HIMACHAL PRADESH TECHNICAL UNIVERSITY
HAMIRPUR

Syllabus

for

B.Tech CSE 2nd Year

As per National Education Policy (NEP-2020)

(w.e.f. the Academic Year 2023-2024)

Department of

Computer Science & Engineering

Dean -Academic
H.P. Technical University
Hamirpur - 177 001, HP

Semester-III

Sr. No.	Category	Subject Code	Subject	L	T	P/D	Credits	Evaluation Scheme (Marks)				
								Internal Assessment (IA)			ESE	Subject Total
								CT	IA	Total		
Theory:												
1	PC	MA-311	Discrete Mathematical Structure	3	1	0	4	20	20	40	60	100
2	PC	CS-311	Operating System	3	1	0	4	20	20	40	60	100
3	PC	CS-312	Data Structure and Algorithms	3	1	0	4	20	20	40	60	100
4	PC	CS-313	Java Programming	3	0	0	3	20	20	40	60	100
5	PC	EC-311	Digital Electronics	3	0	0	3	20	20	40	60	100
6	FC	HS-311	Economic Engineering	3	0	0	3	20	20	40	60	100
7	MC	IKS-311	Indian Knowledge System	2	0	0	2	20	20	40	60	100
	Labs:							**FW**	**LP**	**Total**	**ESVE**	**Sub. Total**
1	PC	CS-311P	Operating System Lab	0	0	2	1	10	20	30	20	50
2	PC	CS-312P	Data Structure and Algorithms Lab	0	0	2	1	10	20	30	20	50
3	PC	CS-313P	Java Programming Lab	0	0	2	1	10	20	30	20	50
4	PC	EC-311P	Digital Electronics Lab	0	0	2	1	10	20	30	20	50
			Total	**20**	**03**	**08**	**27**					**900**

Legends:

L - Lecture

T - Tutorial

P - Practical

CT - Class Test

IA - Internal Assessment

ESE - End Semester Examination

FW - Documentation/ File work and presentation

LP - Lab performance

ESVE - End Semester Exam. / Viva-voce Exam.

PC - Programme Core

Semester-IV

S. No.	Category	Subject Code	Subject	L	T	P/D	Credits	Evaluation Scheme (Marks)				
								Internal Assessment (IA)			ESE	Subject Total
								CT	IA	Total		
Theory:												
1	FC	MA-411	Optimization and Calculus of Variations	3	1	0	4	20	20	40	60	100
2	PC	CS-411/CS-314	Python Programming	3	0	0	3	20	20	40	60	100
3	PC	CS-412	Design and Analysis of Algorithms	3	1	0	4	20	20	40	60	100
4	PC	CS-413	Artificial Intelligence and Expert Systems	3	1	0	4	20	20	40	60	100
5	PC	CS-414/CS-315	Computer Architecture& Organisation	3	1	0	4	20	20	40	60	100
6	PC	EC-411	Microprocessors and Interfacing	3	1	0	4	20	20	40	60	100
7	FC	HS-411	Entrepreneurship and Startups	2	0	0	2	20	20	40	60	100
	Labs:							**FW**	**LP**	**Total**	**ESVE**	**Sub. Total**
1	PC	CS-411P/CS-314P	Python Lab	0	0	2	1	10	20	30	20	50
2	PC	CS-412P	DAA Lab	0	0	2	1	10	20	30	20	50
3	PC	CS-413P	AI Lab	0	0	2	1	10	20	30	20	50
			Total	**20**	**05**	**06**	**28**					**850**

Legends:

L - Lecture

T - Tutorial

P - Practical

CT - Class Test

IA - Internal Assessment

ESE - End Semester Examination

FW - Documentation/ File work and presentation

LP - Lab performance

ESVE - End Semester Exam. / Viva-voce Exam.

PC - Programme Core

Dean –Academic
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MA-311 Discrete Mathematical Structure							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Course Objectives(COs): Detailed study of various discrete and algebraic structures, basic logic, basics of counting and proof techniques.

Unit-I
Sets, Relations and Functions: Operations on Set, Inclusion -exclusion principle, Representation of Discrete Structures, Fuzzy Set, Multi-set, bijective function, Inverse and Composition of functions, Floor and Ceiling functions, Growth of functions: Big-O notation, functions, Recursive function, Functions applications.
Unit-II
Relations: Reflexivity, Symmetry, transitivity, Equivalence, and partial ordered relations, Asymmetric, Irrelexivity relation, Inverse and Complementary relations, partitions and Covering of a set, N-ary Relations and database, Representation relation using matrices and digraph, Closure of relations, Warshall's algorithms, Lexicographic Ordering, Hasse diagram, Lattices, Boolean algebra, Application of transitive Closure in medicine and engineering. Application: Embedding a partial order.
Unit-III
Graph Theory: Representation, Type of Graphs, Paths, and Circuits: Euler Graphs, Hamiltonians Paths &Circuits: Cut Sets, Connectivity and Separability, Planar Graphs, Isomorphisms, Graph Coloring, Covering and Partitioning, Max flow: Ford -Fulkerson algorithm, Application of Graph Theory in real life applications. **Basic Logic:** Propositional Logic, Logical connectives, Truth Tables, Normal Forms (Conjunctive and Disjunctive), Validity of well-formed formula, Propositional inference rules (Concepts of modus ponens and modus tollens), Predicate Logic, Universal and existential quantification.
Unit-IV
Proof Techniques and Counting: Notations of implication, equivalence, converse, inverse, contra positive, negation and contradiction, the structure of mathematical proofs, Direct Proofs, disproving by counter example, Proof by contradiction, Induction over natural numbers, structural induction, weak and strong induction, The pigeonhole principle, solving homogenous and heterogenous recurrence relations. **Algebraic Structure:** Group, Semi-group, Monoids, Homomorphism, Congruencies, Ring, Field, Homomorphism, Congruencies, Applications of algebra to control structure of a program, the application of Residue Arithmetic to Computers.

