

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 <ul style="list-style-type: none"> 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, 10 th 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	<u>Complex differentiation</u> Text 1[13.3,13.4] Limit, continuity and derivative of complex functions	3	15%
	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	
II	<u>Conformal mapping:</u> Text 1[17.1-17.4] Geometry of Analytic functions Conformal Mapping,	1	15%
	Mapping $w = z^2$ conformality of $w = e^z$.	2	

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

	Linear independence-rank of a matrix Vector Space-Dimension-basis-vector space \mathbf{R}^3	2	
	Solution of linear systems, Fundamental theorem of non-homogeneous linear systems(Without proof)-Homogeneous linear systems (Theory only)	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

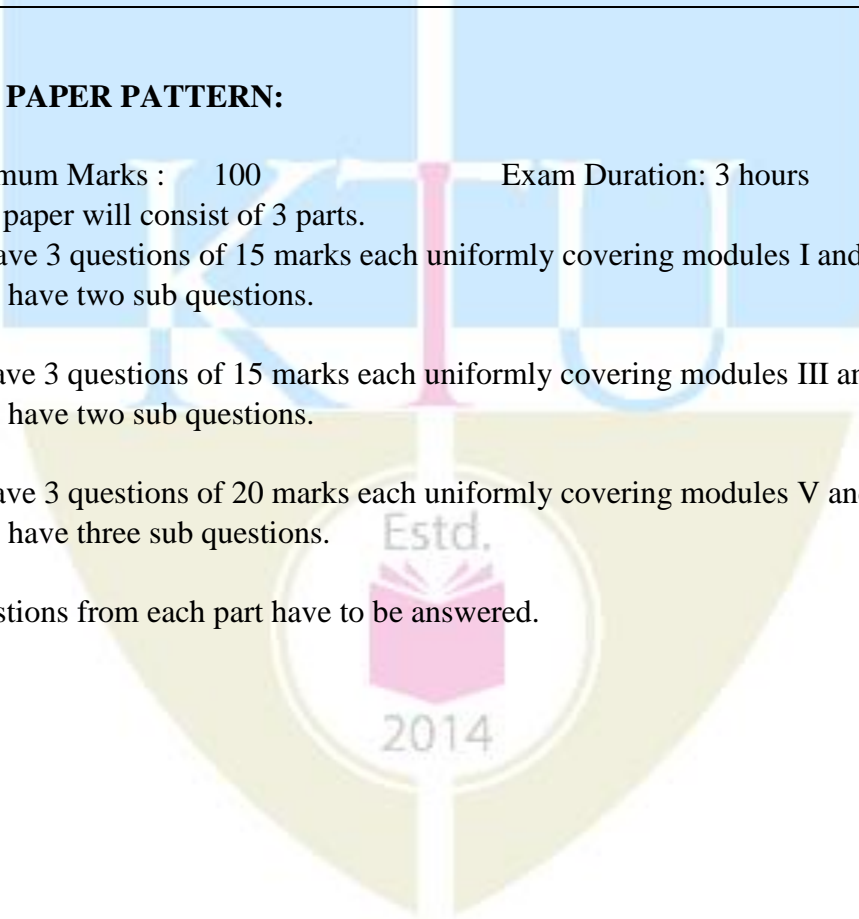
The question paper will consist of 3 parts.

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 code	Course Name	L-T-P Credits	Year of Introduction
CS201	DISCRETE COMPUTATIONAL STRUCTURES	3-1-0-4	2016
Pre-requisite: NIL			
Course Objectives <ol style="list-style-type: none"> 1. To introduce mathematical notations and concepts in discrete mathematics that is essential for computing. 2. To train on mathematical reasoning and proof strategies. 3. To cultivate analytical thinking and creative problem solving skills. 			
Syllabus Review of Set theory, Countable and uncountable Sets, Review of Permutations and combinations, Pigeon Hole Principle, Recurrence Relations and Solutions, Algebraic systems (semigroups, monoids, groups, rings, fields), Posets and Lattices, Propositional and Predicate Calculus, Proof Techniques.			
Expected Outcome: Students will be able to <ol style="list-style-type: none"> 1. identify and apply operations on discrete structures such as sets, relations and functions in different areas of computing. 2. verify the validity of an argument using propositional and predicate logic. 3. construct proofs using direct proof, proof by contraposition, proof by contradiction and proof by cases, and by mathematical induction. 4. solve problems using algebraic structures. 5. solve problems using counting techniques and combinatorics. 6. apply recurrence relations to solve problems in different domains. 			
Text Books <ol style="list-style-type: none"> 1. Trembly J.P and Manohar R, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw–Hill Pub.Co.Ltd, New Delhi, 2003. 2. Ralph. P. Grimaldi, “Discrete and Combinatorial Mathematics: An Applied Introduction”, 4/e, Pearson Education Asia, Delhi, 2002. 			
References: <ol style="list-style-type: none"> 1. Liu C. L., “Elements of Discrete Mathematics”, 2/e, McGraw–Hill Int. editions, 1988. 2. Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, “Discrete Mathematical Structures”, Pearson Education Pvt Ltd., New Delhi, 2003 3. Kenneth H.Rosen, “Discrete Mathematics and its Applications”, 5/e, Tata McGraw – Hill Pub. Co. Ltd., New Delhi, 2003. 4. Richard Johnsonbaugh, “Discrete Mathematics”, 5/e, Pearson Education Asia, New Delhi, 2002. 5. Joe L Mott, Abraham Kandel, Theodore P Baker, “Discrete Mathematics for Computer Scientists and Mathematicians”, 2/e, Prentice-Hall India, 2009. 			

