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Item No. 4.180

UNIVERSITYOFMUMBAI

Revised syllabus (Rev- 2016) from Academic Year 2016 -17

Under

FACULTY OF TECHNOLOGY

Information Technology

Second Year with Effect from **AY 2017-18**

Third Year with Effect from **AY 2018-19**

Final Year with Effect from **AY 2019-20**

As per **Choice Based Credit and Grading System**

with effect from the AY 2016–17

Co-ordinator, Faculty of Technology's Preamble:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty of Technology, University of Mumbai, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEO's) and give freedom to affiliated Institutes to add few (PEO's). It is also resolved that course objectives and course outcomes are to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth and approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges and experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, and developed curriculum accordingly. In addition to outcome based education, semester based credit and grading system is also introduced to ensure quality of engineering education.

Choice based Credit and Grading system enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes and Faculty of Technology has devised a transparent credit assignment policy and adopted ten points scale to grade learner's performance. Credit assignment for courses is based on 15 weeks teaching learning process, however content of courses is to be taught in 12-13 weeks and remaining 2-3 weeks to be utilized for revision, guest lectures, coverage of content beyond syllabus etc.

Choice based Credit and grading system is implemented from the academic year 2016-17 through optional courses at department and institute level. This will be effective for SE, TE and BE from academic year 2017-18, 2018-19 and 2019-20 respectively.

Dr. S. K. Ukarande

Co-ordinator,

Faculty of Technology,

Member - Academic Council

University of Mumbai, Mumbai

Preamble

It is an honor and a privilege to present the revised syllabus of Bachelor of Engineering in Information Technology (effective from year 2016-17) with inclusion of cutting edge technology.
Information Technology is comparatively a young branch among other engineering disciplines in the University of Mumbai. It is evident from the placement statistics of various colleges affiliated to the University of Mumbai that IT branch has taken the lead in the placement. The branch also provides multi-faceted scope like better placement and promotion of entrepreneurship culture among students, and increased Industry Institute Interactions.
Industries views are that, only 16 % graduates are directly employable. One of the reasons is a syllabus which is not in line with the latest technologies. Our team of faculties has tried to include all the latest technologies in the syllabus. Also the first time we are giving the choice of elective from fifth semester such that students will be master in one of the IT domain.
The syllabus is peer reviewed by experts from reputed industries and as per their suggestions it covers future trends in IT technology and research opportunities available due to these trends.
I would like to thank senior faculties of IT department of all colleges affiliated to Mumbai University for significant contribution in framing the syllabus. Also behalf of all faculties I thank all the industry experts for their valuable feedback and suggestions.
I sincerely hope that the revised syllabus will help all graduate engineers to face the future challenges in the field of information and technology

Program Outcome for graduate Program in Information Technology

1. Apply Core Information Technology knowledge to develop stable and secure IT system.
2. Design, IT infrastructures for an enterprise using concepts of best practices in information Technology management and security to enterprise processes.
3. Manage IT projects using written and oral communication skills in collaborative environments by Participating on teams that address solutions for IT management challenges.
4. Identify and discuss professional, individual, organizational, societal, and regulatory implications of Information systems and technology.
5. Assess Security of the IT Systems and able to respond to any breach in IT system
6. Ability to work in multidisciplinary projects and make it IT enabled.
7. Ability to propose the system to reduce carbon footprint.
8. Ability to adapt the lifelong learning process to be in sync with trends in Information Technology

Dr. Deven Shah

Chairman (Ad-hoc Board Information Technology)
University of Mumbai)

University of Mumbai

Program Structure B.E. Information Technology, (Rev. 2016)

S. E. Information Technology (Semester-III)

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract	Tut	Theory	TW/ Pract	Tut	Total
ITC301	Applied Mathematics III	4+1@	-	-	5	-	-	5
ITC302	Logic Design	4	-	-	4	-	-	4
ITC303	Data Structures & Analysis	4	-	-	4	-	-	4
ITC304	Database Management System	4	-	-	4	-	-	4
ITC305	Principle of Communications	3+1$	-	-	4	-	-	4
ITL301	Digital Design Lab	-	2	-	-	1	-	1
ITL302	Data Structures Lab	-	2	-	-	1	-	1
IT303	SQL Lab	-	2	-		1	-	1
ITL304	Java Programming Lab	-	2+2*	-	-	2	-	2
	Total	**21**	**10**	-	**21**	**5**	-	**26**

Course Code	Course Name	Examination Scheme								
		Theory					TW	Oral	Oral & Pract	Total
		Internal Assessment			End Sem. Exam	Exam Duration (in Hrs)				
		Test 1	Test 2	Avg.						
ITC301	Applied Mathematics III	20	20	20	80	3	-	-	-	100
ITC302	Logic Design	20	20	20	80	3	-	-	-	100
ITC303	Data Structures & Analysis	20	20	20	80	3	-	-	-	100
ITC304	Database Management System	20	20	20	80	3	-	-	-	100
ITC305	Principle of Communications	20	20	20	80	3	--	-	-	100
ITL301	Digital Design Lab	-	-	-	-	-	25	--	25	50
ITL302	Data Structures Lab	-	-	-	-	-	25	--	25	50
IT303	SQL Lab	-	-	-	-	-	25	-	25	50
ITL304	Java Programming Lab	-	-	-	-	-	50	--	50	100
Total		100	100	100	400	-	125	--	125	750

@ 4 hours shown as theory to be taken class wise and 1 hour to be taken tutorial as class wise

$ 3 hours shown as theory to be taken class wise and 1 hour to be taken tutorial as batch wise

* 2 hours shown as practical's to be taken class wise lecture and another 2 hours to be taken as batch wise practices in the lab.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC301	Applied Mathematics III	04	--	01	04	--	--	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Oral & Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of Two Tests					
ITC301	Applied Mathematics III	20	20	20	80	--	--	--	100

Course Objectives: Students will try to learn:

1. The concepts of Set theory and Relation.
2. The concepts of Functions and define the recursive functions.
3. The concept of Laplace transforms.
4. The concept of Inverse Laplace transforms.
5. The concept of permutations and combinations.
6. The concept of variable and also identify the mapping.

Course Outcomes: Students will able to:

1. Apply the Set theory and Relation concepts.
2. Apply the Functions and define the recursive functions.
3. Apply Laplace transform to different applications.
4. Apply Inverse Laplace transform to different applications.
5. Identify the permutations and combinations.
6. Define variable and also identify the mapping.

Prerequisite: Applied Mathematics I, Applied Mathematics II

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Basic of AM-I and AM-II.	02	
I	Set Theory	Set Theory: Definition of Sets, Venn Diagrams, complements, cartesian products, power sets, counting principle, cardinality and countability (Countable and Uncountable sets), proofs of some general identities on sets, pigeonhole principle.	08	CO1

II	Relation & Function	Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. Function: Definition and types of function, composition of functions, recursively defined functions.	08	CO1 CO2
III	Laplace Transform	Introduction, Definition of Laplace transforms Laplace transform of constant, trigonometrical, exponential functions. Important properties of Laplace transform: First shifting theorem, Laplace transform of $L\{f(at)\}$, $L\{t^n f(t)\}$, $L\left\{\frac{f(t)}{t}\right\}$, $L\left\{\frac{d^n f(t)}{dt^n}\right\}$, $L\left\{\int_0^t f(u)du\right\}$ (all without proof). Unit step function, Heavi side function, Dirac-delta function, Periodic function and their Laplace transforms, Second shifting theorem.	08	CO3
IV	Inverse Laplace Transform	Inverse Laplace transform with Partial fraction and Convolution theorem (without proof). Application to solve initial and boundary value problem involving ordinary differential equations with one dependent variable and constant coefficients.	08	CO4
V	Complex Variable & mapping	Functions of a complex variable, Analytic functions, Cauchy-Riemann equations in Cartesian co-ordinates, Polar co-ordinates. Harmonic functions, Analytic method and Milne Thomson methods to find f(z), Orthogonal trajectories. Conformal Mapping, Linear, Bilinear transformations, Cross ratio, fixed points and standard transformation such as rotation and magnification, inversion, translation.	10	CO6
VI	Permutations, Combinations and Probability	Rule of sum and product, Permutations, Combinations, Algorithms for generation of	08	CO5

		Permutations and Combinations. Discrete Probability, Conditional Probability, Bayes' Theorem, Information and Mutual Information.		