Course Learning Outcomes (CLOs):

After the completion of the course, the student will be able to:

- Perform operations on various discrete structures such as set, function and relation.

- Apply basic concepts of asymptotic notation in analysis of algorithm.
- Illustrate the basic properties and algorithms of graphs and apply them in modeling and solving real world problems.
- Comprehend formal Logical arguments and translate statements from a natural language into its symbolic structures in logic.
- Identify and prove various properties of rings, field, and groups.

Textbooks:

- Rosen H.K., Discrete mathematics and its Applications, McGraw Hill (2011)7th ed.
- Tremblay P.J. and Manohar, R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill (2008).

Reference Books:

- Gallian A.J., Contemporary Abstract Algebra, Cengage Learning (2017) 9th ed.
- Lipschutz S., Lipson M., Discrete Mathematics, McGraw Hill (2007) 3rd ed.

CS-311 Operating System							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Course Objectives(COs): To understand the role, responsibilities and the algorithms involved for achieving various functionalities of an Operating System.

Unit-I
Introduction and System Structures: Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Functions, Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Design and Implementation. **Process Management:** Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication, **Multi-threaded programming:** Multi-core Programming, Multithreading Models.
Unit-II
Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling**. Concurrency:** The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors. **Deadlock:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.
Unit-III
Memory Management: Basic Hardware, Address Binding, Logical and Physical Address, Dynamic linking and loading, Shared Libraries, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table, Virtual Memory Management: Demand Paging, Page Replacement, Allocation of Frames, Thrashing. **File Systems:** File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.
Unit-IV
Disk Management: Mass Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure. **Networks, Security and Design Principles:** Overview of network operating system, distributed operating system, security attacks, security mechanisms and policies, OS Virtualization, Unix/Linux Case study.

Course Learning Outcomes (CLOs) :

After the completion of the course, the student will be able to:

- Explain the basic of an operating system viz. system programs, system calls, user mode and kernel mode.
- Select particular CPU scheduling algorithms for specific situation and analyses the environment leading to deadlock and its rectification.
- Explicate memory management techniques viz. caching, paging, segmentation, virtual memory, and thrashing.
- Understand the concepts related to file systems, disk scheduling and security, protection.
- Comprehend the concepts related to concurrency.

Text Books:

1. Silberschatz A., Galvin B. P. and Gagne G., Operating System Concepts, John Wiley & Sons Inc (2013) 9 th ed.
2. Stallings W., Operating Systems Internals and Design Principles, Prentice Hall (2018) 9 th ed.

Reference Books:

1. Bovet P. D., Cesati M., Understanding the Linux Kernel, O'Reilly Media (2006), 3 rd ed.
2. Kifer M., Smolka A. S., Introduction to Operating System Design and Implementation: The OSP 2 Approach, Springer (2007).

CS-312 Data Structure and Algorithms							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Course Objectives (COs): To become familiar with different types of data structures and them applications.

Unit-I
Data Structures: Definition, primitive and derived data types, abstract data types, need for data structures, types of data structures. **Algorithm:** Definition, characteristics, development of algorithm, Analysis of complexity**:** - time complexity, space complexity, order of growth, asymptotic notation with example, obtaining the complexity of the algorithm. **Arrays:** Definition, 1d and 2d arrays, operations on arrays, sparse matrices, structures and arrays of structures.
Unit-II
Linked list: Representation of linked list in memory, allocation & garbage collection, operations on linked list, doubly linked lists, circular linked list, linked list with header node, applications. **Stacks:** representation of stack in memory, operations on stack and applications. **Queues:** Representation of queues in memory, operations on queues, circular queues, double ended queues, priority queues, applications.
Unit-III
Trees: Introduction, representation of tree in memory. **Binary Trees:** Terminology, binary tree traversal, binary search tree, insertion, deletion & searching in binary search tree, heap trees, types of heap trees, insertion, deletion in heap tree with example, heap sort algorithm, introduction of AVL trees & B-trees. **Graphs:** Definition, representation of graph (adjacency matrix, adjacency list), traversing a graph (DFS & BFS), dijkstra's algorithm for shortest distance, minimum spanning tree.
Unit-IV
Searching and sorting: Need for searching and sorting, linear and binary search, insertion sort, selection sort, merge sort, quick sort, radix sort and bubble sort. Hash Tables: Introduction, hash function, collision resolution techniques in hashing, deletion from hash table.

Course Learning Outcomes (CLOs):

On completion of this course, the students will be able to:

- Implement basic data structures in solving fundamental problems.
- Implement various searching and sorting techniques.
- Implement tree and graph data structures along with their related operations.
- Evaluate and apply appropriate data structure(s) for real-world problems.

Text Books:

- Seymour Lipschutz: Theory and practice of Data structure , Tata Mc. Graw Hill 1998
- Tenebaum, A. Langsam Y and Augenstein, A. J: Data structures using C++, Prentice Hall Of India.

Reference Books:

- Data structures and Algorithms in C++ by Micheal T. Goodrich, Wiley India publication.
- Data structures, R.Venkatesan, S.Lovelyn Rose, Wiley India publication.
- Data Structures using C++ By Patil, Oxford University press.
- Data Structures, Algorithm and Object-Oriented programming, Gregory L.Heileman, TataMc-Graw Hills.
- S. Sahni, ― Data structure Algorithms ad Applications in C++‖, WCB/McGraw Hill.
- J.P. Tremblay and P.G. Sorenson, ―An Introduction to Data Structures with applications‖, Tata McGraw Hill.

