<table>
<thead>
<tr>
<th>Course code</th>
<th>Course Name</th>
<th>L-T-P Credits</th>
<th>Year of Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS201</td>
<td>DISCRETE COMPUTATIONAL STRUCTURES</td>
<td>3-1-0-4</td>
<td>2016</td>
</tr>
</tbody>
</table>

Pre-requisite: NIL

**Course Objectives**

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, Prepositional and Predicate Calculus, Proof Techniques.

**Expected Outcome:**

Students will be able to

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**


**References:**

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Review of elementary set theory:</strong>&lt;br&gt;Algebra of sets – Ordered pairs and Cartesian products – Countable and Uncountable sets&lt;br&gt;<strong>Relations:</strong>&lt;br&gt;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&lt;br&gt;<strong>Functions:</strong>&lt;br&gt;Injective, Surjective and Bijective functions - Inverse of a function- Composition</td>
<td>3</td>
</tr>
<tr>
<td>II</td>
<td>Review of Permutations and combinations, Principle of inclusion exclusion, Pigeon Hole Principle, <strong>Recurrence Relations:</strong>&lt;br&gt;Introduction- Linear recurrence relations with constant coefficients– Homogeneous solutions – Particular solutions – Total solutions&lt;br&gt;<strong>Algebraic systems:</strong>&lt;br&gt;Semigroups and monoids - Homomorphism, Subsemigroups and submonoids</td>
<td>3</td>
</tr>
<tr>
<td>III</td>
<td><strong>Algebraic systems (contd…):</strong>&lt;br&gt;Groups, definition and elementary properties, subgroups, Homomorphism and Isomorphism, Generators - Cyclic Groups, Cosets and Lagrange’s Theorem&lt;br&gt;Algebraic systems with two binary operations- rings, fields-sub rings, ring homomorphism</td>
<td>6, 2</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Lattices and Boolean algebra:</strong>&lt;br&gt;Lattices – Sublattices – Complete lattices – Bounded Lattices - Complemented Lattices – Distributive Lattices – Lattice Homomorphisms.&lt;br&gt;Boolean algebra – sub algebra, direct product and homomorphisms</td>
<td>7, 3</td>
</tr>
<tr>
<td>V</td>
<td><strong>Propositional Logic:</strong>&lt;br&gt;Propositions – Logical connectives – Truth tables&lt;br&gt;Tautologies and contradictions – Contra positive – Logical</td>
<td>2, 3</td>
</tr>
</tbody>
</table>

**End Sem Exam Marks**

<table>
<thead>
<tr>
<th>Hours</th>
<th>End Sem Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>15 %</td>
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<tr>
<td>4</td>
<td>15 %</td>
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<tr>
<td>6</td>
<td>15 %</td>
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<td>2</td>
<td>15 %</td>
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<td>7</td>
<td>15 %</td>
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<td>3</td>
<td>15 %</td>
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<tr>
<td>2</td>
<td>20 %</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>equivalences and implications</td>
</tr>
<tr>
<td>--</td>
<td>Rules of inference: Validity of arguments.</td>
</tr>
<tr>
<td><strong>Proof techniques:</strong></td>
<td>Mathematical induction and its variants – Proof by Contradiction – Proof by Counter Example – Proof by Contra positive.</td>
</tr>
</tbody>
</table>

**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

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].

References:

COURSE PLAN

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Contact Hours (52)</th>
<th>Sem. Exam Marks;%</th>
</tr>
</thead>
</table>