Course Plan			
Module	Contents	Hou rs (54)	End Sem Exam Marks
I	Review of elementary set theory : Algebra of sets – Ordered pairs and Cartesian products – Countable and Uncountable sets	3	15 %
	Relations :- Relations on sets –Types of relations and their properties – Relational matrix and the graph of a relation – Partitions – Equivalence relations - Partial ordering- Posets – Hasse diagrams - Meet and Join – Infimum and Supremum	6	
	Functions :- <i>Injective, Surjective and Bijective functions - Inverse of a function- Composition</i>	1	
II	Review of Permutations and combinations, Principle of inclusion exclusion, Pigeon Hole Principle, Recurrence Relations:	3	15 %
	Introduction- Linear recurrence relations with constant coefficients– Homogeneous solutions – Particular solutions – Total solutions	4	
	Algebraic systems:- Semigroups and monoids - Homomorphism, Subsemigroups and submonoids	2	
FIRST INTERNAL EXAM			
III	Algebraic systems (contd...):- Groups, definition and elementary properties, subgroups, Homomorphism and Isomorphism, Generators - Cyclic Groups, Cosets and Lagrange's Theorem	6	15 %
	Algebraic systems with two binary operations- rings, fields-sub rings, ring homomorphism	2	
IV	Lattices and Boolean algebra :- Lattices –Sublattices – Complete lattices – Bounded Lattices - Complemented Lattices – Distributive Lattices – Lattice Homomorphisms.	7	15 %
	Boolean algebra – sub algebra, direct product and homomorphisms	3	
SECOND INTERNAL EXAM			
V	Propositional Logic:- Propositions – Logical connectives – Truth tables	2	20 %
	Tautologies and contradictions – Contra positive – Logical	3	

	equivalences and implications Rules of inference: Validity of arguments.	3	
VI	Predicate Logic:- Predicates – Variables – Free and bound variables – Universal and Existential Quantifiers – Universe of discourse. Logical equivalences and implications for quantified statements – Theory of inference : Validity of arguments.	3	20 %
	Proof techniques: Mathematical induction and its variants – Proof by Contradiction – Proof by Counter Example – Proof by Contra positive.	3	
		3	
END SEMESTER EXAM			

Question Paper Pattern:

1. There will be *five* parts in the question paper – A, B, C, D, E
2. Part A
 - a. Total marks : 12
 - b. Four questions each having 3 marks, uniformly covering module I and II; All four questions have to be answered.
3. Part B
 - a. Total marks : 18
 - b. Three questions each having 9 marks, uniformly covering module I and II; Two questions have to be answered. Each question can have a maximum of three subparts
4. Part C
 - a. Total marks : 12
 - b. Four questions each having 3 marks, uniformly covering module III and IV; All four questions have to be answered.
5. Part D
 - a. Total marks : 18
 - b. Three questions each having 9 marks, uniformly covering module III and IV; Two questions have to be answered. Each question can have a maximum of three subparts
6. Part E
 - a. Total Marks: 40
 - b. Six questions each carrying 10 marks, uniformly covering modules V and VI; four questions have to be answered.
 - c. A question can have a maximum of three sub-parts.
7. There should be at least 60% analytical/numerical questions.

