CMP 331.3 Data Structure and Algorithm (3-1-3)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

The purpose of the course is to provide fundamental knowledge on data structure designing and implementation for storing information. Moreover, it provides the knowledge of various algorithms used in computer science.

Course Contents:

1. **Introduction to Data Structure and algorithms** **(3hrs)**
   - 1.1. Review of Array, Structure, Union, Class, Pointer
   - 1.2. Abstract data type
   - 1.3. Data Structure Concept

2. **The Stack** **(4hrs)**
   - 2.1. Definition and Primitive Operations
   - 2.2. Stack as an ADT, Stack operations
   - 2.3. Stack application
   - 2.4. Evaluation of Infix Postfix and prefix expressions.
   - 2.5. Expression Conversion

3. **Queue** **(3hrs)**
   - 3.1. Definition, Queue as an ADT and Primitive operations in queue
   - 3.2. Linear and circular queue and their application
   - 3.3. Double Ended Queue
   - 3.4. Priority queue

4. **Static and Dynamic List** **(8hrs)**
   - 4.1. Definition and Array implementation of lists
   - 4.2. Queues as a list
   - 4.3. Link List Definition and link list as an ADT
   - 4.4. Dynamic implementation
   - 4.5. Basic operations in linked list
   - 4.6. Doubly linked lists and its advantages
   - 4.7. Implementation of Doubly Linked List

4.8. Linked Implementation of stacks and Queues.

5. Recursion **(2hrs)**

5.1. Principle of recursion and Comparison between recursion and iteration
5.2. Factorial, TOH and Fibonacci sequence
5.3. Applications of recursion and Validity of an Expression

6. Trees **(7hrs)**

6.1. Concept and definitions
6.2. Basic operation in binary tree
6.3. Binary search tree and insertion /deletions
6.4. Binary tree traversals (preorder, post order and in order) tree height level and depth
6.5. Balanced trees
6.6. AVL balanced trees
6.7. Balancing algorithm
6.8. The Huffman algorithm
6.9. Game tree
6.10. B- Tree.

7. Sorting

7.1. Internal and external sort **(5hrs)**
7.2. Insertion and selection sort
7.3. Exchange sort
7.4. Bubble and quick sort
7.5. Merge and Radix sort
7.6. Shell sort
7.7. Heap sort as priority queue
7.8. Efficiency of sorting.

8. Searching

8.1. Search technique essential of search **(3hrs)**
8.2. Sequential search
8.3. Binary search
8.4. Hashing :
8.5. Hash function and hash tables ,
8.6. Collision resolution technique ,
8.7. Efficiency comparisons of different search technique.

9. Graphs

9.1. Representation and applications **(8hrs)**
9.2. Graphs as an ADT

9.3. Transitive closure and Wars hall's algorithm
9.4. Graphs types
9.5. Graphs traversal and spanning forests
9.6. Kruskal 's and Round Robin algorithms
9.7. Shortest-path algorithm
9.8. Greedy algorithm
9.9. Dijkstra's Algorithm

10. Algorithms **(2hrs)**

10.1. Deterministic and no-deterministic algorithm
10.2. Divide and conquer algorithm
10.3. Series and Parallel algorithm
10.4. Heuristic and Approximate algorithm.
10.5. Big O Notation

Laboratory:

There shall be lab exercises based on C or C++

1. Implementations of stack
2. Implementations of linear and circular queues
3. Solutions of TOH and Fibonacci Recursion
4. Implementation of linked list: singly and double linked
5. Implementation of trees; AVL tree Balancing of ALV
6. Implementation of merge sort
7. Implementation of search: sequential tree and binary
8. Implementation of Graphs: Graph traversals
9. Implementation of hashing
10. Implementation of heap

Text Books:

1. Y Langsam, MJ, Augenstein and A.M , Tenenbaum Data Structures using C and C++ , Prentice Hall India
2. G.W Rowe, Introduction to Data Structure and Algroithms with C and C++ , prentice Hall India

Reference Books:

1. R.L Kruse, B.P. Leung, C.L. Tondo, data structure and program Design in C Prentice hall India
2. G. Brassard and P. Bratley fundamentals of Algroithms, prentice hall India

ELX 212.3 Logic Circuits (3-1-3)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

The purpose of the course is to provide basic knowledge of logic systems. Moreover, it enables to design a basic digital computer.

