Course No.	Course Name	L-T-P - Credits	Year of Introduction
MA201	LINEAR ALGEBRA AND COMPLEX ANALYSIS	3-1-0-4	2016

Prerequisite : Nil

Course Objectives

COURSE OBJECTIVES

- To equip the students with methods of solving a general system of linear equations.
- To familiarize them with the concept of Eigen values and diagonalization of a matrix which have many applications in Engineering.
- To understand the basic theory of functions of a complex variable and conformal Transformations**.**

Syllabus

Analyticity of complex functions-Complex differentiation-Conformal mappings-Complex integration-System of linear equations-Eigen value problem

Expected outcome .

At the end of the course students will be able to
(i) solve any given system of linear equations
(ii) find the Eigen values of a matrix and how to diagonalize a matrix
(iii) identify analytic functions and Harmonic functions.
(iv)evaluate real definite Integrals as application of Residue Theorem
(v) identify conformal mappings(vi) find regions that are mapped under certain Transformations

Text Book:

Erwin Kreyszig: Advanced Engineering Mathematics, 10th ed. Wiley

References:

1.Dennis g Zill&Patric D Shanahan-A first Course in Complex Analysis with Applications-Jones&Bartlet Publishers
2.B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi.
3.Lipschutz, Linear Algebra,3e **(** Schaums **Series)**McGraw Hill Education India 2005
4.Complex variables introduction and applications-second edition-Mark.J.Owitz-Cambridge Publication

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Complex differentiation Text 1[13.3,13.4] Limit, continuity and derivative of complex functions	3	
	Analytic Functions	2	
	Cauchy–Riemann Equation(Proof of sufficient condition of analyticity & C R Equations in polar form not required)-Laplace's Equation	2	
	Harmonic functions, Harmonic Conjugate	2	15%
II	Conformal mapping: Text 1[17.1-17.4] Geometry of Analytic functions Conformal Mapping,	1	
	Mapping $w = z^2$ conformality of $w = e^z$.	2	15%

	The mapping $w = z + \frac{1}{z}$ Properties of $w = \frac{1}{z}$ Circles and straight lines, extended complex plane, fixed points Special linear fractional Transformations, Cross Ratio, Cross Ratio property-Mapping of disks and half planes Conformal mapping by $w = \sin z$ & $w = \cos z$ (Assignment: Application of analytic functions in Engineering)	1 3 3	
FIRST INTERNAL EXAMINATION			
III	Complex Integration. Text 1[14.1-14.4] [15.4&16.1] Definition Complex Line Integrals, First Evaluation Method, Second Evaluation Method Cauchy's Integral Theorem(without proof), Independence of path(without proof), Cauchy's Integral Theorem for Multiply Connected Domains (without proof) Cauchy's Integral Formula- Derivatives of Analytic Functions(without proof)Application of derivative of Analytical Functions Taylor and Maclaurin series(without proof), Power series as Taylor series, Practical methods(without proof) Laurent's series (without proof)	2 2 2 2 2	15%
IV	Residue Integration Text 1 [16.2-16.4] Singularities, Zeros, Poles, Essential singularity, Zeros of analytic functions Residue Integration Method, Formulas for Residues, Several singularities inside the contour Residue Theorem. Evaluation of Real Integrals (i) Integrals of rational functions of $\sin\theta$ and $\cos\theta$ (ii)Integrals of the type $\int_{-\infty}^{\infty} f(x)dx$ (Type I, Integrals from 0 to ∞) (Assignment : Application of Complex integration in Engineering)	2 4 3	15%
SECOND INTERNAL EXAMINATION			
V	Linear system of Equations Text 1(7.3-7.5) Linear systems of Equations, Coefficient Matrix, Augmented Matrix Gauss Elimination and back substitution, Elementary row operations, Row equivalent systems, Gauss elimination-Three possible cases, Row Echelon form and Information from it.	1 5	20%

	Linear independence-rank of a matrix Vector Space-Dimension-basis-vector space$\mathbf{R^3}$ Solution of linear systems, Fundamental theorem of non-homogeneous linear systems(Without proof)-Homogeneous linear systems (Theory only	2 1	
VI	Matrix Eigen value Problem Text 1.(8.1,8.3 &8.4) Determination of Eigen values and Eigen vectors-Eigen space Symmetric, Skew Symmetric and Orthogonal matrices –simple properties (without proof) Basis of Eigen vectors- Similar matrices Diagonalization of a matrix-Quadratic forms- Principal axis theorem(without proof) (Assignment-Some applications of Eigen values(8.2))	3 2 4	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks : 100 Exam Duration: 3 hours

The question paper will consist of 3 parts.

