and Ultrasound and its protection, Advances in Imaging, Nuclear medical imaging, infrared imaging.
19	Physiological System Modelling	Introduction to Physiological control systems, Illustration- example of a physiological control system. Difference between engineering and physiological control systems. Art of modeling Physiological systems, linear models of physiological systems- distributed parameters versus lumped parameter models. Principle of superposition, Laplace transforms and transfer functions, Impulse response and linear convolution, Cardiovascular system modeling and simulation. Theoretical basis, model development, heart model, circulatory model, computational flow diagram of the cardiac system, software development. Pulmonary mechanics modeling and simulation. Theoretical basis, model development, Lung tissue viscoelastance, chest wall, airways-full model of respiratory mechanics. Pulmonary system software development computational flow diagram. Interaction of Pulmonary and Cardiovascular models. Computational flow diagram for cardiopulmonary software development, Time domain analysis of linear control system, Frequency Domain analysis of linear control system, Eye movement system and Wetheimer's saccade eye model. Oculomotor muscle model. Linear muscle model. Simple models of muscle stretch reflex action, ventilatory control action, Lung mechanics Identification of Physiological control systems, Non parametric and Parametric Identification methods. Problems in parameter estimation, Identification of closed loop system and opening loop technique.
20	Robotics & Artificial Intelligence	Introduction Automation and Robots, Classification, Application, Specification, Notations. Intelligent Robotics, Automation and Robots, Robot Classification, Robot Specifications, Sensory perception, Robot control and Intelligence. Direct Kinematics, Inverse Kinematics, Work space Analysis and Trajectory Planning, Basic Concepts of Artificial Intelligence, Elements of Knowledge Representation, Task Planning, Applications in Biomedical Engineering.
21	Advanced Medical Techniques	Bio signal Analysis, Arrhythmia detection and classification, Heart rate variability measurement, analysis and applications. EEG signal Analysis and diagnostic applications, Biomedical Imaging, Fundamental and Standards of

		Compression & Communications, Medical Image Achieve and Retrieval, Image Standardization in PACS, Data Registration and Fusion, Content based data retrieval Techniques. Image Reconstruction Techniques; CT image Reconstruction, Algebraic Method, Back Projection and Filtered Back Projection Method, Reconstruction of MRI Images. LASER and its medical applications, Application of Lasers in therapy and diagnosis, Single Optical Fibers, Optical fibers, Endoscopy, Fiber Optic Diagnosis, Fiber Optic Laser system for Diagnostics and therapy, Clinical applications of fiber optic Laser systems, Minimally Invasive Cardiovascular Technologies, Hyperbaric Oxygen Therapy, Image Guided Thermal Therapy.
22	Bioinformatics	Introduction to Bioinformatics, Sequence Alignments, Gene Prediction Methods, Protein Structure and Modeling, Simulation & Statistical Protocols, Application of LINUX and PERL for Bioinformatics.
23	Biomedical Microsystems	Introduction, Fabrication Processes, MEMS Technologies, Scaling Issues for MEMS, Design Realization Tools for MEMS, Electro mechanics, MEMS Sensors and Actuators, MICRO/NANO BIOSENSORS, Packaging, Vascular Zip Codes and Nano particle Targeting, Engineering Biocompatible Quantum Dots for Ultra sensitive, Real-Time Biological Imaging and Detection, Diagnostic and Therapeutic Applications of Metal Nanoshells, Nanoporous Microsystems for Islet Cell Replacement, Micro devices for Oral Drug Delivery.
24	Electronics System Design	Electro mechanical energy conservation, Step motor, Drives & suppression circuit, Power Electronics, Thyristor, Inverters, Converters, ELECTRO - MAGNETIC COMPATIBILITY Basic Introduction, E field and H field noise, Noise problem with analog circuit, Assembly and grounding and shielding considerations for analog circuit, EMC Issues, Digital circuit, Problems with circuit containing Processors, ESD, Case studies, Linear power supply, ECG amplifier, Temperature Measurement amplifiers, Instrumentation amplifier, Isolation amplifier.
25	Rehabilitation Engineering	introduction to rehabilitation, orthotics & orthoprosthetics, electronic travel applications (ETA) , sensory augmentation & substitution, measurement tools and processes, advance applications in rehabilitation engineering,
26	Biomedical Image Processing	Visual Preliminaries and Image Transformation :Image Transforms :Image Enhancement : Image Restoration Image Analysis: Segmentation, Edge detection
27	Bio-Signal Processing	Signal conversion: Sampling basics, simple signal conversion system, conversion requirements for biomedical signals, signal conversion circuits. Basics of digital filters: Digital filters, the z transform, Elements of digital filters, types of digital filters, Transfer function of a differential equation, Z-plane pole zero plot. The rubber membrane concept. Finite impulse response. Filters Characteristics, Smoothing Filters, Notch Filters, Derivatives, window design, Frequency sampling minimax design. Infinite impulse response filters Generic equation of HR filter simple one pole example, integrator, Design method of two pole filters, HR. filter for ECG Analysis. Integer filter: Basic Design Concept, LP, HP BP and Band reject filters, The effects of filter cascades, Other applications of adaptive filtering. Adaptive