CS-313 Java Programming							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Course Objectives(COs): Professionals and students who want to get themselves certified in Core Java or JDBC can refer to this syllabus for learning and enhancing their knowledge of Java during their academic sessions.

Unit-I
An overview of Java: - Java features how java differs from C &C++, data types, constants &variables, operators &expressions, control structure in java, classes, objects &methods, arrays, strings &vectors introduction to Java Design patterns. Overview of UML use in program design.
Unit-II
Interfaces &Packages: - Defining, extending, implementing interfaces, accessing interface variables, Packages: - Introduction using system package, accessing a package, using a package, adding a class to a package &hiding class, Introduction to multithread programming.
Unit-III
Applet Programming: - Applet fundamentals, life cycle of applet, creating an executable applet, applet tags, running the applet &passing parameters to applet. Introduction to AWT with windows.
Unit-IV
Software development using Java beans: - Introduction to Java beans, introspection, Introduction to swings, Japplet, Jframe &Jcomponent, Buttons, Introduction to servlet :- Life cycle of a servlet, tomcat for a servlet development.

Course Learning Outcomes (CLOs):

On completion of this course, the students will be able to:

- Use an integrated development environment to write, compile, run, and test simple object-oriented Java programs.
- Read and make elementary modifications to Java programs that solve real-world problems.
- Validate input in a Java program.
- Identify and fix defects and common security issues in code.
- Document a Java program using Javadoc.
- Use a version control system to track source code in a project.

Textbooks:

- Ivor Horton Beginning Java 2 – JDK 5 Edition, Wiley-India
- Mark Grand Patterns in Java Vol. 1-3, Wiley-India
- Steve Holzner Java 2 (JDK 5 Edition) Black Book Wiley-India
- B. Eckel Thinking in JAVA, Pearson Education.
- Deitel & Deitel How to Program JAVA. Pearson Education.

EC-311 Digital Electronics							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Course Objectives: The educational objectives of this course are:

- To present a problem oriented introductory knowledge of Digital circuits and its applications.
- To focus on the study of electronic circuits.

Unit-I
Number System: Binary, Octal, Hexadecimal, and decimal numbers of systems and their inter conversion, BCD numbers (8421-2421), gray code, excess-3 code, cyclic code, code conversion, ASCII, EBCDIC codes. Binary addition and subtraction, Signed and unsigned binary numbers, 1's and 2's complement representation.
Unit-II
Boolean Algebra: Basic logic circuits: Logic Gates (AND, OR, NOT, NAND, NOR, EX-OR, Ex Nor and their truth tables), Universal Gates, laws of Boolean algebra, De- Morgan's theorem, Min term, Max term, POS, SOP, K-Map, Simplification of Boolean theorem, don't care condition.
Unit-III
Logic Families: Introduction to digital logic family such as RTL, DTL, TTL, ECL, CMOS, IIR, HTL etc., their comparative study, Basic circuit, performance characteristics, Wired logic, open collector output etc. **Combinational Logic:** The Half adder, the full adder, subtractor circuit. Multiplexer, demultiplexer, decoder, BCD to seven segment Decoder, encoders. **Flip-flop and Timing circuit:** Set-reset laches, D-flipflop, R-S flip flop, J-K Flip flop, Master slave flip flop, edge triggered flip flop, T flip flop.
Unit-IV
Registers &Counters: Synchronous/Asynchronous counter operation, Up/Down synchronous counter, application of counter, Serial In / Serial Out Shift register, Serial In/Parallel Out Shift register, Parallel In/Parallel Out shift register, parallel in/ Serial Out shift Register, Bi-Directional Register.

Course Learning Outcomes (CLOs):

On successful completion of the course

- The student can acquire the basic knowledge of measurement principles and their application in electrical engineering.
- The students will be able to effectively employ electrical and electronics instruments for measurements of various electrical quantities.

Textbooks:

- Digital Fundamentals by Morris and Mano, PHI Publication.
- Fundamental of digital circuits by A. ANAND KUMAR, PHI Publication.
- Digital Fundamentals by FLOYD & JAIN, Pearson's Pub

HS-311 Economic Engineering							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e., one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Course Objectives(COs): The educational objectives of this course are Choose the concept of scarcity to explain economic trade-offs, opportunity costs, and rational behaviour. Discover the determinants of foreign trade flows and exchange rates, and their effects on the domestic economy.

Unit-I
Introduction: Definition, Nature, Scope, Importance and significance of Economics. For Engineers, Distinction between Micro and Macroeconomics. Concept of Utility and Its Types. **Demand and Supply:** Demand, Kinds of Demand, Demand Function, Law of Demand. Elasticity of Demand: Concept, Types, Measurement and importance. Demand Forecasting and its techniques.
Unit-II
Production Function: Concept and types, Returns to Factor and Returns to Scale, Law of Variable Proportions. **Cost and Revenue:** Concept of Cost, Short run and Lung-run Cost Curves, Relationships among various costs, Break-even Analysis. Revenue Curves: Concept and Types.
Unit-III
Market Structure: Perfect Competition, Monopoly, Monopolistic Competition Oligopoly. **Banking:** Commercial Banks- Function, Central Bank (RBI)- Function and Role of Banks in Economic Development.
Unit-IV
National Income: Definition of National Income and its Aggregates, Methods of Calculating National Income. **Inflation:** Meaning, Types, Theories, Causes, Effects and Control. Business Cycle – Meaning-Phases of business cycle. Balance of Payments, Monetary and Fiscal Policies.