Part A will have 3 questions of 15 marks each uniformly covering modules I and II. Each question may have two sub questions.

Part B will have 3 questions of 15 marks each uniformly covering modules III and IV. Each question may have two sub questions.

Part C will have 3 questions of 20 marks each uniformly covering modules V and VI. Each question may have three sub questions.

Any two questions from each part have to be answered.

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BM201	BASIC MEDICAL SCIENCES FOR ENGINEERS	3-1-0-4	2016

Course Objectives

- To serve as a foundation course for engineers in health care field.
- To introduce the basic anatomy of the major systems of engineering importance in human body.
- To study the basic physiological concepts of these systems.
- To explore the basic engineering principles related to human physiology.

Syllabus

Introduction to Anatomy & Physiology – cell - cell membrane, transport, membrane potential. Nervous System: Central Peripheral & Autonomic nervous - Muscular System - Skeletal system - Cardiovascular system - Respiratory System - Urinary System - Components and functions.

Expected Outcome

Students shall be able to get an overview of the major organ systems of engineering importance in human body, their basic anatomy and physiology with emphasis on the engineering principles. This shall act as a foundation in the modeling, design, development, manufacturing and research in the field of health care.

Text Books:

1. Lauralee Sherwood, Human Physiology: From Cells to Systems, Brooks/Cole, Cengage Learning.
2. Arthur C. Guyton, Textbook of Medical Physiology, Prism Books (Pvt) Ltd & W.B. Saunders Company.

Reference Books:

1. Samson Wright, Cyril A. Keele (editor), Eric Neil (editor): Applied Physiology, Oxford University Press.
2. J.B.West.: Best and Taylor's Physiological Basis of Medical Practice, Williams and Wilkins, Baltimore.
3. W.F.Ganong: Review of Medical Physiology, Prentice-Hall, Connecticut.
4. Kathleen J.W. Wilson, Ross and Wilson, Anatomy and Physiology in Health and Illness, ELBS/Churchill Livingstone.

COURSE PLAN

Module	Contents	Hours	Sem. Exam Marks
I	Introduction to Anatomy & Physiology: definition & relationship of structure & function. Functional organization of body – cells, tissues, organs & systems – Types. Concept of homeostasis – intracellular & extracellular fluids. Homeostatic control systems – negative & positive feedback and feed forward mechanisms.	4	15%