		filters: Principle of noise canceler model, 60 Hz adaptive canceling using a sine wave model, other applications of adaptive filtering. Signal Averaging, Turning point algorithm, AXEC algorithm, CORTES, Fan algorithm, Huffman algorithm. ECG QRS Detection, ECG Analysis System.
28	Medical Safety And Waste Management	Electrical and radiation hazards. Electrical Shock and treatment and safety. high voltage and transient properties, patient safety, electrical shocks and hazards, leakage currents, types and measurement, protection against shocks, burn and explosion hazards, measurement of bioelectric fields, extra cellular fields. Radiation detector system, counting radioactivity, biological effect of radiation, radiation dosimetry. Radiation waste disposal techniques, medical waste disposal, degradable and biodegradable wastes. RF hazards and Microwave Hazards. Clean room technology, Air filtration techniques, water systems for waste management. Recycle of medical waste products its advantages and disadvantages, Sterilization techniques.
29	Medical System Design	Introduction to linear IC applications. Design and error budget analysis of signal conditioners for low level AC and DC applications. Design and applications of Signal conditioners with instrumentation/auto zero/chopper/isolation/charge amplifiers .active filters and high frequency circuits. Signal conditioning for various sensors used for temperature, level, flow, pressure measurement. Design consideration and selection criteria for various parameters like force, strain, stress, acceleration, vibration. Measurement of force, displacement, torque, velocity, conductivity and temperature. Electromagnetic and ultrasonic flow meters.
30	Transducer Design	Review of fundamentals of Transducers for measurement of parameters. Biosensor architecture and Classification; medically significant measurands, functional specifications of medical sensors. Biosensor characteristics: linearity, repeatability, hysteresis, drift; sensor models in the time & frequency domains. Biosensor for physical measurands: strain, force, pressure, acceleration, flow, volume, temperature and bio potentials. Biosensor for measurement of chemicals: potentiometric sensors, ion selective electrodes, ISFETS; Amperometric sensors, Clarke electrode; biosensors, catalytic biosensors, immune sensors. Sensor materials for construction, fabrication techniques for various sensors. Nano sensors, bio sensors, MEMS. Fundamentals of MEMS, Intelligent and network sensors; intelligent instrumentation. Intelligent instrumentation systems; Future trends: neuro sensors, smart sensors.
31	Advance Biomaterials	Fundamental properties of material used as Biomaterial, Metallic Biomaterials, Polymeric Biomaterials, Ceramics Biomaterials, Processing and Characterization of Biomaterials, Interaction between Material and living Tissue, Inflammation, Carcinogenicity and Hypersensitivity, Sterility and Infection, Biocompatibility Testing, Biomaterials for Dental Applications, Ophthalmic Biomaterials, Hip Prosthesis, Natural and Synthetic Polymeric Scaffolds, Bio MEMS, Magnetic Particles for Biomedical Applications, Manufacturing Issues for Biomaterials.
32	Advanced Biomedical	X-ray and Digital Radiography, Computed Tomography, Scintigraphy, Single Photon Emission Computed tomography, Positron Emission