Course Learning Outcomes (CLOs):

After the completion of the course, the student will be able to:

- Identify the determinants of supply and demand; demonstrate the impact of shifts in both market supply and demand curves on equilibrium price and output.
- Determine the roles that prices and markets play in organizing and directing economic activity
- Calculate and graph the short-run and long-run costs of production, supply and demand elasticities.
- Describe governmental efforts to address market failure such as monopoly power, externalities, and

public goods.

- Examine and interpret a nation's economic performance indicators such as economic growth, unemployment and inflation from a macroeconomic perspective.
- Articulate the mechanics and institutions of international trade and their impact on the macro economy.

Textbooks:

- Steven A. Greenlaw, David Shapiro, "Principles of Economics",2nd Edition, Rice University – OpenStax, 2020.ISBN-13: 978-1947172371.

Reference Books:

- N. Gregory Mankiw, **"Principles of Economics",**8th Edition, Cengage Learning, 2016.ISBN-13:978-0357038314.
- 3Niall Kishtainy, **"The Economics Book: Big Ideas Simply Explained",**1st Edition, DKPublishers, 2012.ISBN-13:978-0756698270.
- Yves Hilpisch, **"Python for Finance: Mastering Data-Driven Finance",** 2nd Edition, O'Reilly Media, 2018 ISBN-13:978-1492024330.

IKS-311 Indian Knowledge System							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
2	0	0	2	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Unit-I: The Constitution – Introduction
• The history of the making of the Indian constitution • Preamble and the basic structure, and its interpretations • Fundamentals rights and duties and their interpretation • State policy Principles
Unit-II: Union Government
• Structure of the Indian Union • President- role and power • Prime minister and council of ministers • Lok Sabha and Rajya Sabha
Unit-III: State Government
• Governor- Role and Power • Chief Minister and Council of Ministers • State Secretariat
Unit-IV: Local Administration
• District Administration • Municipal Corporation • Zila Panchayat

Suggested Learning Resources:

Sr No.	Title of Book	Author	Publications
1	Ethics and Politics of the Indian Constitution	Rajeev Bhargava	Oxford university Press, New delhi, 2008
2	The Constitution of India	B.L. Fadia	Sahitya Bhawan, New edition, 2017
3	Introduction of the Constitution of India	DD Basu	Lexis Nexis; twenty Third 2018 edition

CS-311P Operating System Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 08	20	

Following is the list of experiments out of which minimum 08 experiments must be performed in the lab. The additional experiments may be performed by the respective institution depending on the infrastructure available.

List of experiments:

1. Overview of single user systems, network operating system and multiuser system.
2. User administration in window sand Linux operating system.
3. Write a program for the simulation of following non-pre emptive CPU scheduling algorithms to find turn around time and waiting time.
   1. FCFS b)SJF c) Round Robin(pre-emptive) d)Priority
4. Write a program for the simulation of following file allocation strategies.
   1. Sequential b) Indexed c) Linked
5. Write a program for the simulation of following contiguous memory allocation techniques
   1. Worst-fit b)Best-fit c)First-fit
6. Write a program for the simulation of following file organization techniques
   1. Single level directory b)Two level directory c)Hierarchical
7. Write a program for the simulation of Bankers algorithm for the purpose of deadlock avoidance.
8. Write a program for the simulation of following disk scheduling algorithms
   1. FCFS b)SCAN c)C-SCAN
9. Write a program for the simulation of following page replacement algorithms
   1. FIFO b)LRU c)LFU
10. Write a program for the simulation of producer-consumer problem using semaphores.
11. Study the Linux operating system and implement various commands.
12. Write a program do the following:
    1. Find the attribute of file. b) To change the attribute of file. c) Create the directory. d) Delete the directory. e) Create the file. f) Delete the file g) Find the size of Hard Disk, RAM, and VRAM, cache.
13. Study of various viruses / worms and tools.

CS-312P Data Structure and Algorithms Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 08	20	

Following is the list of experiments out of which minimum 08 experiments must be performed in the lab. The additional experiments may be performed by the respective institution depending on the infrastructure available.

List of experiments:

1. Write recursive program which computes then Fibonacci number.
2. Write recursive program which computes the factorial of a given number.
3. Write a program to implement linear search using arrays.
4. Write a program to implement binary search using arrays.
5. Write c program to implement bubble sort, to sort a given list of integers in ascending order.
6. Program to implement insertion sort to sort a given list of integers in ascending order.
7. Program to implement INSERTIONSORT to sort a list of numbers.
8. Write a C program that implement merge sort, to sort a given list of integers in ascending order.
9. Write C programs that implement stack using arrays.
10. Write C programs that implement stack using linked list Program.
11. Write c programs that implement Queue using array.
12. Write C programs that implement Queue using linked lists.
13. Write program to implement linked list operations (Creation, Insertion, Deletion, reversing).
14. Write a program to implement binary tree.
15. Write a program to implement heap sort using arrays.

CS-313P Java Programming Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 08	20	

Following is the list of experiments out of which minimum 08 experiments must be performed in the lab. The additional experiments may be performed by the respective institution depending on the infrastructure available.