	Cell: Basic structure, organelles & their functions – types. Cell membrane – structure, transport across cell membranes – passive diffusion – Fick's law - electrochemical gradient – osmosis - facilitated diffusion – active transport – Na^+ -K^+, Ca^{2+} pumps – Counter & co-transport. Membrane Potential: Resting membrane potential – Action Potential (concepts only).	4	
II	Nervous System: Organization, Neurons – structure – types. Central nervous system: Overview, Cerebrum – Cerebral cortex – General organization – motor, sensory, language & association areas – major functions. Basal ganglia, Thalamus & Hypothalamus – functions. Introduction to EEG & EP.	5	**15%**
	Limbic system – components & basic functions. Learning & Memory: Plasticity - short term & long term memory – comparison – long term potentiation.	3	
	Cerebellum, Brain Stem – basic structure & functions, Spinal cord – nerves, spinal reflex.	3	
FIRST INTERNAL EXAM			
III	Peripheral nervous system: Efferent & afferent division. Special senses – organs of vision, hearing & equilibrium, taste and smell –structure & basic mechanisms. Visual pathway and processing. Autonomic nervous system: Sympathetic & Parasympathetic	4	**15%**
	Muscular System: Basic structure & mechanism of contraction of skeletal, cardiac & smooth muscles.	3	
	Skeletal system: Bones – Basic structure & composition – classification of bones & joints in human body.	3	
IV	Cardiovascular System: Heart – Anatomy – location – pump – valves - major arteries & veins – cardiac muscle – electrical activity – pacemaker – normal & ectopic – cardiac action potential – spread – cardiac cycle. ECG – origin, waveform– cardiac rhythm & rate – normal & abnormal, myocardial ischemia & infarction, atherosclerosis – definitions. Heart sounds & murmurs. Cardiac output – stroke volume.	4	**15%**
	Systemic & Pulmonary circulation - blood flow – pressure gradient – vascular resistance – Poiseulle's law – vascular tree – blood pressure – systolic & diastolic – hyper & hypotension mean arterial pressure. Lymphatic system – functions.	3	
	Blood: Components – plasma – hematocrit – plasma proteins – erythrocytes – hemoglobin – anemia – blood typing – transfusion reaction – universal donor & acceptor – leukocytes – functions & types – platelets – blood clotting.	3	
SECOND INTERNAL EXAM			
V	Respiratory System: Components & anatomy.	2	**20%**
	Respiratory mechanics – respiratory cycle – inspiration & expiration mechanisms - airway resistance – pulmonary compliance & elastic recoil – pulmonary surfactants – lung volumes & capacities – spirograms – pulmonary & alveolar ventilation. Gas exchange – partial pressure gradients.	4	

	Gas transport – % Hb saturation – oxygen – Hb dissociation curve. Abnormal arterial partial pressures, respiratory acidosis & alkalosis, apnea & dyspnea.	3	
VI	Urinary System: Components & anatomy.	2	**20%**
	Kidneys – functions, anatomy & basic processes– nephron – types – components. Basic renal processes – basics of glomerular filtration, tubular reabsorption & secretion – urine excretion & plasma clearance – micturition.	4	
	Body fluids – fluid balance – acid-base balance.	2	
END SEMESTER EXAM			

EVALUATION SCHEME

- INTERNAL EVALUATION:
  MARKS FOR ASSIGNMENTS/ SEMINARS/ PROJECTS/ CASE STUDY: 10 MARKS
  MARKS FOR TESTS: TWO TESTS FOR 20 MARKS EACH

- EXTERNAL EVALUATION:
  Maximum Marks: 100 Exam Duration: 3 Hours

QUESTION PAPER PATTERN:

There shall be three parts for the question paper.

Part A includes Modules 1 & 2 and shall have three questions of fifteen marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Part B includes Modules 3 & 4 and shall have three questions of fifteen marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Part C includes Modules 5 & 6 and shall have three questions of twenty marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BM203	**NETWORK ANALYSIS**	**3-1-0-4**	**2016**

Course Objectives

1. To understand the various Network theorem and apply them in biomedical circuits
2. To expose the students to the basic concepts of electric circuits and their analysis in time and frequency domain
3. To introduce the concept of filter circuits and design of passive filters
4. To introduce the techniques of network synthesis

Syllabus

Network theorems, Network topology, Transient analysis, S-Domain analysis of circuits, Network functions, Two-port network, Symmetrical two-port networks, Symmetrical two-port reactive filters, Attenuators, Elements of realizability theory, Driving point synthesis.

Expected Outcome

Students can realize Network theorems and can apply them in biomedical circuits. And also they can analyze electric circuit in time and frequency domain.

Text Books:

1. Van Valkenberg, *Network Analysis*, Prentice-Hall of India.
2. D. Roy Choudhary, *Networks and Systems*, New Age International Publishers, Second Edition.

Reference Books:

1. Edminister, *Electric Circuits – Schaum's Outline Series*, McGraw-Hill.
2. Franklin F. Kuo, *Network Analysis and Synthesis*, Wiley India, Second Edition.
3. William H Hayt & Jack E Kemmerly, *Engineering Circuit Analysis*, TMH.