Course No.	Course Name	L-T-P-Credits	Year of Introduction
CS203	Switching Theory and Logic Design	3-1-0-4	2016

Pre-requisite: Nil

Course Objectives

1. To impart an understanding of the basic concepts of Boolean algebra and digital systems.
2. To impart familiarity with the design and implementation of different types of practically used sequential circuits.
3. To provide an introduction to use Hardware Description Language

Syllabus

Introduction to Number Systems, Boolean Algebra, Canonical Forms, Logic Gates, Digital Circuit Design, Combination Logic Circuit Design, Sequential Circuit Design, Registers, Counter, Memory modules, Programmable Logical Arrays, Hardware Description Language for Circuit Design, Arithmetic algorithms

Expected Outcome:

Students will be able to:-

1. apply the basic concepts of Boolean algebra for the simplification and implementation of logic functions using suitable gates namely NAND, NOR etc.
2. design simple Combinational Circuits such as Adders, Subtractors, Code Convertors, Decoders, Multiplexers, Magnitude Comparators etc.
3. design Sequential Circuits such as different types of Counters, Shift Registers, Serial Adders, Sequence Generators.
4. use Hardware Description Language for describing simple logic circuits.
5. apply algorithms for addition/subtraction operations on Binary, BCD and Floating Point Numbers.

Text Books:

1. Mano M. M., *Digital Logic & Computer Design*, 4/e, Pearson Education, 2013. [Chapters: 1, 2, 3, 4, 5, 6, 7].
2. Floyd T. L., *Digital Fundamentals*, 10/e, Pearson Education, 2009. [Chapters: 5, 6].
3. M. Morris Mano, *Computer System Architecture*, 3/e, Pearson Education, 2007. [Chapter 10.1, 10.2, 10.5, 10.6, 10.7].
4. Harris D. M. and, S. L. Harris, *Digital Design and Computer Architecture*, 2/e, Morgan Kaufmann Publishers, 2013 [Chapter 4.1, 4.2]

References:

1. Tokheim R. L., *Digital Electronics Principles and Applications*, 7/e, Tata McGraw Hill, 2007.
2. Mano M. M. and M. D Ciletti, *Digital Design*, 4/e, Pearson Education, 2008.
3. Rajaraman V. and T. Radhakrishnan, *An Introduction to Digital Computer Design*, 5/e, Prentice Hall India Private Limited, 2012.
4. Leach D, Malvino A P, Saha G, *Digital Principles and Applications*, 8/e, McGraw Hill Education, 2015.

COURSE PLAN

Module	Contents	Contact Hours (52)	Sem. Exam Marks;%
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<p>I</p>	<p>Number systems – Decimal, Binary, Octal and Hexadecimal – conversion from one system to another – representation of negative numbers – representation of BCD numbers – character representation – character coding schemes – ASCII – EBCDIC etc.</p> <p>Addition, subtraction, multiplication and division of binary numbers (no algorithms). Addition and subtraction of BCD, Octal and Hexadecimal numbers.</p> <p>Representation of floating point numbers – precision – addition, subtraction, multiplication and division of floating point numbers</p>	<p>10</p>	<p>15%</p>
<p>II</p>	<p>Introduction — Postulates of Boolean algebra – Canonical and Standard Forms — logic functions and gates</p> <p>methods of minimization of logic functions — Karnaugh map method and QuinMcClusky method</p> <p>Product-of-Sums Simplification — Don't-Care Conditions.</p>	<p>09</p>	<p>15%</p>
<p>III</p>	<p>Combinational Logic: combinational Circuits and design Procedure — binary adder and subtractor — multi—level NAND and NOR circuits — Exclusive-OR and Equivalence Functions.</p> <p>Implementation of combination logic: parallel adder, carry look ahead adder, BCD adder, code converter, magnitude comparator, decoder, multiplexer, demultiplexer, parity generator.</p>	<p>10</p>	<p>15%</p>
<p>IV</p>	<p>Sequential logic circuits: latches and flip-flops – edge-triggering and level-triggering — RS, JK, D and T flip-flops — race condition — master-slave flip-flop.</p> <p>Clocked sequential circuits: state diagram — state reduction and assignment — design with state equations</p>	<p>08</p>	<p>15%</p>
<p>V</p>	<p>Registers: registers with parallel load - shift registers universal shift registers – application: serial adder.</p> <p>Counters: asynchronous counters — binary and BCD ripple counters — timing sequences — synchronous counters — up-down counter, BCD counter, Johnson counter — timing sequences and state diagrams.</p>	<p>08</p>	<p>20%</p>