| I | 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.  
Addition, subtraction, multiplication and division of binary numbers (no algorithms). Addition and subtraction of BCD, Octal and Hexadecimal numbers.  
Representation of floating point numbers – precision – addition, subtraction, multiplication and division of floating point numbers | 10 | 15% |
| II | Introduction — Postulates of Boolean algebra – Canonical and Standard Forms — logic functions and gates  
methods of minimization of logic functions — Karnaugh map method and QuinMcClusky method  
Product-of-Sums Simplification — Don’t-Care Conditions. | 09 | 15% |
| III | Combinational Logic: combinational Circuits and design Procedure — binary adder and subtractor — multi—level NAND and NOR circuits — Exclusive-OR and Equivalence Functions.  
Implementation of combination logic: parallel adder, carry look ahead adder, BCD adder, code converter, magnitude comparator, decoder, multiplexer, de-multiplexer, parity generator. | 10 | 15% |
Clocked sequential circuits: state diagram — state reduction and assignment — design with state equations | 08 | 15% |
Counters: asynchronous counters — binary and BCD ripple counters — timing sequences — synchronous counters — up-down counter, BCD counter, Johnson counter — timing sequences and state diagrams. | 08 | 20% |
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.
<table>
<thead>
<tr>
<th>Course code</th>
<th>Course Name</th>
<th>L-T-P-Credits</th>
<th>Year of Introduction</th>
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</thead>
<tbody>
<tr>
<td>CS205</td>
<td>Data Structures</td>
<td>3-1-0-4</td>
<td>2016</td>
</tr>
</tbody>
</table>

**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:**


**References**

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours (56)</th>
<th>Sem. Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>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.</td>
<td>9</td>
<td>15%</td>
</tr>
<tr>
<td>II</td>
<td>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,.</td>
<td>9</td>
<td>15%</td>
</tr>
<tr>
<td>III</td>
<td>Applications of linked list (continued): Memory management, memory allocation and de-allocation. First-fit, best-fit and worst-fit allocation schemes</td>
<td>9</td>
<td>15%</td>
</tr>
<tr>
<td>IV</td>
<td>Implementation of Stacks and Queues using arrays and linked list, DEQUEUE (double ended queue). Multiple Stacks and Queues, Applications. 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.</td>
<td>10</td>
<td>15%</td>
</tr>
<tr>
<td>V</td>
<td>Graphs – representation of graphs, BFS and DFS (analysis not required) applications. Sorting techniques – Bubble sort, Selection Sort, Insertion sort, Merge sort, Quick sort, Heaps and Heap sort. Searching algorithms (Performance comparison expected. Detailed analysis not required)</td>
<td>09</td>
<td>20%</td>
</tr>
<tr>
<td>VI</td>
<td>Linear and Binary search. (Performance comparison expected. Detailed analysis not required) Hash Tables – Hashing functions – Mid square, division, folding, digit analysis, collusion resolution and Overflow handling techniques.</td>
<td>10</td>
<td>20%</td>
</tr>
</tbody>
</table>
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/design questions.
Course code: CS207  
Course Name: ELECTRONIC DEVICES & CIRCUITS  
L-T-P -Credits: 3-0-0-3  
Year of Introduction: 2016

**Pre-requisite:** BE101-04 Introduction to Electronics Engg.

**Course Objectives:**
1. To introduce to the students the fundamental concepts of electronic devices and circuits for engineering applications
2. To develop the skill of analysis and design of various analog circuits using electronic devices
3. To provide comprehensive idea about working principle, operation and applications of electronic circuits
4. To equip the students with a sound understanding of fundamental concepts of operational amplifiers
5. To expose to the diversity of operations that operational amplifiers can perform in a wide range of applications
6. 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
1. explain, illustrate, and design the different electronic circuits using electronic components
2. design circuits using operational amplifiers for various applications

**Text Books:**
1. David A Bell, Electronic Devices and Circuits, Oxford University Press, 2008

**References:**

**Course Plan**

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours (40)</th>
<th>Sem Exam Marks</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Wave shaping circuits:</strong> 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.</td>
<td>5</td>
<td>15%</td>
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<tr>
<td><strong>Clamping circuits</strong> - Positive, negative and biased clamper. Voltage multipliers - Voltage doubler and tripler. Simple sweep circuit using transistor as a switch.</td>
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<tr>
<td><strong>2</strong></td>
<td><strong>Regulated power supplies</strong>: 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.</td>
<td>4</td>
<td>15 %</td>
</tr>
<tr>
<td><strong>Field effect transistors</strong>: JFET – Structure, principle of operation and characteristics, Comparison with BJT. MOSFET- Structure, Enhancement and Depletion types, principle of operation and characteristics.</td>
<td>3</td>
<td></td>
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<tr>
<td><strong>FIRST INTERNAL EXAM</strong></td>
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<tr>
<td><strong>3</strong></td>
<td><strong>Amplifiers</strong>: 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.</td>
<td>7</td>
<td>15 %</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td><strong>Oscillators</strong>: 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).</td>
<td>5</td>
<td>15 %</td>
</tr>
<tr>
<td><strong>SECOND INTERNAL EXAM</strong></td>
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<tr>
<td><strong>5</strong></td>
<td><strong>Operational amplifiers</strong>: 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.</td>
<td>8</td>
<td>20 %</td>
</tr>
</tbody>
</table>
| 6 | **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 IC 555, astable and monostable multivibrators using 555. | 8 | 20% |