Text Books:

1. Higher Engineering Mathematics by Grewal B. S. 38th edition, Khanna Publication 2005.
2. Advanced Engineering Mathematics by Kreyszig E. 9th edition, John Wiley.
3. A Text Book of Applied Mathematics Vol. I & II by P.N.Wartilar & J.N.Wartikar, Pune, Vidyarthi Griha Prakashan, Pune.
4. Modern Digital Electronics by R. P. Jain 8th edition, Tata Mcgraw Hill
5. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", SiE Edition, TataMcGraw-Hill.

References:

1. Advanced Engineering Mathematics by C. Ray Wylie & Louis Barrett, TMH International Edition.
2. Mathematical Methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
3. Lapplace Transforms by Murray R. Spiegel, Schaun's out line series-McGraw Hill Publication.

Assessment:

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination: Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions**, **each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC302	Logic Design	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Oral & Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test2	Avg. of Two Tests					
ITC302	Logic Design	20	20	20	80	--	--	--	100

Course Objectives: Students will try to learn:

1. The concept of various components.
2. The concepts that underpin the disciplines of Analog and digital electronic logic circuits.
3. Various Number system and Boolean algebra.
4. Design and implementation of combinational circuits
5. Design and implementation of Sequential circuits
6. Hardware description language

Course Outcomes: Students will able to:

1. Understand the concepts of various components to design stable analog circuits.
2. Represent numbers and perform arithmetic operations.
3. Minimize the Boolean expression using Boolean algebra and design it using logic gates
4. Analyze and design combinational circuit.
5. Design and develop sequential circuits
6. Translate real world problems into digital logic formulations using VHDL.

Prerequisite: Basic Electrical Engineering

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Semiconductor theory, Diodes, Integrated Circuits	02	
I	Biasing of BJT	Biasing of BJT: DC operating point, BJT characteristics & parameters, all biasing circuits, analysis of above circuits and their design, variation of operation point and its stability. Differential	08	CO1

		Amplifier, constant current source, current mirror.		
II	Number System and codes	Introduction to Number systems, Binary Number systems, Signed Binary Numbers, Binary, Octal, Decimal and Hexadecimal number Systems and their conversion, Binary arithmetic using compliments, Gray Code, BCD Code, Excess-3 code, ASCII Code.inter-conversion of codes,	08	CO2
III	Boolean Algebra and Logic gates	Introduction, NAND and NOR operations, Exclusive –OR and Exclusive –NOR operations, Boolean Algebra Theorems and Properties , Standard SOP and POS form, Reduction of Boolean functions using Algebric method, K -map method (2,3,4 Variable).Variable entered Maps, Quine Mc Cluskey, Mixed Logic Combinational Circuits and multiple output function Basic Digital Circuits: NOT,AND, OR,NAND,NOR,EX-OR,EX-NOR Gates.	10	CO2 CO3
IV	Design and Analysis of Combinational Circuits	Introduction, Half and Full Adder, Half and Full Subtractor, Four Bit Binary Adder, One digit BCD Adder, code conversion, Encoder and Decoder ,Multiplexers and De-multiplexers, Decoders, Binary comparator (2,3 variable)4-bit Magnitude Comparator IC 7485 and ALU IC74181.	08	CO2 CO3 CO4
V	Sequential Logic Design	Flip Flops : SR, JK, D, T, master slave flip flop, Truth Table, excitation table and conversion Register: Shift register, SISO, SIPO, PISO, PIPO, Bi-directional and universal shift register. Counters: Design of synchronous and asynchronous ,Modulo Counter, Up Down counter IC 74193, Ring and Johnson Counter	9	CO4 CO5
VI	VHDL	Introduction to VHDL, Library, Entity, Architecture Modeling styles, Concurrent and Sequential statements, data objects and data types, attributes, design examples	07	CO5 CO6

		for combinational circuits		

Text Books:

1. Robert L. Boylestad, Louis Nashelsky, “Electronic devices and circuit Theory”, PHI
2. R. P. Jain, “Modern Digital Electronics”, Tata McGraw Hill.
3. M. Morris Mano, “Digital Logic and computer Design”, PHI
4. J. Bhasker.“ VHDL Primer”, Pearson Education.
5. Balbaniam,Carison,”Digital Logic Design Principles”, Wiley Publication

References:

1. Martin s. Roden, Gordon L. Carpenter, William R. Wieserman “Electronic Design-From Concept to Reality”, Shroff Publishers and Distributors.
2. A. Anand Kumar, “Fundamentals of Digital Circuits ”, Prentice Hall India
3. Subrata Ghosal, ”Digital Electronics”, Cengage Learning.
4. Anil K. Maini, “Digital Electronics Principles and Integrated Circuits”, Wiley India
5. Donald p Leach, Albert Paul Malvino, “Digital principles and Applications”, Tata McGraw Hill

Assessment:

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination: Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions**, **each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC303	Data Structures & Analysis	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Oral & Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of two Tests					
ITC303	Data Structures & Analysis	20	20	20	80	--	--	--	100

Course Objectives: Students will try to:

1. Understand and remember algorithms and its analysis procedure.
2. Introduce the concept of data structures through ADT including List, Stack, Queues .
3. To design and implement various data structure algorithms.
4. To introduce various techniques for representation of the data in the real world.
5. To develop application using data structure algorithms.
6. Compute the complexity of various algorithms.

Course Outcomes: Students will be able to:

1. Select appropriate data structures as applied to specified problem definition.
2. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
3. Students will be able to implement Linear and Non-Linear data structures.
4. Implement appropriate sorting/searching technique for given problem.
5. Design advance data structure using Non-Linear data structure.
6. Determine and analyze the complexity of given Algorithms.