COURSE PLAN

Module	Contents	Hours	Sem. Exam Marks
I	Thevenin's and Norton's theorems – Superposition theorem – Source transformations – Maximum Power Transfer theorem – Reciprocity theorem	**4**	**15%**
	Definition of basic terms – Incidence matrix – Tie-sets and Cut-sets – Analysis and formulation of network equations using tie-set and cut-set	**3**	
	Response of RC, RL and LC networks to impulse and step inputs – Step response of RLC network	**3**	
II	Review of Laplace transform – Transforms of basic signals – Transformation of a circuit into S-domain – Transformed equivalent of inductance, capacitance and mutual inductance – Impedance and admittance in the transformed domain	**4**	**15%**
	Nodal analysis and Mesh analysis of the transformed circuit	**2**	
	Impulse response and Transfer function – Poles and Zeros – Restriction of pole and zero locations of network functions - Steady state response and Frequency response from Laplace transform	**4**	
FIRST INTERNAL EXAM			

III	Characterization in terms of Impedance, Admittance, Transmission and Hybrid parameters – Inter-relationships among parameter sets	**2**	**15%**
	Analysis of interconnected two-port networks – Series, Parallel and Cascade connections of two-port networks	**3**	
	T and π equivalent of a two-port network	**2**	
IV	Image impedance – Characteristic impedance and propagation constant of a symmetrical two-port network	**2**	**15%**
	Filter fundamentals – Pass and stop bands – Types of filtering – Brick wall specifications	**2**	
	Characteristic impedance – Design of Constant K – Low Pass, High Pass, Band Pass and Band Reject Filters	**2**	
	T and π sections – Design of m-derived Low Pass and High Pass filters. Types of attenuators, T and Bridged T attenuators - compensated attenuators	**3**	
SECOND INTERNAL EXAM			
V	Causality and Stability analysis of network functions – Hurwitz polynomials – Properties of Hurwitz polynomials	**4**	**20%**
	Positive real functions – Properties of positive real functions – Testing driving point functions	**3**	
	Application of maximum modulus theorems – Brune's positive real functions – Strum's theorem – Elementary synthesis procedures	**3**	
VI	Foster and Cauer forms of realization of network functions – Properties of driving point immittance functions of LC networks	**3**	**20%**
	Synthesis of LC driving point functions – Properties of RC driving point immittance functions, Synthesis of RC network functions	**4**	
	Properties of RL driving point immittance functions, Synthesis of RL network functions	**3**	
END SEMESTER EXAM			

EVALUATION SCHEME

- INTERNAL EVALUATION:
  MARKS FOR ASSIGNMENTS/SEMINARS/PROJECTS/CASE STUDY: 10 MARKS
  MARKS FOR TESTS: TWO TESTS FOR 20 MARKS EACH

- EXTERNAL EVALUATION:
  Maximum Marks: 100 Exam Duration: 3 Hours

QUESTION PAPER PATTERN:

There shall be three parts for the question paper.

Part A includes Modules 1 & 2 and shall have three questions of fifteen marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Part B includes Modules 3 & 4 and shall have three questions of fifteen marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Part C includes Modules 5 & 6 and shall have three questions of twenty marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BM207	DESIGN OF ELECTRONIC CIRCUITS	3-1-0-4	2016

Course Objectives

To acquaint students with the basic concepts, the design, analysis and applications of electronic circuits containing passive components, BJT and MOSFETs.

Syllabus

Small signal amplifiers using BJT and MOSFET, equivalent Models, frequency response, Multi-stage amplifier. Power amplifier-class A, B, AB, C, D and S power amplifiers. Feed-back amplifiers, negative feedback, feedback topologies, low frequency and high frequency oscillators. Pulse shaping using RC circuits and their applications. Transistor and MOSFET as switches, simple sweep and bootstrap sweep circuits. Multivibrators using BJTs and their applications. Differential amplifiers, BJT and MOSFET differential pairs.