**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/design questions.
Pre-requisite: CS205 Data structures

Course Objectives

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)

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. **
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.
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.
<table>
<thead>
<tr>
<th>Course No.</th>
<th>Course Name</th>
<th>L-T-P - Credits</th>
<th>Year of Introduction</th>
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</thead>
<tbody>
<tr>
<td>CS233</td>
<td>ELECTRONICS CIRCUITS LAB</td>
<td>0-0-3-1</td>
<td>2016</td>
</tr>
</tbody>
</table>

**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.
<table>
<thead>
<tr>
<th>Course code</th>
<th>Course Name</th>
<th>L-T-P - Credits</th>
<th>Year of Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS200</td>
<td>Business Economics</td>
<td>3-0-0-3</td>
<td>2016</td>
</tr>
</tbody>
</table>

**Prerequisite: Nil**

**Course Objectives**
- 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
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**
References:

Course Plan

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem. Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>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)</td>
<td>4</td>
<td>15%</td>
</tr>
<tr>
<td>II</td>
<td>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.)</td>
<td>6</td>
<td>15%</td>
</tr>
<tr>
<td>III</td>
<td>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.).</td>
<td>6</td>
<td>15%</td>
</tr>
<tr>
<td>PART</td>
<td>Module</td>
<td>Topics</td>
<td>Duration</td>
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<tr>
<td>V</td>
<td>Business Decisions I</td>
<td>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.)</td>
<td>5 Hrs.</td>
</tr>
<tr>
<td>VI</td>
<td>Business Decisions II</td>
<td>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.)</td>
<td>7 Hrs.</td>
</tr>
</tbody>
</table>

**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.
<table>
<thead>
<tr>
<th>Course code</th>
<th>Course Name</th>
<th>L-T-P-Credits</th>
<th>Year of Introduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS210</td>
<td>LIFE SKILLS</td>
<td>2-0-2</td>
<td>2016</td>
</tr>
</tbody>
</table>

**Prerequisite:** Nil

**Course Objectives**

- To develop communication competence in prospective engineers.
- To enable them to convey thoughts and ideas with clarity and focus.
- To develop report writing skills.
- To equip them to face interview & Group Discussion.
- To inculcate critical thinking process.
- To prepare them on problem solving skills.
- To provide symbolic, verbal, and graphical interpretations of statements in a problem description.
- To understand team dynamics & effectiveness.
- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.
- To learn leadership qualities and practice them.

**Syllabus**


**Critical Thinking & Problem Solving:** Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats, Mind Mapping & Analytical Thinking.

**Teamwork:** Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.

**Ethics, Moral & Professional Values:** Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.

**Leadership Skills:** Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid & leadership Formulation.

**Expected outcome**

The students will be able to

- Communicate effectively.
- Make effective presentations.
- Write different types of reports.
- Face interview & group discussion.
- Critically think on a particular problem.
- Solve problems.
- Work in Group & Teams
- Handle Engineering Ethics and Human Values.
- Become an effective leader.
**Resource Book:**


**References:**

- Shalini Verma (2014); “Development of Life Skills and Professional Practice”; First Edition; Sultan Chand (G/L) & Company
- John C. Maxwell (2014); “The 5 Levels of Leadership”, Centre Street, A division of Hachette Book Group Inc.