List of experiments:

1. Install JDK, write a simple "Hello World" or similar java program, compilation, debugging, executing using java compiler and interpreter.
2. Write a program in Java to generate first n prime numbers.
3. Write a program in Java to find maximum of three numbers using conditional operator.
4. Write a program in Java to reverse the digits of a number using while loop.
5. Write a program in Java to convert number into words & print it.
6. Write a program in Java to develop overloaded constructor. Also develop the copy constructor to create a new object with the state of the existing object.
7. Write a program in Java to demonstrate the use of 'final' keyword in the field declaration. How it is accessed using the objects.
8. Write a program in Java to demonstrate single inheritance, multilevel inheritance and hierarchical inheritance.
9. Create a class to find out whether the given year is leap year or not. (Use inheritance for this program).
10. Write a program that illustrates interface inheritance. Interface P12 inherits from both P1 and P2. Each interface declares one constant and one method. The class Q implements P12 . Instantiate Q and invoke each of its methods. Each method displays one of the constants.
11. Write an application that illustrates method overriding in the same package and different packages. Also demonstrate accessibility rules in inside and outside packages.
12. Describe abstract class called Shape which has three subclasses say Triangle, Rectangle, Circle. Define one method area() in the abstract class and override this area() in these three subclasses to calculate for specific object i.e. area() of Triangle subclass should calculate area of triangle etc. Same for Rectangle and Circle.
13. Write a program in Java to demonstrate implementation of multiple inheritance using interfaces.
14. Write a program in Java to develop user defined exception for 'Divide by Zero' error.
15. Write a program in Java to demonstrate multiple try block and multiple catch exception.
16. Write a program in Java to demonstrate JComponents and JFrames.

EC-311P Digital Electronics Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 08	20	

Following is the list of experiments out of which minimum 08 experiments must be performed in the lab. The additional experiments may be performed by the respective institution depending on the infrastructure available.

List of experiments:

1. Verify the truth table of AND, OR, NOT, X-OR and X-NOR gates
2. Verify the NAND and NOR gates as universal logic gates.
3. Verify the AND and OR gates as universal logic gates.
4. Design and verification of the truth tables of Half and Full adder circuits.
5. Design and verification of the truth tables of Half and Full subtractor circuits.
6. Verification of the truth table of the Multiplexer 74150.
7. Verification of the truth table of the De-Multiplexer 74154.
8. Design and test of an S-R flip-flop using NOR/NAND gates.
9. Verify the truth table of a S-R flip-flop
10. Verify the truth table of a J-K flip-flop
11. Verify the truth table of a D flip-flop
12. Design of 4-bit shift register.
13. Design of modulo-4 counter using J K flip flop
14. To study a BCD to 7 Segment LED display using 7447IC

SEMESTER-IV

MA-411 Optimization and Calculus of Variations							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Unit-I:
Introduction: A survey of some simplified examples of common real-world situations leading to optimization problems, basic formulation and theory of optimization problems. **Linear programming:** Linear programming (optimization of linear functions subject to linear constraints): basic theory; simplex method, duality, practical techniques.
Unit-II:
Linear programming: Basic LPP-solution techniques (Simplex, Artificial Basis), complimentary slackness theorem, fundamental theorem of duality, degenerate solutions, cycling, applications - elements of dynamic programming including Hamiltonian, bellman's optimality principle. **Transportation and Assignment Problems:** Solution of a balanced transportation problem, degeneracy in transportation problems and alternate solutions, mathematical problems in formulation of assignment problems.
Unit-III:
Non-linear programming: Non-linear programming (optimization of non-linear functions subject to constraints) with lagrange multipliers, Karush-Kuhn-Tucker optimality conditions, convexity, duality. **Approximation methods for nonlinear programming:** Line search methods, gradient methods, conjugate gradient methods, Networking techniques – PERT and CPM.
Unit-IV:
Calculus of Variations: Basic definitions-functional, extremum, variations, function spaces; necessary conditions for an extremum, euler- lagrange equation, convexity and its role in minimization, minimization under constraints; existence and nonexistence of minimizers, applications - isoperimetric problems, geodesics on the surface.

Text Books:

- C. B. Gupta, ***—Optimization Techniques in Operation Research,*** I. K. International Publishing House Pvt. Ltd.

- A.S. Gupta, ***Calculus of Variations and Applications***, PHI Prentice hall India.
- Mukesh Kumar Singh, ***Calculus Of Variations*** ,Krishna Prakashan Media(P)Ltd.
- J.K. Sharma, ***Operations Research–Problems and Solutions***, Macmillian Pub.

Reference books:

- I.M. Gelfand S.V. Fomin, ***Calculus of Variations*** Dover Publications Inc Mineola, New York.
- Purna Chand Biswal, ***Optimization in Engineering***, Scitech Publications India Pvt. Ltd.
- B.S. GREWAL, ***Higher Engineering Mathematics***, Krishna Publications
- G. Hadly, ***Linear Programming***, Narosa Publishing House
- Kanti Swarup, P.K. Gupta and Manmohan, ***Operations Research,*** Sultan Chand & amp; Sons.

CS-411/ CS-314 Python Programming							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	0	0	3	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e., one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Course Objectives: This course will help you to understand the basics of Data Science which includes Programming, Mathematics, and Statistics before getting started with advanced machine learning techniques. Students will also gain knowledge in various data pre-processing techniques and data visualization techniques.

Unit-I:
Introduction to Python: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, type () Function and Is Operator, Dynamic and Strongly Typed Language. **Control Flow Statements:** if Decision Control Flow Statement, the if…else Decision Control Flow Statement, the if-elif-else, Decision Control Statement, Nested if Statement, the while Loop, The for Loop, The continue and break Statements
Unit–II:
Functions, Built-In Functions, Commonly Used Modules, Function Definition and Calling the Function, The return Statement and void Function, Scope and Lifetime of Variables, Default Parameters. **Strings,** Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings,
Unit–III
Lists, Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, The del Statement. **Dictionaries**, Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, The del Statement,
Unit-IV:
Tuples and Sets, Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries. **Files,** Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files. Reading and Writing CSV file.