VI	<p>Memory and Programmable Logic: Random-Access Memory (RAM)—Memory Decoding—Error Detection and Correction — Read only Memory (ROM), Programmable Logic Array (PLA).</p> <p><i>HDL: fundamentals, combinational logic, adder, multiplexer.</i></p> <p>Arithmetic algorithms: Algorithms for addition and subtraction of binary and BCD numbers, algorithms for floating point addition and subtraction.</p>	08	20%
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Question Paper Pattern:

1. There will be *five* parts in the question paper – A, B, C, D, E
2. Part A
 - a. Total marks : 12
 - b. Four questions each having 3 marks, uniformly covering module I and II; All four questions have to be answered.
3. Part B
 - a. Total marks : 18
 - b. Three questions each having 9 marks, uniformly covering module I and II; Two questions have to be answered. Each question can have a maximum of three subparts
4. Part C
 - a. Total marks : 12
 - b. Four questions each having 3 marks, uniformly covering module III and IV; All four questions have to be answered.
5. Part D
 - a. Total marks : 18
 - b. Three questions each having 9 marks, uniformly covering module III and IV; Two questions have to be answered. Each question can have a maximum of three subparts
6. Part E
 - a. Total Marks: 40
 - b. Six questions each carrying 10 marks, uniformly covering modules V and VI; four questions have to be answered.
 - c. A question can have a maximum of three sub-parts.
7. There should be at least 60% analytical/design/numerical questions.

Course code	Course Name	L-T-P-Credits	Year of Introduction
CS205	Data Structures	3-1-0-4	2016

Pre-requisite: B101-05 Introduction to Computing and Problem Solving

Course Objectives

1. To impart a thorough understanding of linear data structures such as stacks, queues and their applications.
2. To impart a thorough understanding of non-linear data structures such as trees, graphs and their applications.
3. To impart familiarity with various sorting, searching and hashing techniques and their performance comparison.
4. To impart a basic understanding of memory management.

Syllabus

Introduction to various programming methodologies, terminologies and basics of algorithms analysis, Basic Abstract and Concrete Linear Data Structures, Non-linear Data Structures, Memory Management, Sorting Algorithms, Searching Algorithms, Hashing.

Expected Outcome:

Students will be able to

1. compare different programming methodologies and define asymptotic notations to analyze performance of algorithms.
2. use appropriate data structures like arrays, linked list, stacks and queues to solve real world problems efficiently.
3. represent and manipulate data using nonlinear data structures like trees and graphs to design algorithms for various applications.
4. illustrate and compare various techniques for searching and sorting.
5. appreciate different memory management techniques and their significance.
6. illustrate various hashing techniques.

Text Books:

1. Samanta D., Classic Data Structures, Prentice Hall India, 2/e, 2009.
2. Richard F. Gilberg, Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, 2/e, Cengage Learning, 2005.

References

1. Horwitz E., S. Sahni and S. Anderson, Fundamentals of Data Structures in C, University Press (India), 2008.
2. Aho A. V., J. E. Hopcroft and J. D. Ullman, Data Structures and Algorithms, Pearson Publication, 1983.
3. Tremblay J. P. and P. G. Sorenson, Introduction to Data Structures with Applications, Tata McGraw Hill, 1995.
4. Peter Brass, Advanced Data Structures, Cambridge University Press, 2008
5. Lipschuts S., Theory and Problems of Data Structures, Schaum's Series, 1986.
6. Wirth N., Algorithms + Data Structures = Programs, Prentice Hall, 2004.
7. Hugges J. K. and J. I. Michtm, A Structured Approach to Programming, PHI, 1987.
8. Martin Barrett, Clifford Wagner, And Unix: Tools For Software Design, John Wiley, 2008 reprint.

COURSE PLAN			
Module	Contents	Hours (56)	Sem. Exam Marks
I	Introduction to programming methodologies – structured approach, stepwise refinement techniques, programming style, documentation – analysis of algorithms: frequency count, definition of Big O notation, asymptotic analysis of simple algorithms. Recursive and iterative algorithms.	9	15%
II	Abstract and Concrete Data Structures- Basic data structures – vectors and arrays. Applications, Linked lists:- singly linked list, doubly linked list, Circular linked list, operations on linked list, linked list with header nodes, applications of linked list: polynomials,.	9	15%
III	Applications of linked list (continued): Memory management, memory allocation and de-allocation. First-fit, best-fit and worst-fit allocation schemes Implementation of Stacks and Queues using arrays and linked list, DEQUEUE (double ended queue). Multiple Stacks and Queues, Applications.	9	15%
IV	String: - representation of strings, concatenation, substring searching and deletion. Trees: - m-ary Tree, Binary Trees – level and height of the tree, complete-binary tree representation using array, tree traversals (Recursive and non-recursive), applications. Binary search tree – creation, insertion and deletion and search operations, applications.	10	15%
V	Graphs – representation of graphs, BFS and DFS (analysis not required) applications. Sorting techniques – <i>Bubble sort, Selection Sort</i> , Insertion sort, Merge sort, Quick sort, Heaps and Heap sort. Searching algorithms (Performance comparison expected. Detailed analysis not required)	09	20%
VI	Linear and Binary search. (Performance comparison expected. Detailed analysis not required) Hash Tables – Hashing functions – Mid square, division, folding, digit analysis, collision resolution and Overflow handling techniques.	10	20%