Prerequisite: C Programming Language

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	C Programming Language	02	
I		Introduction to Data structures, Need of Data structures, Types of	07	CO1

	Introduction to Data structures and Analysis	Data structures : Linear and non linear data structures Arrays, Stacks, Queue, Linked list and Tree, Graph, Recursion, ADT (Abstract Data type). Introduction to Analysis, Algorithms, characteristics of an algorithms, Time and Space complexities, Order of growth functions, Asymptotic notations		CO2 CO3 CO6
II	Stack	Introduction to Stack, Stack as ADT, Operations on stack, Application of stack: – reversing string, Polish notations	07	CO1 CO2 CO3 CO6
III	Queue	Introduction to Queue, Queue as ADT, Operations on Queue, Linear representation of queue, Circular Queue, Priority Queue, De-queue, Application of Queues	06	CO1 CO2 CO3 CO6
IV	Linked list	Introduction to Linked List, Basic concept of Linked List, Memory allocation & de allocation of Linked list, Singly Linked list, Doubly Linked list, Circular linked list, Operations on linked list, Linked representation of stack, Linked representation of Queue, Application of linked list.	08	CO1 CO2 CO3 CO6
V	Sorting and Searching	Introduction to Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Shell Sort, Radix sort. Analysis of Sorting Techniques. Comparison of sorting Techniques Introduction to Searching: Linear	12	CO4 CO5 CO6

		search, Binary search, Hashing Techniques, Different Hash functions, Collision& Collision resolution techniques, Analysis of searching Techniques.		
VI	Trees & Graph	Introduction to Trees, Definitions& Tree terminologies, Binary tree representation, Operations on binary tree, Traversal of binary trees, Binary search tree, Threaded Binary tree, Expression tree, Application of Trees Introduction to Graph, Introduction Graph Terminologies, Graph Representation, Type of graphs, Graph traversal:Depth first search(DFS)&Breadth First search(BFS), Minimum Spanning Tree : Prim's & Kruskal's Shortest Path Algorithm – Dijkstra's Algorithm. Applications of graph	10	CO1 CO2 CO3 CO6

Text Books:

1. Data structures using C by Tenenbaum, Langsam, Augenstein , Pearson.
2. Data Structures using C, ReemaThareja, Oxford.
3. C and Data structures, Prof. P.S.Deshpande, Prof. O.G.Kakde, Dreamtech Press.
4. Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G. Sorenson

Reference Books:

1. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India.
2. Data Structures and Algorithm Analysis in C ,Mark A.Weiss ,Pearson
3. ALGORITHMS Design and Analysis, Bhasin, OXFORD.
4. Computer Algorithms by Ellis Horowitz and Sartaj Sahni, Universities Press.

Assessment:

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination: Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions**, **each carrying 20 marks.**

- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC304	Database Management Systems	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Oral & Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of two Tests					
ITC304	Database Management Systems	20	20	20	80	--	--	--	100

Course Objectives: Students will try:

1. To describe a sound introduction to the discipline of database management systems.
2. To give a good formal foundation on the relational model of data and usage of Relational Algebra
3. To introduce the concepts of basic SQL as a universal Database language
4. To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC
5. To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
6. To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques.

Course Outcomes: Student should be able to:

1. Explain the features of database management systems and Relational database
2. Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra
3. Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.
4. Retrieve any type of information from a data base by formulating complex queries in SQL.
5. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
6. Build indexing mechanisms for efficient retrieval of information from a database

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisites	Basic knowledge of operating systems and file systems, Any programming	02	

		knowledge		
I	Introduction Database Concepts	Introduction, Characteristics of databases, File system V/s Database system, Users of a Database system Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Administrator (DBA), Role of a DBA	05	CO 1
II	Entity–Relationship Data Model	Conceptual Modeling of a database, The Entity-Relationship (ER) Model, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Weak Entity Types Generalization, Specialization and Aggregation, Extended Entity-Relationship (EER) Model.	09	CO 2
III	Relational Model and Relational Algebra	Introduction to Relational Model, Relational Model Constraints and Relational Database Schemas, Concept of Keys: Primary Kay, Secondary key, Foreign Key, Mapping the ER and EER Model to the Relational Model, Introduction to Relational Algebra, Relational Algebra expressions for • Unary Relational Operations, • Set Theory operations, • Binary Relational operation Relational Algebra Queries	09	CO 2
IV	Structured Query Language (SQL)	Overview of SQL , Data Definition Commands, Set operations , aggregate function , null values, , Data Manipulation commands, Data Control commands , Views in SQL, Complex Retrieval Queries using Group By, Recursive Queries, nested Queries ; Referential integrity in SQL. Event Condition Action (ECA) model (Triggers) in SQL; Database Programming with JDBC, Security and authorization in SQL Functions and Procedures in SQL and cursors.	10	CO 3, CO 4
V	Relational–Database Design	Design guidelines for relational schema, Functional Dependencies, Definition of Normal Forms- 1NF, 2NF, 3NF, BCNF, Converting Relational Schema to higher normal forms.	08	CO 5

VI	Storage and Indexing	Operation on Files; hashing Techniques; Types of Indexes: Single-Level Ordered Indexes; Multilevel Indexes; Overview of B-Trees and B+-Trees; Indexes on Multiple Keys.	09	CO 6

Text Books:

1. Korth, Slberchatz,Sudarshan, "Database System Concepts", 6th Edition, McGraw – Hill
2. Elmasri and Navathe, " Fundamentals of Database Systems", 6th Edition, PEARSON Education.
3. G. K. Gupta :"Database Management Systems", McGraw – Hill

References:

1. Raghu Ramkrishnan and Johannes Gehrke, " Database Management Systems",TMH
2. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom "Database System Implementation", Pearson Ltd. 1/ e
3. Thomas M. Connolly Carolyn Begg, Database Systems : A Practical Approach to Design, Implementation and Management, 4/e, Pearson Education.

Assessment:

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination: Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions**, **each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC305	Principle of Communications	03	--	01	03	--	01	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Oral & Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
ITC305	Principle of Communications	20	20	20	80	--	--	--	100

$ 3 hours shown as theory to be taken class wise and 1 hour to be taken tutorial as batch wise

Course Objectives: Students will try to:

1. Study the basic principles and techniques used in analog and digital communications.
2. Understand the concept of noise and Fourier transform for designing and analysing communication system.
3. Acquire the knowledge of different modulation techniques such as AM , FM and study the block diagrams of transmitter and receiver.
4. Study the Sampling theorem and Pulse Analog Modulation techniques.
5. Learn the concepts of Digital modulation techniques such as PCM, DM, ADM and multiplexing techniques.
6. Gain the core idea of Electromagnetic Radiation and propagation of waves.

Course Outcomes: Students will be able to:

1. Differentiate analog and digital communication systems
2. Identify different types of noise occurred, its minimization and able to apply Fourier analysis in frequency & time domain to quantify bandwidth requirement of variety of analog and digital communication systems.
3. Design generation & detection AM, DSB, SSB, FM transmitter and receiver.
4. Apply sampling theorem to quantify the fundamental relationship between channel bandwidth, digital symbol rate and bit rate
5. Explain different types of line coding techniques for generation and detection of signals.
6. Describe Electromagnetic Radiation and propagation of waves.

Prerequisite: Basic Electrical Engineering

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Electrical engineering concepts, analog and digital electronics.	02	--
I	Introduction	Basics of analog communication systems (Block diagram), Sources of information, Baseband and band pass signals, Types of communication channels, Frequency / Spectrum allocations, Need for modulation and demodulation	03	CO1
II	Fourier Transform and Noise	Introduction to Fourier Transform, its properties (time and frequency shifting and convolution property), Fourier transform of unit step, delta and gate function. Correlated and uncorrelated sources of noise in communication system, Noise parameters –Signal to noise ratio, Noise factor, Noise figure, Friis formula and Equivalent noise temperature	05	CO2
III	Modulation and Demodulation (AM and FM)	AM: Amplitude modulation techniques and its types- DSBFC AM, DSBSC-AM, SSB SC AM- spectrum, waveforms, bandwidth, Power calculations. AM Receivers – Block diagram of TRF receivers and Super heterodyne receiver. Receiver characteristics - Sensitivity, Selectivity, Fidelity, Image frequency and its rejection and double spotting FM : Principle of FM- waveforms, spectrum, bandwidth. Pre-emphasis and de-emphasis in FM, FM noise triangle, Comparison of AM and FM systems, FM generation: Direct method –Varactor diode Modulator, Indirect method (Armstrong method) block diagram and waveforms. FM demodulator: Foster Seely discriminator, Ratio detector.	12	CO3
IV	Pulse Analog Modulation	Sampling theorem for low pass and band pass signals with proof, Anti- aliasing filter, PAM, PWM and PPM generation and	05	CO4