Course Learning Outcomes (CLO):

On completion of this course, the students will be able to:

1. To know the concept of functions in Python, like “if” and different types of loops.
2. Be able to convert datatypes and work with lists.
3. To know the difference between running Python programs on Mac and Windows
4. Be able to work with CSV files

Textbooks:

1. Gowri Shankar S, Veena A, **“Introduction to Python Programming”,** 1st edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372.

CS-412 Design and Analysis of Algorithm							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Unit-I:
Introduction and Complexity Analysis: Algorithms Introduction: Algorithm Design paradigms-motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptotic Notations
Unit–II:
Divide and Conquer Approach: Structure of divide-and-conquer algorithms: sets and disjoint sets: Union and Find algorithms, quick sort, Finding the maximum and minimum, Quick Sort, Merge sort, Heap, and heap sort. **Greedy Algorithms:** Optimal storage on tapes, Knapsack problem, Job sequencing with deadlines, Minimum Spanning trees: Prim's algorithm and Kruskal's algorithm, Huffman codes.
Unit–III
Graph Algorithms: Representation of graphs, BFS, DFS, Topological sort, strongly connected components; single source shortest paths: Bellmen-Ford algorithm, Dijkstra's algorithm; All pairs shortest path: The Warshall's algorithm. **Dynamic Programming:** Overview, difference between dynamic programming and divide and conquer, Matrix chain multiplication, Traveling salesman Problem, longest Common sequence, 0/1 knapsack. **Backtracking:** 8-Queen Problem, Sum of subsets, graph coloring, Hamiltonian cycles.
Unit-IV:
Branch and Bound: LC searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem. **Computational Complexity**: Complexity measures, Polynomial vs. non polynomial time complexity; NP-hard and NP-complete classes, examples, cook's theorem (without proof).

Course Learning Outcomes (CLOs):

After completion of this course, the students will be able to:

1. Analyse the complexity of algorithms, to provide justification for the selection, and to implement the

algorithm in a particular context.

2. Apply various algorithmic design paradigms such as greedy, dynamic, backtracking etc. to solve common engineering problems.
3. Identify basic properties of graphs and apply their algorithms to solve real life problems.
4. Demonstrate the application of algorithms and selection of appropriate data structures under several categories such as string matching, randomized algorithms and genetic logarithms.

Textbooks & References:

1. Fundamentals of Computer Algorithms by E. Horowitz and S. Sahni, Galgotia.
2. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, MIT Press, Cambridge.
3. The Design and Analysis of Computer Algorithms by A.V. Aho, J.E. Hopcroft and J.D. Ullman, Addison Wesley.

CS- 413 Artificial Intelligence and Expert Systems							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Unit-I:

Introduction: Introduction to artificial intelligence, background and applications, turing test and rational agent approaches, introduction to intelligent agents, their structure, behaviour and environment. **Problem Solving and Searching Techniques**: Problem characteristics, production systems, breadth first search, depth first search, heuristics search techniques, best first search, A*algorithm, hill climbing, AND/OR graph AO*, constraint satisfaction problem, means-end analysis, introduction to game playing, min max and alpha beta pruning.

Unit–II:

Knowledge Representation: introduction to first order predicate logic, well-formed formulas, quantifiers, rule-based system, resolution principle, unification, forward reasoning: conflict resolution, backward reasoning, structured knowledge representation. AI programming language: PROLOG: Syntax, procedural and declarative meaning, PROLOG unification mechanism, converting english to PROLOG facts and rules, goals, anonymous variable, lists, use of fail, CUT, NOT

Unit–III:

Introduction to Neural Network: Hop field network, single and multi layer networks, perceptions, back-propagations learning, Boltzman machine. Introduction to genetic algorithm: The genetic algorithm, genetic operators, working of genetic algorithm, problem with genetic algorithm.

Unit-IV:

Expert System: introduction, skills/knowledge, characteristics of expert system, knowledge engineering, inferencing, forward chaining and backward chaining expert system tools, applications and future scope

Natural language processing: Introduction, language parsing, syntactic and semantic analysis, top down and bottom-up parsing, chart parsing, knowledge representation languages, ELIZA, speech Recognition

Text Books:

- Russell and Norvig, ***Artificial Intelligence- A Modern Approach***, Pearson Prentice Hall.
- DW Patterson, ***Artificial Intelligence and Expert Systems***, Prentice Hall of India.
- B. Vegnanarayana, ***Artificial neural networks,*** Prentice Hall of India P Ltd.

Reference Books:

- Elaine Rich, Kevin Knight, ***Shivashankar B. Nair, Artificial Intelligence***, Tata Mc Graw Hill.
- Nils J Nilsson, ***Artificial Intelligence A New Synthesis***, Morgan Kaufmann