**Course Plan**

<table>
<thead>
<tr>
<th>Module</th>
<th>Contents</th>
<th>Hours</th>
<th>Sem. Exam Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Need for Effective Communication, Levels of communication; Flow of communication; Use of language in communication; Communication networks; Significance of technical communication, Types of barriers; Miscommunication; Noise; Overcoming measures, Listening as an active skill; Types of Listeners; Listening for general content; Listening to fill up information; Intensive Listening; Listening for specific information; Developing effective listening skills; Barriers to effective listening skills.</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Technical Writing: Differences between technical and literary style, Elements of style; Common Errors, Letter Writing: Formal, informal and demi-official letters; business letters, Job Application: Cover letter, Differences between bio-data, CV and Resume, Report Writing: Basics of Report Writing; Structure of a report; Types of reports.</td>
<td>4</td>
<td>See evaluation scheme</td>
</tr>
<tr>
<td></td>
<td>Non-verbal Communication and Body Language: Forms of non-verbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interview Skills: Types of Interviews; Ensuring success in job interviews; Appropriate use of non-verbal communication, Group Discussion: Differences between group discussion and debate; Ensuring success in group discussions, Presentation Skills: Oral presentation and public speaking skills; business presentations, Technology-based Communication: Netiquettes: effective e-mail messages; power-point presentation; enhancing editing skills using computer software.</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
| II | Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity  
Critical thinking Vs Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence.  
Steps in problem solving, Problem Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections.  
Problem Solving strategies, Analytical Thinking and quantitative reasoning expressed in written form, Numeric, symbolic, and graphic reasoning, Solving application problems. | 2 | 2 |
| III | Introduction to Groups and Teams, Team Composition, Managing Team Performance, Importance of Group, Stages of Group, Group Cycle, Group thinking, getting acquainted, Clarifying expectations.  
Group Problem Solving, Achieving Group Consensus.  
Group Dynamics techniques, Group vs Team, Team Dynamics, Teams for enhancing productivity, Building & Managing Successful Virtual Teams. Managing Team Performance & Managing Conflict in Teams.  
Working Together in Teams, Team Decision-Making, Team Culture & Power, Team Leader Development. | 3 | 2 |
| IV | Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully.  
Caring, Sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character  
Spirituality, Senses of 'Engineering Ethics’, variety of moral issued, Types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, Consensus and controversy, Models of Professional Roles, Theories about right action, Self-interest, customs and religion, application of ethical theories.  
Engineering as experimentation, engineers as responsible experimenters, Codes of ethics, Balanced outlook on.  
The challenger case study, Multinational corporations, Environmental ethics, computer ethics, | 3 | 2 |
Weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India, etc.

Introduction, a framework for considering leadership, entrepreneurial and moral leadership, vision, people selection and development, cultural dimensions of leadership, style, followers, crises.

Growing as a leader, turnaround leadership, gaining control, trust, managing diverse stakeholders, crisis management.

Implications of national culture and multicultural leadership
Types of Leadership, Leadership Traits.

Leadership Styles, VUCA Leadership, DART Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders, making of a Leader, Formulate Leadership

END SEMESTER EXAM

EVALUATION SCHEME

Internal Evaluation
(Conducted by the College)

Total Marks: 100

Part – A

(To be started after completion of Module 1 and to be completed by 30th working day of the semester)

1. Group Discussion – Create groups of about 10 students each and engage them on a GD on a suitable topic for about 20 minutes. Parameters to be used for evaluation is as follows;

   (i) Communication Skills – 10 marks
   (ii) Subject Clarity – 10 marks
   (iii) Group Dynamics - 10 marks
   (iv) Behaviors & Mannerisms - 10 marks

   (Marks: 40)
Part – B

(To be started from 31st working day and to be completed before 60th working day of the semester)

2. Presentation Skills – Identify a suitable topic and ask the students to prepare a presentation (preferably a power point presentation) for about 10 minutes. Parameters to be used for evaluation is as follows;

   (i) Communication Skills* - 10 marks
   (ii) Platform Skills** - 10 marks
   (iii) Subject Clarity/Knowledge - 10 marks

   (Marks: 30)

* Language fluency, auditability, voice modulation, rate of speech, listening, summarizes key learnings etc.