Question Paper Pattern:

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2. Part A
 - a. Total marks : 12
 - b. Four questions each having 3 marks, uniformly covering module I and II; All four questions have to be answered.
3. Part B
 - a. Total marks : 18
 - b. Three questions each having 9 marks, uniformly covering module I and II; Two questions have to be answered. Each question can have a maximum of three subparts
4. Part C
 - a. Total marks : 12
 - b. Four questions each having 3 marks, uniformly covering module III and IV; All four questions have to be answered.
5. Part D
 - a. Total marks : 18
 - b. Three questions each having 9 marks, uniformly covering module III and IV; Two questions have to be answered. Each question can have a maximum of three subparts
6. Part E
 - a. Total Marks: 40
 - b. Six questions each carrying 10 marks, uniformly covering modules V and VI; four questions have to be answered.
 - c. A question can have a maximum of three sub-parts.
7. There should be at least 60% analytical/numerical/design questions.

Course code	Course Name	L-T-P -Credits	Year of Introduction
CS207	ELECTRONIC DEVICES & CIRCUITS	3-0-0-3	2016
Pre-requisite: BE101-04 Introduction to Electronics Engg.			
Course Objectives: <ol style="list-style-type: none"> To introduce to the students the fundamental concepts of electronic devices and circuits for engineering applications To develop the skill of analysis and design of various analog circuits using electronic devices To provide comprehensive idea about working principle, operation and applications of electronic circuits To equip the students with a sound understanding of fundamental concepts of operational amplifiers To expose to the diversity of operations that operational amplifiers can perform in a wide range of applications To expose to a variety of electronic circuits/systems using various analog ICs 			
Syllabus RC Circuits, Diode Circuits, Regulated power supplies, Field effect transistor , DC analysis of BJT, RC Coupled amplifier, MOSFET amplifiers, Feedback amplifiers, Power amplifiers, Oscillators, Multivibrators, Operational Amplifier and its applications, Timer IC.			
Expected Outcome: Students will be able to <ol style="list-style-type: none"> explain, illustrate, and design the different electronic circuits using electronic components design circuits using operational amplifiers for various applications 			
Text Books: <ol style="list-style-type: none"> David A Bell, Electronic Devices and Circuits, Oxford University Press, 2008 Salivahanan S. and V. S. K. Bhaaskaran, Linear Integrated Circuits, Tata McGraw Hill, 2008 			
References : <ol style="list-style-type: none"> Neamen D., Electronic Circuits, Analysis and Design, 3/e, TMH, 2007 Robert Boylestad and L Nashelsky, Electronic Devices and Circuit Theory, Pearson. Bogart T. F., Electronic Devices Circuits, 6/e, Pearson, 2012. Maini A. K. and V. Agrawal, Electronic Devices and Circuits, Wiley India, 2011. K.Gopakumar, Design and Analysis of Electronic Circuits, Phasor Books, Kollam, 2013 Millman J. and C. Halkias, Integrated Electronics, 2/e, McGraw-Hill, 2010. 			
Course Plan			
Module	Contents	Hou rs (40)	Sem Exam Marks
1	Wave shaping circuits: Sinusoidal and non-sinusoidal wave shapes, Principle and working of RC differentiating and integrating circuits, Conversion of one non-sinusoidal wave shape into another. Clipping circuits - Positive, negative and biased clipper.	5	15%