CS-315/ CS-414 Computer Architecture & Organisation							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e., one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Unit-I:
Basics of Digital Electronics: Codes, logic gates, flip flops, registers, counters, multiplexer, de multiplexer, decoder, and encoder. **Register Transfer and Micro operations:** Register transfer language, register transfer, bus & memory transfer, logic micro-operations, shift micro-operation. **Computer Arithmetic:** Unsigned, signed and floating-point data representation, addition, subtraction, multiplication and division algorithms. booths multiplication algorithm.
Unit–II:
Basic Computer Organization: Instruction codes, computer instructions, timing & control, instruction cycles, memory reference instruction, input/output & interrupts, complete computer description & design of basic computer. **Control Unit:** Hardwired vs Micro programmed control unit. **Central Processing Unit:** General register organization, stack organization, instruction format, addressing modes, data transfer & manipulation, program control, RISC, CISC.
Unit–III
Input-Output Organization: Peripheral devices, I/O interface, Modes of data transfer: Programmed I/O, Interrupt-Initiated I/O, DMA transfer, I/O processor. Serial Communication. **Memory Unit:** Memory hierarchy, processor vs. memory speed, main memory, auxiliary memories, high-speed memories, cache memory, associative memory, virtual memory, and memory management hardware.
Unit-IV:
Introduction to Parallel Processing: Flyn's classification, pipelining, arithmetic pipeline, instruction pipeline, characteristics of multiprocessors, inter connection structures, inter processor arbitration, inter processor communication & synchronization. Performance evaluation SPEC marks LINPACK Whetstone Dhrystone etc., transaction processing benchmarks. **Case Studies:** Case studies of some contemporary advanced architecture for processors of families like Intel, AMD, IBM etc./ Seminar on state-of the-art technology.

Text Books:

1. Mano, Morris M., Computer System Architecture, Prentice Hall.
2. Hayes, J.P., Computer Architecture and Organization, Mc Graw Hill.

Reference Books:

- Hennessy, J.L., Patterson, D.A, and Goldberg, D., Computer Architecture A Quantitative Approach, Pearson Education Asia.
- Leigh, W.E. and Ali, D.L., System Architecture: software and hardware concepts, South Wester Publishing Co.

EC-411 Microprocessors and Interfacing							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
3	1	0	4	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Course Objectives: The educational objectives of this course are to understand the basics of processors and microprocessors and interfacing with real world to study basic programming.

Unit-I:
Introduction to Microprocessor: History and Evolution, types of microprocessors, 8085 Microprocessor, Architecture, Bus Organization, Registers, ALU, Control section, Instruction set of 8085, Instruction format, Addressing modes, Types of Instructions. Microprocessor timings, Microinstructions, Instruction cycle, Machine cycles, T states, State transition diagrams, Timing diagram for different machine cycles. **Assembly Language Programming and Timing Diagram:** Assembly language programming in 8085, Macros, Labels and Directives
Unit–II:
Serial I/O, Interrupts and Comparison of Contemporary Microprocessors: Serial I/O using SID, SOD. Interrupts in 8085, RST instructions, Issues in implementing interrupts, Multiple interrupts and priorities, Daisy chaining, Interrupt handling in 8085, Enabling, disabling and masking of interrupts.
Unit–III
Data Transfer techniques: Data transfer techniques, programmed data transfer, parallel data transfer using 8155. Programmable parallel ports and handshake input/output, Asynchronous and Synchronous data transfer using 8251A. Programmable interrupt controller 8259A. DMA transfer, cycle stealing and burst mode of DMA, 8257 DMA controller
Unit-IV:
Microprocessor Interfacing Techniques: Interfacing memory and I/O devices, addressing memory, interfacing static RAMs, Interfacing and refreshing dynamic RAMs, interfacing a keyboard, Interfacing LED and seven segment displays, interfacing a printer, Interfacing A/D converters, D/A converters. **Architecture of 8086:** Memory Address space and data organization, segment registers and memory segmentation, generating memory addresses, IO address space, addressing modes, Comparison of 8086 and 8088, minimum mode maximum mode, system timing, introduction to Pentium and further series of microprocessors. Brief comparison of contemporary 8-bit microprocessors like Z-80, M68000 with 8085.

Course Outcomes: On completion of this course the student will be able to:

- Describe the architecture & organization of 8085 & 8086 Microprocessor.
- Understand and classify the instruction set of 8085/8086 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.
- Relate the addressing modes used in the instructions.
- Realize the Interfacing of memory & various I/O devices with 8085/8086 microprocessor.
- Familiarize the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessors.
- Interface various peripheral IC's with Intel 8085/8086 microprocessor for its various applications

Textbooks & References:

- Fundamentals of Microprocessors and Microcomputers by B. Ram, Dhanpat Rai and Sons.
- Microprocessor Architecture, Programming and applications with the 8085/8080A by R.S. Gaonkar, Wiley.
- Microprocessors& Interfacing by Douglas V Hall, McGraw Hill.
- Microprocessors and Digital Systems by Douglas V Hall, McGraw Hill.
- Introduction to Microprocessor by A.P. Mathur, Tata McGraw Hill.

HS-411 Entrepreneurship and Startups

Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P		Internal Assessment	End Semester Examination	Total	
2	0	0	2	Maximum Marks: 40	Maximum Marks: 60	100	3 Hours
				Minimum Marks: 16	Minimum Marks: 24	40	

Instructions to the question paper setter:

Question paper of end semester examination will be of 60 marks. The question paper will consist of five sections A, B, C, D and E. Sections A, B, C and D will have 2 questions of 12 marks each and section E has short answer type questions consisting of six parts of 02 marks each. The candidate will attempt five questions in all, i.e one question each from sections A, B, C, D and the compulsory question from section E. In the question paper, the questions available in sections A, B, C and D will be covered from Unit-I, Unit-II, Unit-III and Unit-IV respectively and section-E will cover whole syllabus.

Course Objectives: To understand the Entrepreneurship, Idea and Customer, business models, Marketing, Sales, and Support.