Course Contents:

1. **Introduction** **(3 hrs)**
   - 1.1 Numerical representation
   - 1.2 Digital number system
   - 1.3 Digital and analog system

2. **Number System and Codes** **(6 hrs)**
   - 2.1 Binary to decimal and decimal to binary conversions
   - 2.2 Octal, hexadecimal number system and conversions
   - 2.3 Binary Arithmetic 1's complement and 9's complements
   - 2.4 Gray code
   - 2.5 Instruction codes
   - 2.6 Alphanumeric characters
   - 2.7 Modulo2 system and 2's complement
   - 2.8 Binary Coded Decimal (BCD) and hexadecimal codes
   - 2.9 Parity method for error detection

3. **Boolean Algebra and Logic Gates** **(4 hrs)**
   - 3.1 Basic definition
   - 3.2 Basic properties and theorem of Boolean algebra
   - 3.3 DeMorgan's Theorem
   - 3.4 Logic gates and truth tables
   - 3.5 Universality of NAND and NOR gates
   - 3.6 Tristate logic

4. **Simplification of Boolean Function** **(5 hrs)**
   - 4.1 Venn diagram and test vectors

4.2 Karnaugh maps up to five variables
4.3 Minimum realization
4.4 Don't care conditions
4.5 Logic gates implementation
4.6 Practical design steps

5. **Combination Logic** **(4 hrs)**
   5.1 Design procedure
   5.2 Adders and subtractors
   5.3 Code conversion
   5.4 Analysis procedure
   5.5 Multilevel NAND and NOR circuits,
   5.6 Parity generation and checking
6. **MSI and LSI Components in Combinational Logic Design** **(6 hrs)**
   6.1 Binary adder and subtractor,
   6.2 Decimal adder
   6.3 Magnitude comparator
   6.4 Decoder and encoder
   6.5 Multiplexer and demultiplexer
   6.6 Read-only memory (ROM)
   6.7 Programmable Logic Array (PLA)

7. **Sequential Logic** **(6 hrs)**
   7.1 Event driven model and state diagram
   7.2 Flip-flops and their types
   7.3 Analysis of clocked sequential circuits
   7.4 Decoder as memory devices
   7.5 State reduction and assignment
   7.6 Synchronous and asynchronous logic
   7.7 Edge triggered device
   7.8 Master slave flip-flops
   7.9 JK and T flip-flops

8. **Registers, Counters and Memory Unit** **(6 hrs)**
   8.1 Registers
   8.2 Shift registers
   8.3 Superposition of registers
   8.4 Generation of codes using registers
   8.5 Ripple
   8.6 Synchronous and Johnson Counters
   8.7 Design of multiple input circuits

8.8 Random Access Memory (RAM)
8.9 Memory decoding
8.10 Error-correction code
8.11 Output hazards races

9. **Arithmetic Logic Units** **(5 hrs)**
   9.1 Nibble adder
   9.2 Adder/ subtractor unit
   9.3 Design of arithmetic logic unit
   9.4 Status register
   9.5 Design of shifter
   9.6 Processor unit
   9.7 Design of accumulator

Laboratory Work:

1. Familiarization with logic gates.
2. Encodes and decodes
3. Multiplexer and demultiplexer
4. Design of simple combination circuits.
5. Design of adder/subtractor
6. Design of flip-flop
7. Design of counter
8. Clock driven sequential circuits
9. Conversion of parallel data into serial format.
10. Generation of timing signal for sequential system.

Text Books:

1. M. Mano, Digital Logic and Computer Design, Prentice Hall of India 1998.
2. M. Mano, Computer System Architecture, Prentice Hall of India, 1998.

Reference:

1. M. Mano, Digital Design, Prentice Hall of India, 1998.

CMP 483.3 Web Technology (3-0-3)

Evaluation

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

The purpose of the course is to provide basic techniques of Web Technology and Web Programming. After completing the course, students will be familiar with the recent technologies such as web technology, client site programming, server side programming, and will be able to develop web based applications using most recent technologies.