	Clamping circuits - Positive, negative and biased clamper. Voltage multipliers- Voltage doubler and tripler. Simple sweep circuit using transistor as a switch.		
2	Regulated power supplies: Review of simple zener voltage regulator, Shunt and series voltage regulator using transistors, Current limiting and fold back protection, 3 pin regulators-78XX and 79XX, IC 723 and its use as low and high voltage regulators, DC to DC conversion, Circuit/block diagram and working of SMPS.	4	15 %
	Field effect transistors: JFET – Structure, principle of operation and characteristics, Comparison with BJT. MOSFET- Structure, Enhancement and Depletion types, principle of operation and characteristics.	3	
FIRST INTERNAL EXAM			
3	Amplifiers: Introduction to transistor biasing, operating point, concept of load line, thermal stability, fixed bias, self bias, voltage divider bias. Classification of amplifiers, RC coupled amplifier - voltage gain and frequency response. Multistage amplifiers - effect of cascading on gain and bandwidth. Feedback in amplifiers - Effect of negative feedback on amplifiers. MOSFET Amplifier- Circuit diagram and working of common source MOSFET amplifier.	7	15 %
4	Oscillators: Classification, criterion for oscillation, analysis of Wien bridge oscillator, Hartley and Crystal oscillator. Non-sinusoidal oscillators: Astable, monostable and bi-stable multivibrators using transistors (Only design equations and working of circuit are required, Analysis not required).	5	15 %
SECOND INTERNAL EXAM			
5	Operational amplifiers: Differential amplifier, characteristics of op-amps(gain, bandwidth, slew rate, CMRR, offset voltage, offset current), comparison of ideal and practical op-amp(IC741), applications of op-amps- scale changer, sign changer, adder/summing amplifier, subtractor, integrator, differentiator, Schmitt trigger, Wien bridge oscillator.	8	20 %

6	<p>Integrated circuits: Active filters – Low pass and high pass (first and second order) active filters using op-amp with gain (No analysis required). D/A and A/D convertors – important specifications, Sample and hold circuit. Binary weighted resistor and R-2R ladder type D/A convertors. (concepts only). Flash, dual slope and successive approximation type A/D convertors. Circuit diagram and working of Timer IC555, astable and monostablemultivibrators using 555.</p>	8	20 %
END SEMESTER EXAM			

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3. Part B
 - a. Total marks : 18
 - b. Three questions each having 9 marks, uniformly covering module I and II; Two questions have to be answered. Each question can have a maximum of three subparts
4. Part C
 - a. Total marks : 12
 - b. Four questions each having 3 marks, uniformly covering module III and IV; All four questions have to be answered.
5. Part D
 - a. Total marks : 18
 - b. Three questions each having 9 marks, uniformly covering module III and IV; Two questions have to be answered. Each question can have a maximum of three subparts
6. Part E
 - a. Total Marks: 40
 - b. Six questions each carrying 10 marks, uniformly covering modules V and VI; four questions have to be answered.
 - c. A question can have a maximum of three sub-parts.
7. There should be at least 60% analytical/numerical/design questions.

Course code	Course Name	L-T-P - Credits	Year of Introduction
HS200	Business Economics	3-0-0-3	2016
Prerequisite: Nil			
Course Objectives <ul style="list-style-type: none"> • To familiarize the prospective engineers with elementary Principles of Economics and Business Economics. • To acquaint the students with tools and techniques that are useful in their profession in Business Decision Making which will enhance their employability; • To apply business analysis to the “firm” under different market conditions; • To apply economic models to examine current economic scenario and evaluate policy options for addressing economic issues • To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate; • To prepare and analyse various business tools like balance sheet, cost benefit analysis and rate of returns at an elementary level 			
Syllabus Business Economics - basic concepts, tools and analysis, scarcity and choices , resource allocation, marginal analysis, opportunity costs and production possibility curve. Fundamentals of microeconomics - Demand and Supply Analysis, equilibrium, elasticity, production and production function, cost analysis, break-even analysis and markets. Basics of macroeconomics - the circular flow models, national income analysis, inflation, trade cycles, money and credit, and monetary policy. Business decisions - investment analysis, Capital Budgeting decisions, forecasting techniques and elementary Balance Sheet and taxation, business financing, international investments			
Expected outcome . A student who has undergone this course would be able to <ol style="list-style-type: none"> i. make investment decisions based on capital budgeting methods in alignment with microeconomic and macroeconomic theories. ii. 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. iii. gain knowledge on Monetary theory, measures by RBI in controlling interest rate and emerging concepts like Bit Coin. iv. gain knowledge of elementary accounting concepts used for preparing balance sheet and interpretation of balance sheet 			
Text Books <ol style="list-style-type: none"> 1. Geetika, Piyali Ghosh and Chodhury, <i>Managerial Economics</i>, Tata McGraw Hill, 2015 2. Gregory Mankiw, <i>Principles of Macroeconomics</i>, Cengage Learning, 2006. 3. M.Kasi Reddy and S.Saraswathi, <i>Economics and Financial Accounting</i>. Prentice Hall of India. New Delhi. 			