Expected Outcome

The student will be able to

- Analyze and design circuits using BJTs and MOSFETs
- Understand different applications of BJTs and MOSFETs
- Get familiarized with the concept of pulse shaping, amplification and feedback in electronic circuits

Text Books:

1. Adel S**.** Sedra & Kenneth C. Smith: Microelectronic circuits, Oxford University Press. Fifth Edition
2. R E Boylstead and L Nashelsky: Electronic Devices and Circuit Theory, 9/e, Pearson Education
3. Millman and Taub, Pulse, digital and Switching Waveforms, Tata McGraw Hill.

Reference Books:

1. Millman & Halkias, Integrated Electronics, Tata McGraw Hill
2. Gray & Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley & Sons
3. Sung-Mo Kang & Yusuf Leblebici, CMOS Digital Integrated Circuits - Analysis & Design, Tata McGraw Hill.
4. Allan Mottershead, Electronic Devices &Circuits, Prentice Hall of India, New Delhi,2003
5. Schilling & Belove, Electronic Circuits, Discrete &Integrated, Tata McGraw Hill
6. Razavi, "Fundamentals of Microelectronics", Wiley Education

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	BJT small-signal amplifier circuits: *Biasing in amplifier circuits*, small-signal operation and equivalent Models	4	15%
	Single-stage BJT amplifiers – CE, CB, CC amplifiers, The BJT internal capacitances and High-frequency Model, Frequency Response of the Common-Emitter amplifier, Multi-stage RC coupled CE amplifier	6	
II	MOSFET amplifier circuits: *Biasing in MOS amplifier circuits*,	4	15%

	small-signal operation and Models		
	Single-stage MOS amplifier, The MOSFET internal capacitances and High-frequency Model, Frequency Response of the Common-Source amplifier	6	
FIRST INTERNAL EXAM			
III	Power amplifier: classification, class A and Class B power amplifier	4	**15%**
	Class C and Class AB amplifiers, Class D and S Power Amplifiers, *Power BJTs and power MOSFETS*	4	
IV	Feed-back amplifiers: General feedback structure, properties of negative feedback, the four basic feedback topologies	5	**15%**
	Basic principles of sinusoidal oscillators, RC, LC and *crystal oscillators*	4	
SECOND INTERNAL EXAM			
V	Pulse Circuits: pulse shaping using RC circuits -Differentiating and integrating circuits – applications. *Transistor and MOSFET as switch*	4	**20%**
	Simple sweep circuits- bootstrap sweep. Multivibrators - astable, monostable and bistable circuits - applications	5	
VI	Differential amplifiers: the BJT differential pair, operation with Common-Mode and differential input voltages	5	**20%**
	The MOS differential pair, small-signal operation of the MOS differential pair	5	
END SEMESTER EXAM			

***Note*: Topics in italics for self study.**

EVALUATION SCHEME

- INTERNAL EVALUATION:
  MARKS FOR ASSIGNMENTS/SEMINARS/PROJECTS/CASE STUDY: 10 MARKS
  MARKS FOR TESTS: TWO TESTS FOR 20 MARKS EACH

- EXTERNAL EVALUATION:
  Maximum Marks: 100 Exam Duration: 3 Hours

QUESTION PAPER PATTERN:

There shall be three parts for the question paper.

Part A includes Modules 1 & 2 and shall have three questions of fifteen marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Part B includes Modules 3 & 4 and shall have three questions of fifteen marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Part C includes Modules 5 & 6 and shall have three questions of twenty marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Course No.	Course Name	L-T-P-Credits	Year of Introduction
IC207	DESIGN OF LOGIC CIRCUITS	3-0-0-3	2016

Course Objectives

- To study various number systems and conversions
- To study Boolean Algebra
- To study combinational logic design and circuits
- To study various sequential components and circuits
- To study finite state machines
- To study the logic families.

Syllabus

Number system and codes - Boolean algebra and related theorems – Combinational logic and reduction using Algebraic Method and Karnaugh maps – Combinational circuits – Latches, Flip-Flops and registers – Asynchronous counters - Introduction to design of synchronous sequential circuits using Finite State Machines – Basic working of TTL NAND and CMOS inverter gates.