Course Contents:

1. **Fundamentals** **(6 hrs)**
   - 1.1 Introduction to Internet, WWW, Web Browsers, Web Servers, URL, Multipurpose Internet Mail Extensions
   - 1.2 Overview of different protocols: HTTP, POP, SMTP, FTP, WAP, Web Architecture, Web Standards
   - 1.3 Domain name and hierarchy, domain name registration process, web hosting

2. **Introduction to HTML and XHTML** **(6 hrs)**
   - 2.1 Origins and evaluation of HTML, Basic Syntax
   - 2.2 Standard HTML Document Structure and Basic Text Formatting
   - 2.3 Images, Hypertext Links, Lists, Tables, Frames, Forms, Multimedia in HTML

3. **Cascading Style Sheets** **(5 hrs)**
   - 3.1 Introduction and Levels of Style Sheets
   - 3.2 Style Specification Formats, Style classes, Properties and Property values, color, the and tags

4. **Introduction to Java Script** **(11 hrs)**
   - 4.1 Basics of Java script and Document Object Model
   - 4.2 Element Access in Java scripts, event and event handling

4.3 DOM Event Model and Element Positioning
4.4 Moving elements and Element visibility
4.5 Changing colors and fonts
4.6 Dynamic content and stacking elements
4.7 Locating the mouse cursor and reacting to a mouse click
4.8 Dragging and dropping elements

5. Programming in PHP and MYSQL **(17 hrs)**

5.1 Origins and Uses of PHP
5.2 Overview of PHP and General Syntactic Characteristics
5.3 Primitives, Operations, and Expressions
5.4 Output and Control Statements
5.5 Arrays, Functions, Basic Pattern Matching, Form Handling, Files Handling
5.6 Cookies, Session Tracking, Database Access with PHP and MySQL

Laboratory:

1. Every topic of the course content should be included for the lab.
2. Individual or group project work to develop a web application could be assigned. This should cover most of the technologies included in the course content

Text Book:

Robert W. Sebesta, Programming the World Wide Web, Addison-Wesley, ISBN-10: 0321489691

References:

1. W3Schools Online Web Tutorials, www.w3school.com
2. Ipfaffenberger, World Wide Web Bible, BPB, ISBN: 81-7029-781-8
3. Powell, The Complete reference to HTML and XHTML, TATA McGRAW HILL, Fourth Edition

MTH 211.3 Engineering Mathematics III (3-2-0)

Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

Course Objectives:

The main objectives of this course is to provide the basic knowledge of Linear algebra, vector calculus, fourier series, linear programming by graphical and simplex methods. After the completion of this course, students can use their knowledge in their professional course.

Course Contents:

1. Matrix and Determinant: **(8 hrs)**

1.1 Review of Matrix and determinant with their properties
1.2 System of linear equation with their solutions by Gauss elimination methods
1.3 Rank of matrix
1.4 Consistency of system of linear equation
1.5 Vector space and sub space
1.6 Linear transformation
1.7 Eigen values and vectors. Cayley Hamilton theorem (Statement only) and its application.

2. Vector Calculus **(16 hrs)**

2.1 Differentiation and integration of vectors
2.2 Gradient divergence and curl with their properties (without proof)
2.3 Line integral: Definition of line integral, Evaluation of line integral, properties, Greens theorem, Area by Greens theorem
2.4 Surface integral: Surface integral, tangent planes, Gauss divergence theorem, Dirichelet integral
2.5 Line integral: Stokes theorem

3. Infinite series **(8 hrs)**

3.1 Sequence and series
3.2 Necessary condition of convergence of infinite series
3.3 P-test (hyper-harmonic test)
3.4 Ratio test
3.5 Root test
3.6 Integral test
3.7 Leibnitz test and absolute convergence
3.8 Interval of convergence of power series.
3.9 Taylor and Maclaurin expansion (Statement only) and its application

4. Fourier Series **(6 hrs)**

4.1 Periodic function, Trigonometric series, even and odd function
4.2 Fourier series of a function with period 2π and arbitrary period 2L
4.3 Fourier sine and cosine series representation of the half range function.