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
6. Welch, *Economics: Theory and Practice* 7th Edition, Wiley
7. Uma Kapila, *Indian Economy Since Independence, 26th Edition: A Comprehensive and Critical Analysis of India's Economy, 1947-2015*
8. C Rangarajan, *Indian Economy, Essays on monetary and finance*, UBS Publishers'Distributors, 1998
9. A.Ramachandra Aryasri, *Managerial Economics and Financial Analysis*, Tata McGraw-Hill, New Delhi.
10. Dominick Salvatore, *Managerial Economics in Global Economy*, Thomas Western College Publishing, Singapore.
11. I.M .Pandey, *Financial Management*, Vikas Publishing House. New Delhi.
12. Dominick Salvatore, *Theory and Problems of Micro Economic Theory*. Tata Mac Graw-Hill, New Delhi.
13. T.N.Hajela.*Money, Banking and Public Finance*. Anne Books. New Delhi.
14. G.S.Gupta. *Macro Economics-Theory and Applications*. Tata Mac Graw- Hill, New Delhi.
15. Yogesh, Maheswari, *Management Economics* , PHI learning, NewDelhi, 2012
16. Timothy Taylor , *Principles of Economics*, 3rdedition, TEXTBOOK MEDIA.
17. Varshney and Maheshwari. *Managerial Economics*. Sultan Chand. New Delhi

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Business Economics and its role in managerial decision making-meaning-scope-relevance-economic problems-scarcity Vs choice (2 Hrs)-Basic concepts in economics-scarcity, choice, resource allocation- Trade-off-opportunity cost-marginal analysis- marginal utility theory, Law of diminishing marginal utility -production possibility curve (2 Hrs)	4	15%
II	Basics of Micro Economics I Demand and Supply analysis-equilibrium-elasticity (demand and supply) (3 Hrs.) -Production concepts-average product-marginal product-law of variable proportions- Production function-Cobb Douglas function-problems (3 Hrs.)	6	15%
FIRST INTERNAL EXAMINATION			
III	Basics of Micro Economics II Concept of costs-marginal, average, fixed, variable costs-cost curves-shut down point-long run and short run (3 Hrs.)- Break Even Analysis-Problem-Markets-Perfect Competition, Monopoly and Monopolistic Competition, Oligopoly-Cartel and collusion (3 Hrs.).	6	15%
IV	Basics of Macro Economics - Circular flow of income-two sector and multi-sector models- National Income Concepts-Measurement methods-problems-Inflation, deflation (4 Hrs.)-Trade cycles-Money-stock and flow concept-Quantity theory of money-Fischer's Equation and Cambridge Equation -velocity of circulation of money-credit control methods-SLR, CRR, Open Market Operations-Repo and Reverse Repo rate-emerging concepts in money-bit coin (4 Hrs.).	8	15%

SECOND INTERNAL EXAMINATION			
V	Business Decisions I -Investment analysis-Capital Budgeting-NPV, IRR, Profitability Index, ARR, Payback Period (5 Hrs.)- Business decisions under certainty-uncertainty-selection of alternatives-risk and sensitivity- cost benefit analysis-resource management (4 Hrs.).	9	20%
VI	Business Decisions II Balance sheet preparation-principles and interpretation-forecasting techniques (7 Hrs.)-business financing-sources of capital- Capital and money markets-international financing-FDI, FPI, FII-Basic Principles of taxation-direct tax, indirect tax-GST (2 hrs.).	9	20%
END SEMESTER EXAM			

Question Paper Pattern

Max. marks: 100, Time: 3 hours

The question paper shall consist of three parts

Part A

4 questions uniformly covering modules I and II. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

4 questions uniformly covering modules III and IV. Each question carries 10 marks
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

6 questions uniformly covering modules V and VI. Each question carries 10 marks
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: In all parts, each question can have a maximum of four sub questions, if needed.