		Degeneration.		
V	Digital Modulation Techniques and Transmission	Introduction to digital communication (Block diagram), Quantization process, Pulse code modulation, Delta modulation, Adaptive delta modulation, Principle of time division multiplexing, Frequency division multiplexing and its applications. Introduction to Line codes, Inter-symbol interference, Binary phase shift keying, Differentially encoded phase shift keying, Quadrature phase shift keying, M-ary phase shift keying, Quadrature amplitude shift keying	08	CO5
VI	Radiation and Propagation of Waves	Electromagnetic radiation, fundamentals, types of propagation, ground wave, sky wave, tropospheric scatter propagation	04	CO6

Text Books:

1. Simon Haykin, Michael Moher, Introduction to Analog & Digital Communications, Wiley India Pvt. Ltd., 2nd Ed.
2. Herbert Taub, Donald L Schilling, Goutam Saha, Principles of Communication Systems, Tata McGraw Hill, 3rdEd.
3. V Chandrasekar, Communication Systems, Oxford University Press, Ist Ed.

References:

1. George Kennedy, Bernard Davis, SRM Prasanna, Electronic Communication Systems, Tata McGraw Hill, 5th Ed.
2. Wayne Tomasi, Electronic Communications Systems, Pearson Publication, 5th Ed.
3. BP Lathi,Zhi Ding, Modern Digital and Analog Communication Systems, Oxford University.
4. K Sam Shanmugam, Digital and Analog Communication Systems, Wiley India Pvt. Ltd, 1st Ed.

Suggested Topics for Tutorials (Any 10):

1. Demonstration of Amplitude modulation.
2. Demonstration of Frequency modulation.
3. Study of AM/ FM receiver.
4. Demonstration of Signal sampling and reconstruction.
5. Study of PWM generation and detection.
6. Study of PCM coding and decoding.
7. Study of Delta modulation and demodulation
8. Demonstration of TDM/ FDM.
9. Demonstration of BPSK, BFSK, BASK
10. Study of QPSK
11. Study of Inter symbol Interference and Line coding.
12. Study of different types of Propagation.

Assessment:

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination: Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions**, **each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	TW/Practical	Tutorial	Total
ITL301	Digital Design Lab	--	2	--	--	1	--	01

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Oral & Practical	Total
		Internal assessment			End Sem. Exam			
		Test1	Test2	Avg. of two Tests				
ITL301	Digital Design Lab	--	--	--	--	25	25	50

Lab Objectives: Students will try to:

1. Learn to minimize and design combinational logic;
2. Understand the relationships between combination logic and Boolean algebra, and between sequential logic and finite state machines;
3. Appreciate tradeoffs in complexity and speed of combinational designs;
4. Understand how state can be stored in a digital logic circuit;
5. Study how to design a simple finite state machine from a specification and be able to implement this in gates and edge triggered flip-flops
6. Learn to translate real world problems into digital logic formulations

Lab Outcomes: Students will be able to:

1. Minimize the Boolean algebra and design it using logic gates.
2. Analyse and design combinational circuit.
3. Realise given function using combinational circuit.
4. Design and develop sequential circuits
5. Implement digital systems using programmable logic devices
6. Translate real world problems into digital logic formulations using VHDL.

Prerequisite: Concepts of Logic Design

Hardware requirement:

Digital Trainer kit, ICs for various logic gates and functions, connecting wires

Software requirement:

VHDL tool

Detail Syllabus:

Sr. No.	**Module**	Detailed Content	**Hours**	**LO Mapping**

I	Boolean Algebra and Logic gates	a. Verify the truth table of logic gates (basic and universal gates) b. Realization of Boolean algebra using gates	04	LO1
II	Design and Analysis of Combinational Circuits	a. Design of Full Adder and Full Subtractor. b. verify the operation of 4- bit magnitude comparator	04	LO2
III	Implementation of Combinational Circuits	a. Implementation of MUX and DeMUX. b. Implementation of Encoder and Decoder	04	LO3
IV	Sequential Logic Design	a. To verify and observe the operation of flip-flop(any two) b. To design any two shift register. c. To design Modulo and ring Counter	06	LO4
V	Programmable logic Devices	a. Evaluate and observe Boolean expression using PALs and PLAs..	04	LO5
VI	VHDL	a. Implementation of Logic Gates using VHD b. Evaluate and observe combinational circuits on VHDL.	04	LO6

Text Books:

1. R. P. Jain, “Modern Digital Electronics”, Tata McGraw Hill.
2. Balbaniam,Carison,”Digital Logic Design Principles”, Wiley Publication

References:

1. M. Morris Mano, “Digital Logic and computer Design”, PHI
2. J. Bhasker.“ VHDL Primer”, Pearson Education.

Term Work:
Term Work shall consist of at least 10 to 12 practical’s based on the above list. Also Term work Journal must include at least 2 assignments.
Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral & Practical Exam: An Oral & Practical exam will be held based on the above syllabus.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	TW/Practical	Tutorial	Total
ITL302	Data Structures Lab	--	2	--	--	1	--	1

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Oral & Practical	Total
		Internal assessment			End Sem. Exam			
		Test1	Test2	Avg. of two Tests				
ITL302	Data Structures Lab	--	--	--	--	25	25	50

Lab Objectives: Students will try:

1. Understand and remember algorithms and its analysis procedure.
2. Introduce the concept of data structures through ADT including List, Stack, Queues .
3. To design and implement various data structure algorithms.
4. To introduce various techniques for representation of the data in the real world.
5. To develop application using data structure algorithms.
6. Compute the complexity of various algorithms.

Lab Outcomes: Students will be able to:

1. Select appropriate data structures as applied to specified problem definition.
2. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
3. Students will be able to implement Linear and Non-Linear data structures.
4. Implement appropriate sorting/searching technique for given problem.
5. Design advance data structure using Non-Linear data structure.
6. Determine and analyze the complexity of given Algorithms.

Prerequisite: C Programming Language

Hardware Requirement:	**Software requirement:**
PC i3 processor and above	Turbo/Borland C complier.

Detailed Syllabus:

Sr. No.	Module	Detailed Content	Hours	LO Mapping
0	Prerequisite	Introduction of C programming language		
I	Stack	1. Implementations of stack menu driven program 2. Implementation of multistack in one array. 3. ***Implementations of Infix to Postfix Transformation and its evaluation program.** 4. Implementations of Infix to Prefix Transformation and its evaluation program.	04	LO1 LO2 LO3 LO6
II	Queue	1. Implementations of circular queue menu driven program **2. * Implementations of double ended queue menu driven program** 3. Implementations of queue menu driven program 4. Implementation of Priority queue program using array.	04	LO1 LO2 LO3 LO6
III	Linked List	1. Implementations of Linked Lists menu driven program. **2. *Implementation of different operations on linked list –copy, concatenate, split, reverse, count no. of nodes etc** 3. Implementation of polynomials operations (addition, subtraction) using Linked List. 4. Implementations of Linked Lists menu driven program (stack and queue)	04	LO1 LO2 LO3 LO6
IV	Tree & Graph	1. Implementations of Binary Tree menu driven program 2. Implementation of Binary Tree Traversal program. **3. *Implementation of construction of expression tree using postfix expression.** 4. Implementations of BST program 5. Implementation of various operations on tree like – copying tree, mirroring a tree, counting the number of nodes in the tree, counting only	04	LO1 LO2 LO3 LO6

		leaf nodes in the tree. 6. Implementation of Preorder traversal of a threaded binary tree. 7. Implementations of Huffman code construction 8. Implementations of Graph menu driven program (DFS & BSF)		
V	Sorting	1. Implementations of Shell sort, Radix sort and Insertion sort menu driven program. **2. *Implementations of Quick Sort, Merge sort and Heap Sort menu driven program** **3.** Implementations of Advanced Bubble Sort, Insertion Sort and Selection Sort menu driven program	04	LO4 LO5 LO6
VI	Searching	1. Implementations of searching methods (Index Sequential, Interpolation Search) menu driven program 2. ***Implementation of hashing functions with different collision resolution techniques**	02	LO4 LO5 LO6

Text Books:

1. Data structures using C by Tenenbaum, Langsam, Augenstein , Pearson.
2. Data Structures using C, ReemaThareja, Oxford.