5. **Linear Programming** (7 hrs)

5.1 System of Linear Inequalities

5.2 Linear Programming

- 5.2.1 Model Formulation
- 5.2.2 Graphical Solution
- 5.2.3 Simplex method
- 5.2.4 The Dual model
- 5.2.5 Dual Simplex Method

Text Books:

1. Kreyszig, Erwin. *Advance Engineering Mathematics* (8th edition). New Delhi: Wiley-Easter Publication.
2. Paudel, Toya Narayan. *Engineering Mathematics III*, Bhotahity: Sukunda publication,

References:

1. Thomas, George B. & Finney, Ross L. *Calculus and Analytical Geometry.*
2. Swokoswski, E.W., *Calculus with Analytical Geometry.*
3. Singh, M.B., *Vector Analysis.*
4. Pant, G. D., *Algebra.*

Electronic Circuit and Instrumentation

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

The purpose of the course is to provide knowledge of designing amplifiers and electronic circuits. It also provides knowledge of measurement & instrumentation and instrumentation system.

Course contents:

1. Low Frequency Transistor Amplifier Circuits **(6 hrs)**

1.1 Need of cascading and gain calculation of n-stage cascaded amplifiers
1.2 Choice of configuration in a cascade
1.3 Voltage gain, current gain, input and output impedances of two stage RC coupled amplifier
1.4 Amplitude, frequency and phase distortions
1.5 Lower cut off frequency, upper cut off frequency and bandwidth
1.6 Frequency response of RC-Stage amplifiers
1.7 Effects of bypass capacitor on frequency response

2. Large Signal Amplifiers **(5 hrs)**

2.1 Analysis of large signal model
2.2 Classification of power amplifiers
2.3 Efficiency calculation of class A and B amplifiers
2.4 Direct coupled load and transformer coupled load class A amplifiers
2.5 Push pull concept and transformer coupled load class B push pull amplifiers
2.6 Complementary symmetry class B push pull amplifiers
2.7 Cross over distortion and class AB operation
2.8 Power dissipation and heat sinks

3. Feedback Amplifiers and Oscillators **(5 hrs)**

3.1 Advantages of Negative feedback amplifiers
3.2 Gain stability and bandwidth extension
3.3 Feedback configurations
3.4 Sinusoidal oscillators
3.5 Importance of positive feedback in oscillator circuits

3.6 Wien-bridge oscillator
3.7 RC phase shift oscillator
3.8 Tuned LC oscillators
3.9 Crystal oscillator

4. Operational Amplifiers **(6 hrs)**

4.1 Fundamentals of operational amplifiers (Op. Amp)
4.2 Characteristics and features of Op. Amp
4.3 Virtual ground concept, Output offset voltages, input bias current, CMRR and slew rate
4.4 Inverting and non inverting amplifiers
4.5 Applications of op amp in summing, differentiation, and integration
4.6 Instrumentation amplifiers
4.7 Applications of Instrumentation amplifiers
4.8 Isolation amplifiers

5. Instrumentation System and signal measurements **(6 hrs)**

5.1 Components of Instrumentation and their function
5.2 Units and standards of measurements
5.3 Measuring instruments
5.4 Performance parameters
5.5 Review of Wheat stone, inductance and capacitance bridges
5.6 Error, Probability of errors, Normal distribution

6. Physical Variables and Transducers **(8hrs)**

6.1 Physical variables and their types (Electrical, Mechanical, Process, bio-physical variable)
6.2 Types, Principle of operation, input and output characteristics and applications of Transducer (resistive, capacitive, inductive, voltage and currents)

7. Signal Conditioning and Processing **. (6 hrs)**

7.1 Importance of signal conditioning
7.2 Interference signals and their elimination
7.3 Importance of signal conversion
7.4 Binary weighted resistor DAC
7.5 R-2R ladder DAC
7.6 Counting type ADC
7.7 Successive type ADC
7.8 Flash ADC

8. Output Devices **(3 hrs)**

8.1 Indication instruments,
8.2 Magnetic data recorders,
8.3 Strip-chart,
8.4 X-Y recorder

Laboratory:

1. Frequency response of BJT amplifier
2. Efficiency calculation of class A and B power amplifiers
3. Design of RC Phase shift and Wein Bridge Oscillator
4. Realization of a R-2R D/A Converter
5. Conversion of physical variables into electrical signal
6. Signal conditioning using active devices or Op Amp
7. Measurement of physical variables using various Bridges
8. Error measurements in instrumentation system

Text Books:

1. A.K. Sawhney, *A Course in Electronic Measurements and Instrumentation*, Dhanpat Rai and Sons, India, 1998.
2. Theodore F. Bogart, Electronic Devices and Circuits, Universal Book Stall, India.