** Postures/Gestures, Smiles/Expressions, Movements, usage of floor area etc.

Part – C

(To be conducted before the termination of semester)

3. Sample Letter writing or report writing following the guidelines and procedures. Parameters to be used for evaluation is as follows;

   (i) Usage of English & Grammar - 10 marks
   (ii) Following the format - 10 marks
   (iii) Content clarity - 10 marks

   (Marks: 30)

External Evaluation

(Conducted by the University)

Total Marks: 50          Time: 2 hrs.

Part – A

Short Answer questions

There will be one question from each area (five questions in total). Each question should be written in about maximum of 400 words. Parameters to be used for evaluation are as follows;

   (i) Content Clarity/Subject Knowledge
   (ii) Presentation style
   (iii) Organization of content
Part – B

Case Study

The students will be given a case study with questions at the end the students have to analyze the case and answer the question at the end. Parameters to be used for evaluation are as follows:

(i) Analyze the case situation
(ii) Key players/characters of the case
(iii) Identification of the problem (both major & minor if exists)
(iv) Bring out alternatives
(v) Analyze each alternative against the problem
(vi) Choose the best alternative
(vii) Implement as solution
(viii) Conclusion
(ix) Answer the question at the end of the case

(Marks: 1 x 20 = 20)
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:

References:
1. Dennis g Zill & Patric D Shanahan - A first Course in Complex Analysis with Applications - Jones & Bartlet Publishers
3. Lipschutz, Linear Algebra, 3e (Schaums Series) McGraw Hill Education India 2005

Course Plan

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

### FIRST INTERNAL EXAMINATION

<table>
<thead>
<tr>
<th>III</th>
<th>Complex Integration. Text 1 [14.1-14.4] [15.4&amp;16.1]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Definition Complex Line Integrals, First Evaluation Method, Second Evaluation Method</td>
</tr>
<tr>
<td></td>
<td>Cauchy’s Integral Theorem (without proof), Independence of path (without proof), Cauchy’s Integral Theorem for Multiply Connected Domains (without proof)</td>
</tr>
<tr>
<td></td>
<td>Cauchy’s Integral Formula- Derivatives of Analytic Functions (without proof) Application of derivative of Analytical Functions</td>
</tr>
<tr>
<td></td>
<td>Taylor and Maclaurin series (without proof), Power series as Taylor series, Practical methods (without proof)</td>
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<tr>
<td></td>
<td>Laurent’s series (without proof)</td>
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</tbody>
</table>

### SECOND INTERNAL EXAMINATION

<table>
<thead>
<tr>
<th>V</th>
<th>Linear system of Equations Text 1 [7.3-7.5]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linear systems of Equations, Coefficient Matrix, Augmented Matrix</td>
</tr>
<tr>
<td></td>
<td>Gauss Elimination and back substitution, Elementary row operations, Row equivalent systems, Gauss elimination - Three possible cases, Row Echelon form and Information from it.</td>
</tr>
<tr>
<td>Module</td>
<td>Topics</td>
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</tr>
<tr>
<td>I</td>
<td>Linear independence-rank of a matrix</td>
</tr>
<tr>
<td></td>
<td>Vector Space-Dimension-basis-vector space $\mathbb{R}^3$</td>
</tr>
<tr>
<td></td>
<td>Solution of linear systems, Fundamental theorem of non-homogeneous linear systems (Without proof)-Homogeneous linear systems (Theory only)</td>
</tr>
<tr>
<td>IV</td>
<td>Matrix Eigen value Problem Text 1.(8.1,8.3 &amp;8.4)</td>
</tr>
<tr>
<td></td>
<td>Determination of Eigen values and Eigen vectors-Eigen space</td>
</tr>
<tr>
<td></td>
<td>Symmetric, Skew Symmetric and Orthogonal matrices –simple properties (without proof)</td>
</tr>
<tr>
<td></td>
<td>Basis of Eigen vectors- Similar matrices Diagonalization of a matrix-Quadratic forms- Principal axis theorem(without proof)</td>
</tr>
<tr>
<td></td>
<td>(Assignment-Some applications of Eigen values(8.2))</td>
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</tbody>
</table>

**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.