Unit-I:

Entrepreneurship Concepts: Understanding nuances of being an entrepreneur; Difference between a startup venture and small business; Identifying entrepreneurial styles. **Idea/Problem and Customer:** Identifying problems worth solving, identifying business opportunities, methods for problem interviews; Design thinking process; Generation of potential solutions; Identifying customer segment and early adopters, difference between a consumer and a customer, craft your value proposition, outcome driven innovation, testing out solutions for the problems; Unique value proposition

Unit–II:

Business Model Validation: Basic lean approach and canvas, types of business models, documenting business plan with a lean canvas, documenting hypotheses; Introduction to risks; Develop solution demos; The problem-solution test, solution interviews, sizing the opportunity, building a minimum viable product; The product-market fit test; Revenue streams; How companies with different business models earn money; Understanding income, costs, gross and net margins; Identifying primary and secondary revenue streams; Costing and pricing; How to finance your business idea; Financing your venture at different stages, what investors expect from you; Various sources of funding and pros & cons of each

Unit–III

Building a Resourceful Team: Shared leadership model, role of a good team in a venture's success, what to look for in a team, define clear roles and responsibilities; How to pitch to candidates to attract to join your team, explore collaboration tools and techniques - brainstorming, mind mapping; Kanban board.

Unit-IV:

Marketing, Sales, and Support: Understanding the difference between product and brand and link between them; Product/service positioning; Channels and strategies, budgeting and planning; Sales planning, target setting; Unique sales propositions (USP); Follow-up and closing sale; Planning and tracking, importance of project management to launch and track progress; Understanding time management, workflow, delegation of tasks; Business regulations of starting and operating a business; Documentation, how to find help to get started; Various government scheme

Course Learning Outcomes (CLOs):

After the completion of the course, the student will be able to:

- Understanding nuances of being an entrepreneur; Difference between a startup venture and small business.
- Identifying problems worth solving, find the difference between customer and consumer.
- Make resourceful team and manage it.
- For marketing, sales and Support to the startup and business.

Textbooks:

- Blank, S. G., & Dorf, B. (2012). The startup owner's manual: The step-by-step guide for building a great company. Pescadero, Calif: K & S Ranch.
- Reference Books:
- Maurya, A (2016). Scaling Lean: Mastering the Key Metrics for Startup Growth. Portfolio/Penguin. Sethi, A. (2016). From Science to Startup, Springer.

References:

- Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009

CS-411P/CS-314P Python Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 08	20	

NOTE: - Following is the list of experiments out of which 8-10 experiments must be performed in the lab. The additional experiments may be performed by the respective institution depending on the infrastructure and student intake.

List of experiments:

1. Demonstrate about Basics of Python Programming
2. Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types) Demonstrate the working of following functions in Python. i) id () ii) type() iii)range()
3. Write a Python program to demonstrate various base conversion function
4. Write a Python program to demonstrate various type conversion functions
5. Demonstrate the following Operators in Python with suitable examples: i) Arithmetic Operators ii) Relational Operators iii) Assignment Operator iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
6. Write Python programs to demonstrate the following:
   1. Input() ii)print()iii)'sep'attributeiv)'end'attributev)replacementOperator({})
7. Demonstrate the following Conditional statements in Python with suitable examples. i) if statement ii) if else statement iii) if-else-if statement
8. Demonstrate the following Iterative statements in Python with suitable examples. i) while loop ii) for loop
9. Write a Python program to demonstrate various ways of accessing the string. i) By using Indexing (Both Positive and Negative) ii) By using Slice Operator
10. Python program to perform read and write operations on a file.

CS- 412P DAA Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 08	20	

Following is the list of experiments out of which minimum 08 experiments must be performed in the lab. The additional experiments may be performed by the respective institution depending on the infrastructure available.

List of experiments:

1. Write a program to perform Insertion sort for any given list of numbers.
2. Write a program to perform Quick Sort for the given list of integer values.
3. Write a program to find Maximum and Minimum of the given set of integer values.
4. Write a Program to perform Merge Sort on the given two lists of integer values.
5. Write a Program to perform Binary Search for a given set of integer values recursively and non-recursively.
6. Write a program to find solution for knapsack problem using greedy method.
7. Write a program to find minimum cost spanning tree using Prim's Algorithm.
8. Write a program to find minimum cost spanning tree using Kruskal's Algorithm.
9. Write a program to perform Single source shortest path problem for a given graph.
10. Write a program to find solution for job sequencing with deadlines problem.
11. Write a program for all pairs shortest path problem.
12. Write a program to solve N-QUEENS problem.
13. Write a program to solve Sum of subsets problem for a given set of distinct numbers.

CS-413P AI Lab							
Teaching Scheme			Credit	Marks Distribution			Duration of End Semester Examination
L	T	P	C	Internal Assessment	End Semester Examination	Total	
0	0	2	1	Maximum Marks: 30	Maximum Marks: 20	50	2 Hours
				Minimum Marks: 12	Minimum Marks: 08	20	

Following is the list of experiments out of which minimum 08 experiments must be performed in the lab. The additional experiments may be performed by the respective institution depending on the infrastructure available.

List of experiments:

1. Write a program to implement breadth first search algorithm.
2. Write a program to implement depth first search algorithm.
3. Study of PROLOG programming language, functions and its facts.
4. Write a program to implement the Hill Climbing algorithm.
5. Write a program to build and display Neural network using Tenser flow Keres.
6. Write a program to implement back-propagations learning.
7. Write a program to implement Genetic algorithm.
8. Study of expert system tools and its applications.
9. Write a program to implement Traveling salesman problem.
10. Write a program to implement four queen problem.
11. Write a program to solve monkey banana problem.
12. Write a program to implement Tower of Hanoi.