References:

1. S. Wolf and R.F.M. Smith, *Student Reference Manual for Electronic Instrumentation Laboratories*, Prentice Hall of India, 1996.
2. E.O. Deobelin, *Measurement System: Application and Design*, McGraw Hill, 1990
3. C.S. Rangan, G.R. Sarma, and V.S.V. Mani, *Instrumentation Devices and Systems*, Tata McGraw Hill, India, 1992.
4. D.M. Considine, *Process Instruments and Control Handbooks*, McGraw Hill 1985.
5. Dhruba Banjade, Electronic Circuits, Yog Prakashan 2012.
6. A.D. Helfrick and W.D. Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, Prentice Hall of India, 1996

MTH 213.2 Probability and Queuing Theory (2-2-0)

Evaluation:

	Theory	Practical	Total
Sessional	50	-	50
Final	50	-	50
Total	100	-	100

Course Objectives:

The purpose of the course is to provide sound knowledge of the probability, probability distributions and queuing theory.

Course Contents:

1. **Basic Probability Concepts** **(4 hrs)**
   - 1.1 Probability Theory and Sample space
   - 1.2 Events and probability approaches
   - 1.3 Probability laws: Addition law and Multiplication law
   - 1.4 Conditional Probability and Bayes' Rule.

2. **Random variable, Mathematical expectation and theoretical distribution** **(16 hrs)**
   - 2.1 Concepts of Random variable, Types of random variable
   - 2.2 Probability distribution of discrete random variable and continuous random variable
   - 2.3 Function of random variable
   - 2.4 Mathematical expectation and variance of Continuous and discrete random variable
   - 2.5 Moments of continuous random variable, Uses of Moments
   - 2.6 Binomial distribution, Poisson distribution
   - 2.7 Normal distribution, t-distribution, Chi-square distribution, F-distribution, Beta distribution, Gamma distribution, Exponential distribution
   - 2.8 Expectations and Higher Order Moments
   - 2.9 Characteristic function
   - 2.10 Chebyshev inequality for continuous random variable
   - 2.11 Laws of Large Numbers: Weak Laws and Strong Laws of Large Numbers
   - 2.12 Central Limit Theorem and its application

3. **Queuing Theory** **(10 hrs)**
   - 3.1 Essential features of queuing system
   - 3.2 Specification and Measure of Queuing System
   - 3.3 Probability distribution in queuing system
     - 3.3.1 Distribution of arrival, Pure Birth Process
     - 3.3.2 Distribution of inter-arrival times, distribution of departure, pure death process

3.4 Distribution of service time

3.5 The Classical System: Operating characteristics (Transient and steady state behavior, Line Length, Queue length, Relationship among System Characteristics)

3.6 Solution of Queuing Models: The (M/M/1: α /FCFS) model, (M/M/1: α/SIRO) model. The M/M/1: N/FCFS model, The M/M/s: α /FCFS model. The M/M/s: N/FCFS model, The M/M/s: M/G/D model, The M/Ek/1: α /FCFS model, Application of Queuing Theory in Computer Science, (Examples and numerical problems)

Text Book:

1. Trivedi, K. S., *Probability & Statistics with Reliability Queuing, and Computer Science Applications*, PHI, 2000, ISBN: 81-203-0508-6

References:

1. Johnson, Rechard A., *Miller & Freund's Probability and Statistics for Engineers*, PHI, Fifth Edition, ISBN: 81-203-0892-1.
2. Sharma, J. K., *Operation Research – Theory and Applications*, McMilan India Ltd. 2000, ISBN: 033-923944.
3. V.Sundarapandain Probability Statistics and Queuing theory, PHI Learning PVT, ISBN: 978-203-3844-9