Reference Books:

1. C and Data structures, Prof. P.S.Deshpande, Prof. O.G.Kakde, Dreamtech Press.
2. Data Structures A Pseudocode Approach with C, Richard F. Gilberg & Behrouz A. Forouzan, second edition, CENGAGE Learning.

Term Work:

Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral & Practical Exam: An Oral & Practical exam will be held based on the above syllabus.

		Theory	Practical	Tutorial	Theory	TW/Practical	Tutorial	Total
ITL303	SQL Lab	--	2	--	--	01	--	01

Subject Code	Subject Name	Examination Scheme						
		Theory Marks				Term Work	Oral & Practical	Total
		Internal assessment			End Sem. Exam			
		Test 1	Test 2	Avg. of 2 Tests				
ITL303	SQL Lab	--	--	--	--	25	25	50

Course Objectives: Students will try:

1. To provide a sound introduction to the creation of problem statements from real life situations.
2. To give a good formal foundation on the relational model of data and usage of Relational Algebra.
3. To introduce the concepts of basic SQL as a universal Database language.
4. To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.
5. To enable the design of an efficient database using normalization concepts.
6. To enable students to be create indexes for databases for efficient retrieval.

Course Outcomes: Student should be able to:

1. Construct problem definition statements for real life applications and implement a database for the same.
2. Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra.
3. Create and populate a RDBMS, using SQL.
4. Write queries in SQL to retrieve any type of information from a data base.
5. Analyze and apply concepts of normalization to design an optimal database.
6. Implement indexes for a database using techniques like B or B+ trees.

Hardware Requirement:	**Software requirement:**
PC i3 processor and above	Any SQL Compiler

Prerequisite: C Programming Language

Detailed syllabus:

Sr. No.	Detailed Content	Hours	CO Mapping
1	a) Students to be given assignments to construct detailed problem definitions for real life applications. b) Construction of ER/EER diagrams for the given problems. c) Assignment based on relational Algebra	4	CO 1 CO 2
2	a) Basic SQL Queries-DDL and DML. b) Construction of Database-Keys c) Population of the database	5	CO 3
3	Complex Queries using group by, nested queries, recursive queries, joins, views, Triggers, Cursors	5	CO 4
4	Design and Implementation of a fully fledged Database with front end for a real life application (Using JDBC)	4	CO 1
5	Assignment for conversion of relation to different normal forms.	2	CO 5
6	Program for construction of index- B-Tree / B+-Tree	4	CO 6

Text Books:

1. SQL The Complete Reference, 3rd Edition , James R Groff, Paul N. Weinberg, Andy Oppel, McGraw Hill.
2. G. K. Gupta :"Database Management Systems", McGraw – Hill

References:

1. Korth, Slberchatz,Sudarshan, :"Database System Concepts", 6th Edition, McGraw – Hill
2. Raghu Ramkrishnan and Johannes Gehrke, " Database Management Systems", TMH

Term Work:
Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments.
Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral & Practical Exam: An Oral & Practical exam will be held based on the above SQL syllabus.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	TW/Practical	Tutorial	Total
ITL304	Java Programming Lab	--	2+2*	--	--	2	--	2

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Oral & Practical	Total
		Internal assessment			End Sem. Exam			
		Test1	Test 2	Avg. of two Tests				
ITL304	Java Programming Lab	--	--	--	--	50	50	100

* 2 hours shown as practical's to be taken class wise lecture and other 2 hours to be taken as batch wise practical's in Lab.

Lab Objectives: Students will try:

1. To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
2. To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
3. Discuss the principles of inheritance, interface and packages and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
4. To understand importance of Multi-threading & different exception handling mechanisms.
5. To learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.
6. To understand Java Swings for designing GUI applications based on MVC architecture.

Lab Outcomes: Upon Completion of the course the learner should be able to:

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
2. Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
3. Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
4. Demonstrate understanding and use of different exception handling mechanisms and

concept of multithreading for robust faster and efficient application development.
5. Identify and describe common abstract user interface components to design GUI in Java using Applet & AWT along with response to events
6. Identify, Design & develop complex Graphical user interfaces using principal Java Swing classes based on MVC architecture

Hardware Requirements	Software Requirements	Other Requirements
PC With Following Configuration 1. Intel PIV Processor 2. 2 GB RAM 3. 500 GB Harddisk 4. Network interface card	1. Windows or Linux Desktop OS 2. JDK 1.8 or higher 3. Notepad ++ 4.JAVA IDEs like Netbeans or Eclipse	1. Internet Connection for installing additional packages if required

Detailed Syllabus:

Sr. No.	Module	Detailed Contents	Hours	LO Mapping
1)	Fundamental of Java Programming	**Theory** 1.1 Overview of procedure and object oriented Programming, Java Designing Goals, Features of Java Language. 1.2 Introduction to the principles of object-oriented programming: Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism, 1.3 Keywords, Data types, Variables, Operators, Expressions, Types of variables and methods. 1.4 Control Statements: If Statement, If-else, Nested if, switch Statement, break, continue. Iteration Statements: for loop, while loop, and do-while loop. **Experiment 1:** (Perform any three programs that covers Classes, Methods, Control structures and Looping statements) i) Write a Java program to understand how to accept input using Scanner or	12	LO 1 LO 2

		BufferedReader and print output using System.out.println statement. ii) Write a Java program to display the default value of all primitive data types in Java. iii) Write a Java program that prints all real solutions to the quadratic equation ax2+bx+c = 0. Read in a, b, c and use the quadratic formula. If the discriminate b2-4ac is negative, display a message stating that there are no real solutions. iv) Write a java program to test whether string is palindrome or not v) Write a java program to count number of alphabets, digits, special symbols, blank spaces and words from the given sentence. vi) Write a java program to count number of vowels and consonants from the given strings. vii) Write a Menu driven program in java to implement simple banking application. Application should read the customer name, account number, initial balance, rate of interest, contact number and address field etc. Application should have following methods. 1. createAccount() 2. deposit() 3. withdraw() 4. computeInterest() 5. displayBalance() viii) Write a menu driven Java program which will		