Expected Outcome

After the completion of the course, students should be able to

- Convert numbers represented in one system to other
- Simplify Boolean expressions
- Design and implement combinational circuits
- Design and implement sequential circuits
- Explain the working of TTL NAND and CMOS inverter gates

Text Books:

1. Charles H. Roth, Jr. Fundamentals of Logic Design, 5th edition, Thomson Books/Cole.
2. A. Anand Kumar, Fundamentals of Digital Circuits, PHI learning, 2/e, 2010, ISBN: 978-81-203-3679-7.

Reference Books:

1. Thomas L Floyd, Digital Fundamentals, Pearson, 10/e, 2011.
2. Stephen Brown and Zvonko Vranesic, Fundamentals of Digital Logic with VHDL Design, TMH
3. John F Wakerly, Digital Design- Principles and Practices(Third edition), Pearson
4. Taub and Schilling, Digital principles and applications, TMH
5. Mano M M, Digital Design, PHI.
6. R P Jain, Modern Digital Electronics, Tata Mc Graw Hill, 4/e, 2009.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Number systems: Binary, Octal, and Hexadecimal - Representation of negative numbers in binary - Binary arithmetic.	2	15%
	Binary codes: BCD & BCD addition, XS-3 & Gray Codes, Error detection and correction codes - Parity & Hamming codes.	2	
	Boolean algebra: Operations, Laws & Theorems, De Morgan's	2	

	theorems - SOP & POS Boolean expressions and truth tables		
II	Applications of Boolean Algebra: Formation of switching functions from word statements, Minterm and Maxterm expansions, Incompletely specified functions.	3	**15%**
	Minimization Techniques: Algebraic, Karnaugh map (up to 6 variables) & Quine-McCluskey methods - Realization using basic gates and universal gates.	6	
FIRST INTERNAL EXAM			
III	Combinational Logic Circuits & Design: Adders & Subtractors – Types, Ripple carry & Carry look ahead adders, BCD adder.	3	**15%**
	Code converters – examples & Comparators. Multiplexers, Demultiplexers, Decoders & Encoders.	3	
IV	Sequential Logic circuits & Design: Latches – SR Latch. Flip-Flops – SR, JK, D & T Flip Flops – Level & Edge triggered flip flops – Synchronous & Asynchronous inputs - Conversion between flip flops. Master slave flip flops.	3	**15%**
	Shift Registers: SISO, SIPO, PISO, PIPO shift registers, Right & Left shifts, Bidirectional & Universal shift registers. Applications: Serial binary adder and binary multiplier circuits.	3	
SECOND INTERNAL EXAM			
V	Counters: Asynchronous counters- Up, Down and Up/ Down counter, Mod n counters.	4	**20%**
	Introduction to design of synchronous sequential circuits using Finite State Machines - Mealy & Moore types with single input-single out problems- Synchronous counter design	4	
	Shift register counters - Ring & Johnson counters.	1	
VI	Logic families: Introduction to different logic families, Standard logic levels - Current and voltage parameters - fan in and fan out - Propagation delay, noise consideration.	1	**20%**
	TTL: Basic working principle of a TTL NAND gate - Totem pole and Open collector gate output configurations - Tri-state logic - characteristics of a TTL NAND gate.	3	
	CMOS: Basic working principle of a CMOS inverter, Comparison of TTL & CMOS, Interfacing TTL & CMOS ICs.	2	
END SEMESTER EXAM			

EVALUATION SCHEME

- INTERNAL EVALUATION:
  MARKS FOR ASSIGNMENTS/SEMINARS/PROJECTS/CASE STUDY: 10 MARKS
  MARKS FOR TESTS: TWO TESTS FOR 20 MARKS EACH

- EXTERNAL EVALUATION:
  Maximum Marks: 100 Exam Duration: 3 Hours

QUESTION PAPER PATTERN:

There shall be three parts for the question paper.

Part A includes Modules 1 & 2 and shall have three questions of fifteen marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Part B includes Modules 3 & 4 and shall have three questions of fifteen marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Part C includes Modules 5 & 6 and shall have three questions of twenty marks out of which two are to be answered. There shall be subdivisions, limited to a maximum of 4, in each question.