Course No.	Course Name	L-T-P - Credits	Year of Introduction
CS231	DATA STRUCTURES LAB	0-0-3-1	2016
Pre-requisite: CS205 Data structures			
Course Objectives <ol style="list-style-type: none"> 1. To implement basic linear and non-linear data structures and their major operations. 2. To implement applications using these data structures. 3. To implement algorithms for various sorting techniques. 			
List of Exercises/Experiments : (Minimum 12 are to be done) <ol style="list-style-type: none"> 1. Implementation of Stack and Multiple stacks using one dimensional array. ** 2. Application problems using stacks: Infix to post fix conversion, postfix and pre-fix evaluation, MAZE problem etc. ** 3. Implementation of Queue, DEQUEUE and Circular queue using arrays. 4. Implementation of various linked list operations. ** 5. Implementation of stack, queue and their applications using linked list. 6. Implementation of trees using linked list 7. Representation of polynomials using linked list, addition and multiplication of polynomials. ** 8. Implementation of binary trees using linked lists and arrays- creations, insertion, deletion and traversal. ** 9. Implementation of binary search trees – creation, insertion, deletion, search 10. Application using trees 11. Implementation of sorting algorithms – bubble, insertion, selection, quick (recursive and non-recursive), merge sort (recursive and non-recursive), and heap sort.** 12. Implementation of searching algorithms – linear search, binary search.** 13. Representation of graphs and computing various parameters (in degree, out degree etc.) - adjacency list, adjacency matrix. 14. Implementation of BFS, DFS for each representation. 15. Implementation of hash table using various mapping functions, various collision and overflow resolving schemes.** 16. Implementation of various string operations. 			

17. Simulation of first-fit, best-fit and worst-fit allocations.

18. Simulation of a basic memory allocator and garbage collector using doubly linked list.

**** mandatory.**

Expected Outcome:

Students will be able to:

1. appreciate the importance of structure and abstract data type, and their basic usability in different applications
2. analyze and differentiate different algorithms based on their time complexity.
3. implement linear and non-linear data structures using linked lists.
4. understand and apply various data structure such as stacks, queues, trees, graphs, etc. to solve various computing problems.
5. implement various kinds of searching and sorting techniques, and decide when to choose which technique.
6. identify and use a suitable data structure and algorithm to solve a real world problem.



Course No.	Course Name	L-T-P - Credits	Year of Introduction
CS233	ELECTRONICS CIRCUITS LAB	0-0-3-1	2016

Pre-requisite: CS207 Electronic devices & circuits

Course Objectives:

1. To introduce the working of analog electronic circuits.
2. To design, implement and demonstrate analog circuits using electronic components.
3. To provide hands-on experience to the students so that they are able to put theoretical concepts to practice.
4. To use computer simulation tools such as PSPICE, or Multisim to the simulation of electronic circuits.
5. To create an ability to develop descriptions, explanations, predictions and models using evidence .
6. To create an ability to communicate effectively the scientific procedures and explanations about the experiments in oral/report forms.

List of Exercises/Experiments :

(Minimum 13 experiments are to be done in the semester, at least 6 each should be selected from the first(Exp. 1-10) and second(Exp. 11-20) half. Experiment no. 18 is compulsory).

1. Forward and reverse characteristics of PN diode and Zener diode
2. Input and output characteristics of BJT in CE configuration and evaluation of parameters
3. RC integrating and differentiating circuits-Transient response with different time constant
4. RC low pass and high pass circuits- Frequency response with sinusoidal input
5. Clipping circuits (Positive, negative and biased) - Transient and transfer characteristics
6. Clamping circuits (Positive, negative and biased)- Transient characteristics
7. Bridge Rectifier - with and without filter- ripple factor and regulation
8. Simple Zener regulator- Line and load characteristics
9. RC coupled CE amplifier – Mid band gain and frequency response
10. RC phase shift or Wien bridge oscillator using transistor
11. Astable and Monostable multivibrators using transistors
12. Series voltage regulator (Two transistors)- Line and load characteristics
13. Voltage regulator using LM 723)- Line and load characteristics
14. Astable and mono stable multivibrators using 555 Timer
15. Inverting and non-inverting amplifier using op-amp IC741
16. Instrumentation amplifier using op-amp IC741
17. RC phase shift or Wien bridge oscillator using op-amp IC741
18. Simulation of simple circuits (at least 6 from above) using any SPICE software(Transient, AC and DC analysis)

Expected Outcome:

Students will be able to:

1. identify basic electronic components, design and develop electronic circuits.
2. Design and demonstrate functioning of various discrete analog circuits
3. Be familiar with computer simulation of electronic circuits and how to use it proficiently for design and development of electronic circuits.
4. Understand the concepts and their applications in engineering.
5. Communicate effectively the scientific procedures and explanations in formal technical presentations/reports.

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