	Imaging	Tomography, Photoacoustic Imaging, Magnetic Resonance Imaging, Functional Magnetic Resonance Imaging, Magnetic Resonance Spectroscopy, Magnetic Particle Imaging, Ultrasound Imaging, Thermal Imaging, Diffusive Optical Imaging, Biomedical Imaging at Nano Scale.
33	Artificial Organs and Biomechanics	Artificial Heart & cardiac assisted devices, Testing Artificial Hearts, The Artificial Heart Driven by Atomic Energy, Methods of Mechanical Assistance to the Circulation, Cardiac pacemaker, Artificial kidney, Liver substitution, Artificial pancreas, Artificial sphincter, Cochlear implants, Visual prosthesis, Mechanics of Body movement, Blood flow in arteries, lung, heart, veins, Respiratory gas flow, Biomechanical aspects of growth and tissues engineering, Biomechanics of joints (Knee, hip, shoulder), Biomechanics of foot and ankle joint, Biomechanics of elbow, Biomechanics of wrist.
34	Bionano technology	Nanotechnology and Bionano Technology, Significance of Nano Domain, Physics for BioNano Technology, Properties at Nano Scale, Structural and Functional Principle of BioNano Technology, Transport Phenomenon at Nano Scale, BioNano Materials, Biomolecular Design, Sensors at Nano Scale, Nano Drug Delivery, Nano BioImaging, BioNano Robots.
35	Biomedical Image Processing and Analysis	Sources of biomedical Images, Limitations of Imaging Device and Types of Defects in Biomedical images, Formats and Standards for Biomedical Images, Storage and Compression of Biomedical Images, Visualization, Enhancement in Biomedical Images, Artifact Reduction In Biomedical Images, Transformation of Biomedical Images, Restoration of Images, Biomedical Image Segmentation, Registration in Biomedical Images, Communication of Medical Images, Diffusion Filtering, Deformable Models.
36	Electro-magnetic Compatibility	Introduction to Electromagnetic Interference and Compatibility, Cabling, Shielding, Grounding, Balancing and Filtering, Passive components, Contact Protection, Intrinsic noise source. Active device noise, Digital circuit issues, RF and Transient Immunity, ESD, PCB level considerations, Precomplaine tests.
37	Medical Product Design: Standards & Regulation	Need of Standards and Regulations, Medical Device Safety, Quality Management, Risk Management, Device Risk and Quality Categorization, Governmental Regulations of Medical Devices, Standards, Optimizing Use of Regulatory Resources, Priorities in International Agendas, Information Security, Standardization and Regulatory concerns.
38	Virtual Biomedical Instrumentation System	Hardware and Software Benefits and Limitations, Architecture and Systematic Representation, Data Acquisition In Biomedical Instruments, Storage and Retrieval of medical and paramedical data of Patient, Reduction and Transformation of medical and paramedical data, Mathematical Operations for Virtual Instrumentation, Pattern Recognition for matching of symptoms with known knowledgebase, Limit Detection, Statistical Analysis of Patient data, Data Presentation, Hard and Soft control functions, Synthetic Instruments.
39	Cardiovascular Mechanics	Structure and Function of Heart, Structure and Function of Vessels, Blood Rheology, Basic Mechanics Concepts, Biofluid Mechanics, Flow and

		Pressure Measurement, Mathematical Modeling of Blood flow, Cardiac Mechanics, Cardiac Mathematical Modeling, Cardiac Valve Mechanics, Stress Analysis in Heart, Vascular Mechanics, Vascular Mathematical Modeling, Stress Analysis in Vessels.
40	Functional Magnetic Resonance Imaging	Introduction to Functional NeuroImaging, Introduction to Functional Magnetic Resonance Imaging, The Nature of Magnetic Resonance Signal, Magnetic Resonance Imaging, Perfusion Based Functional Magnetic Resonance Imaging, Flow Based Functional Magnetic Resonance Imaging, Susceptibility Contrast Based Functional Magnetic Resonance Imaging, Clinical Applications of Functional Magnetic Resonance Imaging, Data Processing and Practical Issues.
41	Intelligent Control Systems	Foundations of Fuzzy Set Theory, Fuzzy Logic Theory, Fuzzy Linguistic Descriptions, Fuzzy Logic Controller, Mamdani Fuzzy Controller, Tsukamoto Fuzzy Controller, Takagi–Sugeno Fuzzy Controller, Implementation of the Fuzzy Logic Controllers, Introduction Artificial Neural Networks, Perceptron, Multi-layer Neural Network, Neuro-fuzzy Controller Theory, Neuro-fuzzy Controller, ANFIS: Adaptive Neuro-fuzzy Inference Systems, Genetic Algorithms and Genetic Programming.

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