Course Number	Course Name	L-T-P	Credits	Year of introduction
HS200	**Business Economics**	**3-0-0**	**3**	**2016**

Course Objectives

- To familiarize the prospective engineers with elementary Principles of Economics and Managerial Economics;.
- To acquaint the students with tools and techniques that are useful in their profession in Managerial Decision Making which will enhance their employability;
- To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate;
- To prepare and understand balance sheet at an elementary level.

Syllabus

Nature of economics. Demand and Supply Analysis, demand curve, supply curve and equilibrium price determination. Production economics, economies of Scale, optimal quantity determination, Production and Cost functions, the law of Diminishing Marginal Productivity, Costs, Break-Even Analysis Chart Preparation and Cost-Volume-Profit Analysis. Market Structure and Price-Output Decisions under various competition situations and Collusion/Cartel formations in the real life situation. Monetary theory, functions of RBI and NI. Computation and some aspects of macro economics. Capital Budgeting decisions, forecasting techniques and elementary Balance Sheet..

Expected Outcome

A student who has undergone this course

- *would be able to make investment decisions based on capital budgeting methods in alignment with microeconomic and macroeconomic theories.*
- *would be able to analyse the profitability of the firm, economy of operation, determination of price under various market situations with good grasp on the effect of trade cycles in business.*
- *would gain knowledge on Monetary theory, measures by RBI in controlling interest rate and emerging concepts like Bit Coin.*
- *would gain knowledge of elementary accounting concepts used for preparing balance sheet and interpretation of balance sheet*

Course Plan			
Unit	**Topics**	**Hours Allotted**	**Percentage Marks**
I	**Nature of Economics** Definitions of Economics and their limitations, Economic Problems (2 Hrs.), Economic Systems, meaning of Business or Managerial Economics (2 Hrs.)and its role and relevance in managerial decision making in an industrial setting (2 Hrs).	6	15%
II	**Demand and Supply Analysis** Demand Curve, Demand function (2 Hrs.), Elasticity of demand and its estimation (2 Hrs.), Supply curve, equilibrium price and price mechanism (2 Hrs).	6	15%
FIRST INTERNAL EXAM			
III	**Production Economics** Economies of Scale and Diseconomies of Scale (1 Hr.), Production and Cost Functions. Factors of Production (2 Hrs.), Law of Diminishing marginal Productivity. Construction and analysis of Break Even Charts (3 Hrs.)	6	15%
IV	**Market Structure and Price-Output Decisions** Price and output determination under Perfect Competition, Monopoly and Monopolistic Competition (3 Hrs.). Collusion and Cartel, Nash Equilibrium (3 Hrs.).	6	15%
SECOND INTERNAL EXAM			
V	**Money, National Income and Taxation** Money, Emerging Bit Coin concept, Quantity Theory of Money, Interest Rate Management (2 Hrs), Open Market Operations by RBI, Selective Credit Controls, SLR, CRR (2 Hrs), Definition & Measurement of National Income, methods, sectors of economy (3 Hrs), inflation, deflation, trade cycles- Value-Added Tax (2 Hrs).	9	20%
VI	**Investment Decisions and Balance Sheet Analysis** Capital Budgeting, Investment Analysis – NPV, IRR, Profitability Index, ARR, Payback Period (3 Hrs), Depreciation, Time value of money. Business Forecasting– Elementary techniques (2 Hrs). Balance sheet preparation principles and interpretation (4 Hrs)	9	20%
END SEMESTER EXAM			

Text Book

Yogesh, Maheswari, *Management Economics* , PHI learning, NewDelhi, 2012

References

1. Dornbusch, Fischer and Startz, Macroeconomics, McGraw Hill, 11th edition, 2010.
2. Khan M Y, Indian Financial System, Tata McGraw Hill, 7th edition, 2011.
3. Samuelson, Managerial Economics, 6th edition, Wiley
4. Snyder C and Nicholson W, Fundamentals of Microeconomics, Cengage Learning (India), 2010.
5. Truett, Managerial Economics: Analysis, Problems, Cases, 8th Edition, Wiley Welch, Economics: Theory and Practice 7th Edition, Wiley

Course No.	Course Name	L-T-P-Credits	Year of Introduction
BM231	ELECTRONIC DEVICES & CIRCUITS LAB	0-0-3-1	2016

Course Objectives

To familiarize students with the design of electronic circuits using passive and active components and make them understand the capabilities and applications of such circuits.