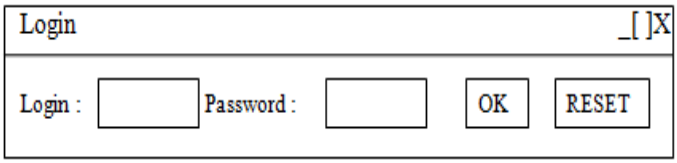
		read a number and should implement the following methods 1. factorial() 2. reverse() 3. testArmstrong() 4. testPalindrome() 5. testPrime() 6. fibonacciSeries() ix) Write a Java program to demonstrate Method overloading		
2)	Classes, Objects, Arrays and Recursion	**Theory** 2.1 Classes & Objects: Class Fundamentals: Assigning Object Reference Variables, Passing parameters to Methods and Returning parameters from the methods, Nested and Inner Classes. 2.2 Constructors: Parameterized Constructors, finalize( ) Method, Method overloading, Constructors overloading, Recursion, Command-Line Arguments. 2.3 Wrapper classes, Java.util.Scanner, Java. io.BufferedReader, Java.io.DataInputStream, Java.io.DataOutputStream and String Buffer classes and String functions. 2.4 Arrays & Vectors: One Dimensional arrays, Two Dimensional array, Irregular arrays, dynamic arrays, Array List and Array of Object. **Experiment 2** (Perform any Five programs that covers Classes & objects, Constructors, Command Line Arguments,	12	LO 1 LO 2

		Arrays/Vectors & recursions) i) Write a java program to demonstrate Constructors, Parameterized Constructors and Constructor Overloading ii) Write a java program to demonstrate Command Line Arguments iii) Write a java program to demonstrate String Functions iv) Write a java program to demonstrate Array and Vectors operations v) Write a java programs to add n strings in a vector array. Input new string and check whether it is present in the vector. If it is present delete it otherwise add it to the vector. vi) Write a java programs to test whether the given element is present in the vector array. vii) Write a java programs to find frequency of a element in the given Vector array. viii) Write a java programs to add n strings in a vector array. Input new string and check whether it is present in the vector. If it is present delete it otherwise add it to the vector. ix) Write menu driven program to implement recursive functions for following tasks. a) To find GCD and LCM b) To find X^Y c) To print n Fibonacci numbers		

		d) To find reverse of number e) To 1+2+3+4+……..+(n-1)+n x) Write the Menu driven program to perform a) Addition of two matrices of order m*n and p*q b) Multiplication of two matrices of order m*n and p*q c) Transpose of matrix of order m*n d) addition of diagonal and non-diagonal elements		
3)	Inheritance, Interface and Packages	**Theory** 3.1 Inheritance Basics, , Types of Inheritance in Java, Concept of Super and sub class, inheriting Data members and Methods, Role of Constructors in inheritance, Making methods and classes final , Method overriding, Dynamic Method Dispatch, Abstract classes and methods 3.2 Defining an interface, extending interfaces , implementing interfaces, accessing implementations through interface references, Interfaces vs. Abstract classes. 3.3 Packages – Steps for defining, creating and accessing a Package, importing packages,Making JAR Files for Library Packages, java.util.Vector **Experiment 3** (Perform any Two programs that covers Inheritance, interfaces and packages) i) Write a java programs to demonstrate hierarchical inheritance ii) Write a java program to demonstrate extending & implementing Interfaces	08	LO 3

		iii) Write a java program to demonstrate Modules and packages iv) Write a java program to create user defined packages		
4)	Exception Handling and Multithreading	**Theory:** 4.1 Exception handling Mechanism: try, catch, throw, throws and finally. 4.2 Multithreading: Need of Multithreading , Java thread Model, thread Life-Cycle, thread class Methods, Implementing Runnable, Extending thread, Synchronizing threads, synchronized Statement, Critical Factor in Thread –Deadlock. **Experiment 4** (Perform any Two programs that covers Exception Handling & Multithreading) i) Write java programs to demonstrate Exception handling using try, catch, throw, throws and finally statements. ii) Write a Java Program to input the data through command Line and Find out total valid and in-valid integers. (Hint: use exception handling). iii) Write a Java Program to calculate the Result. Result should consist of name, seatno, date, center number and marks of semester three exam. Create a User Defined Exception class MarksOutOfBoundsException, If Entered marks of any subject is greater than 100 or less than 0, and then program should create a user defined Exception of type MarksOutOfBoundsException and must have a provision to handle it.	06	LO3 LO 4

		iv) Write java program to create a user defined Exception class known as PayOutOfBoundsException. Organization does not offer basic salary less than 8000. If entered salary is less than 8000 then program should create an Exception of Type PayOutOfBoundsException. Program should calculate gross salary by considering salary parameters such as DA, HRA, CA, TA, Professional tax, TDS, PF.. etc v) Write java programs to create user defined threads by extending thread class and by implementing runnable. vi) Write java program to print Table of Five, Seven and Thirteen using Multithreading (Use Thread class for the implementation) . vii) Write a java program to print first 20 prime numbers and 15 Fibonacci numbers by creating two child threads and also print the total time taken by each thread for the execution. viii) Write a java program to implement use of nested try-catch concept using appropriate example. ix) Write java program to create the child thread. Comment on the execution of main and Child Thread. x) Write java program to implement the concept of Thread Synchronization xi) Write a Java program to identify whether inputted data is byte/short/int/long/float/double/String/char type. (Use Exception Handling)		
5)	Applet Programming, GUI	5.1 Applet: Applet fundamentals, Applet lifecycle, Creating applet, paint method Applet tag, Applet class methods.	10	LO3 LO4

	development using AWT and Event handling	5.2 Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Adding a Menu to Window, Extending GUI Features 5.3 Event-Driven Programming in Java, Event-Handling Process, Event- Handling Mechanism, Delegation Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling. **Experiment 5** (Perform any Three programs that covers Applet Programming, GUI development using AWT and Event handling) i) Write java program to draw the house on an applet. ii) On Applet: Take a Login and Password from the user and display it on the third Text Field which appears only on clicking OK button and clear both the Text Fields on clicking RESET button Perform same using AWT and Swings as well.  iii) Write java program to create an advertisement banner on an applet using multithreading iv) Write java program to create a registration form using AWT. v) Write a Java program to demonstrate the use of AWT components namely buttons,labels, text boxes, lists/combos, menus with event handling.		LO 5

		vi) Write a java program to store personal telephone directory in such a way that when user hits a character, the names which starts with the character and telephone numbers should appear.		
6)	Java Swings	**Theory** 6.1 Introducing Swing: AWT vs Swings, Components and Containers, Swing Packages, A Simple Swing Application, Painting in Swing, Designing Swing GUI Application using Buttons,JLabels, Checkboxes, Radio Buttons, JScrollPane, JList, JComboBox, Trees, Tables Scroll pane Menus and Toolbars **Experiment 6** (Perform any one programs that covers concept of Swings) i) Write a Java program to implement Swing components namely Buttons, ,JLabels, Checkboxes, Radio Buttons, JScrollPane, JList, JComboBox, Trees, Tables Scroll pane Menus and Toolbars to design interactive GUI. ii) Write a program to create a window with four text fields for the name, street, city and pincode with suitable labels. Also windows contains a button MyInfo. When the user types the name, his street, city and pincode and then clicks the button, the types details must appear in Arial Font with Size 32, Italics.	06	LO4 LO 6

Textbook Books:

1. Herbert Schildt, “Java-The Complete Reference”, Seventh Edition, Tata McGraw Hill Publication
2. E. Balguruswamy, “Programming with java A primer”, Fifth edition, Tata McGraw Hill Publication

Reference Books:

1. D.T. Editorial Services, “Java 8 Programming Black Book”, Dreamtech Press

2. H. M.Deitel, P. J. Deitel, S. E. Santry, “Advanced Java 2 Platform How to Program” Prentice Hall
3. Learn to Master JAVA, from Star EDU solutions , by ScriptDemics

Term Work:

The term Work shall consist of at least 12 to 15 practical’s based on the above list. The also Term work Journal must include at least 2 assignments.

Term Work Marks: 50 Marks (Total marks) = 40 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral & Practical Exam: An Oral & Practical exam will be held based on the above syllabus.