List of Exercises/ Experiments (Minimum of 12 mandatory)

1. Characteristics of diodes (Si and Ge diodes, zener diode & LED)
2. Rectifying circuits
   i) HW rectifier ii) Centre tapped FW rectifier iii) FW Bridge rectifier
3. Filter circuits - Capacitor filter, inductor filter and Pi section filter
4. Clipping circuits
5. Clamping circuits
6. Characteristics of transistors
7. Biasing of BJT – Fixed and voltage divider biasing
8. Zener voltage regulator
9. Series voltage regulator using transistors.
10. Design of single and dual power supplies.
11. Frequency responses of RC low pass & high pass filters
12. RC differentiating and integrating circuits.
13. Characteristics of FET
14. Biasing of FET – Fixed and voltage divider biasing
15. Series and parallel resonant circuits
16. Switch circuits using BJTs
17. Sweep circuits - Simple transistor and bootstrap sweep circuits
18. RC coupled amplifiers using BJT with and without feedback - gain, frequency response & bandwidth.

Equipments needed: Bread boards, Multimeters, Fixed and Variable DC power supplies, CROs, Function Generators, Electronics Circuit Simulation software like LTspice

Expected Outcome

At the end of the course the student will be able to

- Test components and to learn the characteristics of Si & Ge diodes, zener diode, LED, BJT and FET
- Learn to design and analyze circuits of rectifiers, filters, regulators and power supplies
- Set up biasing circuits for BJT and FET to fix the Q-point and also the amplifier circuits
- Design, analyze and find the applications of simple circuits using active components
- Tabulate the results and document them properly

Text Book:

R E Boylstead and L Nashelsky: Electronic Devices and Circuit Theory, 9/e, Pearson Education

Course No.	Course Name	L-T-P-Credits	Year of Introduction
IC233	LOGIC CIRCUITS LAB	0-0-3-1	2016

Course Objectives

To provide experience on design, testing, and analysis of digital electronic circuits.

List of Exercises/ Experiments (Minimum of 12 mandatory)

1. Realization of logic gates using diodes and transistors.
2. Characteristics of TTL Gates
3. Study of basic logic gates and realization of logic gates using universal gates.
4. Half and full adders and subtractors using basic gates
5. Half and full adders and subtractors using universal gates.
6. Study of adder IC and implementation of binary adders, adder cum subtractors & BCD adder using adder IC.
7. Design and implementation of code converters.
8. Design and implementation of comparator circuits.
9. Seven segment display
10. Realization of simple Mux, Demux, Decoder and Encoder using basic gates and study of their ICs.
11. Combinational logic design using Multiplexers and Decoders.
12. Flip-Flop Circuits (SR, JK, T, D and Master Slave JK) using basic gates.
13. Study of flip flop ICs.
14. Asynchronous Counters
15. Johnson and Ring Counters.
16. Synchronous counters.
17. Study of counter ICs.
18. A sequence generator circuit.
19. A sequence detector Circuit.
20. Shift registers using flip flops

Equipments needed

Logic Trainer Kits, Combinational, Sequential Circuit ICs, Basic Gates ICs, Seven segment Display, Multimeters etc.

Expected Outcome

After the completion of the course, students should be able to

- Design and implement combinational circuits
- Design and implement sequential circuits
- Get familiarized with the TTL logic family.

Text Books:

1. Charles H. Roth, Jr. Fundamentals of Logic Design, 5th edition, Thomson Books/Cole.
2. A. Anand Kumar, Fundamentals of Digital Circuits, PHI learning, 2/e, 2010, ISBN: 978-81-203-3679-7.