University of Mumbai

Program Structure B.E. Information Technology, (Rev. 2016)

S. E. Information Technology (Semester-IV)

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract	Tut	Theory	TW/ Pract	Tut	Total
ITC401	Applied Mathematics-IV	4+1@	-	-	5	-	-	5
ITC402	Computer Networks	4	-	-	4	-	-	4
ITC403	Operating Systems	4	-	-	4	-	-	4
ITC404	Computer Organization and Architecture	4	-	-	4	-	-	4
ITC405	Automata Theory	3+1$	-	-	4	-	-	4
ITL401	Networking Lab	-	2	-	-	1	-	1
ITL402	Unix Lab	-	2	-		1	-	1
ITL403	Microprocessor Programming Lab	-	2	-	-	1	-	1
ITL404	Python Lab	-	2+2*	-	-	2	-	2
	Total	**21**	**10**	-	**21**	**5**	-	**26**

ourse Code	Course Name	Examination Scheme								
		Theory					TW	Oral	Oral & Pract	Total
		Internal Assessment			End Sem. Exam	Exam Duration (in Hrs)				
		Test 1	Test 2	Avg.						
ITC401	Applied Mathematics-IV	20	20	20	80	3	-	-	-	100
ITC402	Computer Networks	20	20	20	80	3	-	-	-	100
ITC403	Operating Systems	20	20	20	80	3	-	-	-	100
ITC404	Computer Organization and Architecture	20	20	20	80	3	-	-	-	100
ITC405	Automata Theory	20	20	20	80	3	--	-	-	100
ITL401	Networking Lab	-	-	-	-	-	25	25	--	50
ITL402	Unix Lab	-	-	-	-	-	25	--	25	50
ITL403	Microprocessor Programming Lab	-	-	-	-	-	25	25	--	50
ITL404	Python Lab	-	-	-	-	-	50	--	50	100
Total		100	100	100	400	-	125	50	75	750

@ 4 hours shown as theory to be taken class wise and 1 hour to be taken tutorial as class wise

$ 3 hours shown as theory to be taken class wise and 1 hour to be taken tutorial as batch wise

*2 hours shown as practical's to be taken class wise lecture and other 2 hours to be taken as batch wise practicals in Lab.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC401	Applied Mathematics IV	04	--	01	04	--	--	05

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Oral & Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test2	Avg. of Two Tests					
ITC401	Applied Mathematics IV	20	20	20	80	--	--	--	100

Course Objectives: Students will try to learn:

1. The concepts of Number Theory by using different theorem.
2. The concepts of probability and study PDF.
3. The concept of sampling theory and correlation.
4. The concept of graphs and trees.
5. The concept of groups theory.
6. The concept of Lattice theory.

Course Outcomes: Students will able to:

1. Apply the Number Theory to different applications using theorem.
2. Apply probability and understand PDF.
3. Understand sampling theory and correlation.
4. Apply the graphs and trees concepts to different applications.
5. Understand group's theory.
6. Understand the Lattice theory.

Prerequisite: Applied Mathematics III

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Basic of Set, Permutations, Combination and Probability .	02	
I	Elements of Number Theory I	Modular Arithmetic, Divisibility and Euclid Algorithm, Primes and the Sieve of Eratosthenes, Testing for primes, Prime Number Theorem	06	CO1

II	Elements of Number Theory II	Euler's, Fermat's Little theorems, Congruences, Computing Inverse in Congruences, Legendre and Jacobi Symbols, Chinese Remainder Theorem	06	CO1
III	Probability	Statistics: Formal concept, sample space, outcomes, events Random Variables: discrete & continuous random variables, expectation, Variance, Probability Density Function & Cumulative Density Function Moments, Moment Generating Function Probability distribution: binomial distribution, Poisson & normal distribution	08	CO2
IV	Sampling theory	Test of Hypothesis, Level of significance, Critical region, One Tailed and two Tailed test, Test of significant for Large Samples:- Means of the samples and test of significant of means of two large samples Test of significant of small samples:- Students t- distribution for dependent and independent samples Chi square test:- Test of goodness of fit and independence of attributes, Contingency table. Correlation Scattered diagrams Karl Pearson's coefficient of correlation Spearman's Rank correlation Regression Lines	10	CO3
V	Graph & Groups theory.	Introduction to graphs, graph terminology, representing graphs and graph isomorphism, connectivity, Euler and Hamilton paths, planar graphs, graph coloring, introduction to trees, application of trees. Groups, subgroups, generators and evaluation of powers, cosets and Lagrange's theorem, permutation groups and Burnside's theorem, isomorphism, automorphisms, homomorphism and normal	12	CO4 CO5

		subgroups, rings, integral domains and fields.		
VI	Lattice theory	Lattices and algebras systems, principles of duality, basic properties of algebraic systems defined by lattices, distributive and complimented lattices, Boolean lattices and Boolean algebras, uniqueness of finite Boolean expressions, prepositional calculus. Coding theory: Coding of binary information and error detection, decoding and error correction.	08	CO5

Text Books:

1. Cryptograph and Network Security by B. A. Forouzan & D. Mukhopadhyay, 11th edition, McGraw Hill Publication.
2. Network Security and Cryptograph byBernard Menezes, Cengage Learning Publication.
3. Higher Engineering Mathematics by Grewal B. S. 38th edition, Khanna Publication 2005.
4. Probability and Statistics for Engineering, Dr. J Ravichandran, Wiley-India.
5. Mathematical Statistics by H. C Saxena, S Chand & Co.
6. *C. L. Liu: Elements of Discrete Mathematics*, 2nd edition, TMH

References:

1. Elementary Number Theory and its applications by Kenneth H. Rosen, 5th edition, Addison Wesley Publication.
2. Abstract Algebra by I. N. Herstain, 3rd eition, John Wiley and Sons Publication.
3. Discrete Mathematics by Norman Biggs, 2nd edition, Oxford University Press.
4. Advanced Engg. Mathematics by C. Ray Wylie & Louis Barrett.TMH International Edition.
5. Mathematical Methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
6. Advanced Engineering Mathematics by Kreyszig E. 9th edition, John Wiley.
7. Probability by Seymour Lipschutz, McGraw-Hill publication.

Assessment:

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination: Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions**, **each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.

- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC402	Computer Networks	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Oral & Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of two Tests					
ITC402	Computer Networks	20	20	20	80	--	--	--	100

Course Objectives: Students will try to:

1. Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
2. Acquire knowledge of Application layer and Presentation layer paradigms and protocols.
3. Study Session layer design issues, Transport layer services, and protocols.
4. Gain core knowledge of Network layer routing protocols and IP addressing.
5. Study data link layer concepts, design issues, and protocols.
6. Read the fundamentals and basics of Physical layer, and will apply them in real time applications.

Course Outcomes: Students will be able to:

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
3. Describe the Session layer design issues and Transport layer services.
4. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
5. Describe the functions of data link layer and explain the protocols.
6. Explain the types of transmission media with real time applications.

Prerequisite: COA, Logic Design

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Von Neumann model, Modulation, Demodulation, encoding, Decoding.	02	--

I	Introduction	Network Criteria, Physical Structures, Network Types: LAN, WAN, Switching, OSI Reference model, TCP/IP suite, Comparison of OSI and TCP/IP, Network devices.	04	CO1
II	Application layer and Presentation layer	Introduction: Providing Services, Application layer Paradigms, Client-Server Paradigm: Application Programming Interface, Using Services of the Transport Layer, Standard Client Server applications: World Wide Web and HTTP, FTP, Electronic Mail, TELNET, Secure Shell (SSH), Domain Name System (DNS), Compression: Lossless Compression, Lossy Compression, Multimedia data: Text, Image, Video , Audio ,Multimedia in the Internet: Streaming Stored Audio/Video, Streaming Live Audio/Video, Real-Time Interactive Audio/Video, Optimal Compression Algorithms, Huffman Coding, Adaptive Huffman Compression, Dictionary Based Compression, Speech Compression, LZW, RLE, Image Compression – GIF,JPEG.	10	CO1 CO2
III	Session layer and Transport layer	Session layer design issues, Session Layer protocol - Remote Procedure Call (RPC), Transport layer services, Transport Layer Protocols: Simple Protocol, Stop-and-Wait Protocol, Go-Back-N Protocol (GBN), Selective-Repeat Protocol, Bidirectional Protocols: Piggybacking, Internet Transport-Layer Protocols, User Datagram Protocol: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features, Segment, Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options.	10	CO1 CO3
IV	Network Layer	Introduction: Network-Layer Services, Packet Switching, Network-Layer Performance, Network-Layer Performance, Network-Layer Congestion, Structure of A Router, Network Layer Protocols: IPv4 Datagram Format, IPv4 Addresses,	12	CO1 CO4

		Forwarding of IP Packets, ICMPv4, Unicast Routing: General Idea, Routing Algorithms, Unicast Routing Protocols, Multicast Routing : Introduction, Multicasting Basics, Intradomain Routing Protocols, Interdomain Routing Protocols, Next generation IP: Packet Format , IPv6 Addressing , Transition from IPv4 to IPv6, ICMPv6, Mobile IP: Addressing , Agents , Three Phases , Inefficiency in Mobile IP.		
V	Data Link Layer	Wired Networks; Introduction: Nodes and Links, Two Types of Links, Two Sublayers, Data Link Control: Framing, Flow and Error Control, Error Detection and Correction, Two DLC Protocols, Medium Access Protocols: Random Access, Controlled Access, Channelization, Link Layer Addressing, Wired LANS: Ethernet Protocol; IEEE Project 802, Standard Ethernet, Fast Ethernet (100 Mbps), Gigabit Ethernet, 10-Gigabit Ethernet, Virtual LANs, Other Wired Networks: Point-to-Point Networks, SONET, Switched Network: ATM, Connecting Devices: Repeaters or Hubs, Link-Layer Switches, Routers, Sliding Window Compression.	09	CO1 CO5
VI	Physical Layer	Data and Signals: Analog and Digital, Transmission Impairment, Data Rate Limits, Performance, Digital Transmission: Digital-to-Digital Conversion , Analog-to-Digital Conversion, Analog Transmission: Digital-to-Analog Conversion, Analog-to-Analog Conversion ,Bandwidth Utilization: Multiplexing, Spread Spectrum, Transmission Media: Guided Media, Unguided Media: Wireless, Real Time Interactive Protocols: Rationale for New Protocols, RTP, Session Initialization Protocol (SIP), H.323, SCTP.	05	CO1 CO6

Text Books:

1. Behrouz A. Forouzan, Forouzan Mosharrat , Computer Networks A Top down Approach, Mc Graw Hill education.
2. Andrew S Tanenbaum, Computer Networks -, 4th Edition, Pearson Education.
3. Ranjan Bose, Information Theory, Coding and Cryptography, Ranjan Bose, Tata McGrawHill , Second Edition.

4. Diane Teare, " Authorized Self- Study Guide Designing for CISCO Internetwork Solutions(DESGN), Second Edition.

References:

1. Behrouz A. Forouzan, Data communications and Networking, Fifth edition TMH 2013.
2. James F. Kurose, K. W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, 3rd Edition, Pearson Eduction.
3. L. L. Peterson and B. S. Davie, Computer Networks: A Systems Approach, 4th Ed, Elsevier India.
4. S. Keshav, An Engineering Approach to Computer Networks, 2nd Edition, Pearson Edication.
5. W. A. Shay, Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
6. Khalid Sayood, Introduction to Data Compression, Third Edition, Morgan Kaufman.

Assessment:

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination: Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions**, **each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC403	Operating System	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Oral & Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of two Tests					
ITC403	Operating System	20	20	20	80	--	--	--	100

Course Objectives: Students will try:

1. To understand the main components of an OS & their functions.
2. To study the process management and scheduling.
3. To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.
4. To understand the concepts and implementation Memory management policies and virtual memory.
5. To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS
6. To study the need for special purpose operating system with the advent of new emerging technologies

Course Outcomes: Student will be able to

1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.
2. Understand the process management policies and scheduling of processes by CPU
3. Evaluate the requirement for process synchronization and coordination handled by operating system
4. Describe and analyze the memory management and its allocation policies.
5. Identify use and evaluate the storage management policies with respect to different storage management technologies.
6. Identify the need to create the special purpose operating system.

Prerequisite: Programming Language C

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	Programming Language C. Basic of Hardware i.e. ALU,RAM,ROM, HDD etc.	02	
I	Overview of Operating System	Introduction: Operating System Structure and operations, Process management, Memory management, storage management, Protection and security, Distributed and special purpose Systems; System Structure: Operating system services and interface, System calls and its types, System programs, Operating System Design and implementation, OS structure, Virtual machines, OS debugging and generation, System boot.	07	C01
II	Process Management	Process concept: Process Scheduling, Operation on process and Interprocess communication;, Multithreading, Process: Multithreading models and thread libraries, threading issues; Process Scheduling: Basic concepts, Scheduling algorithms and Criteria, Thread Scheduling and Multiple Processor Scheduling;	09	C02
III	Process coordination	Synchronization: The critical Section Problem, Peterson's Solution, synchronization Hardware and semaphores, Classic problems of synchronization, monitors, Atomic transactions; Deadlocks: System Model, Deadlock Characterization , Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance , Deadlock Detection, Recovery from Deadlock.	09	CO3
IV	Memory Management	Memory Management strategies: Background, Swapping, Contiguous Memory Allocation, Paging , Structure of the Page Table, Segmentation; Virtual Memory Management: Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory, Other Considerations.	10	C04
V	Storage Management	File system: File Concept , Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection; Implementing file System: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery, NFS; Secondary Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, Disk Scheduling, Disk Management, RAID Structure, Stable-Storage Implementation, Tertiary-Storage Structure, Swap-Space Management; I/O systems: Overview I/0 Hardware, Application I/0 Interface, Kernel I/0 Subsystem, Transforming I/0 Requests to	09	C05

		Hardware Operations, STREAMS, Performance		
VI	Distributed Systems	Distributed operating System: Network based OS, Network Structure and Topology, Communication Structure and Protocols; Distributed File system: Naming and transparency, Remote file access, Stateful Versus Stateless Service, File Replication; Distributed Synchronization: Mutual Exclusion, Concurrency Control and Deadlock Handling,	06	C06

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Greg Gagne, Peter Baer Galvin, 8th edition Wiley.
2. Modern Operating System, Tanenbaum, Pearson Education.
3. Operating Systems: Internal and Design Principles: William Stallings, PHI

Reference Books:

1. Operating System Design and Implementation, A Tanenbaum, Pearson
2. Real Time Systems Design and Analysis, Wiley, IEEE Press
3. Principles of Operating Systems: Naresh Chauhan, Oxford Higher Education

Assessment:

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination: Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions**, **each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC404	Computer Organization and Architecture	04	--	--	04	--	--	04

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Oral & Practical	Total
		Internal assessment			End Sem. Exam			
		Test1	Test 2	Avg. of two Tests				
ITC404	Computer Organization and Architecture	20	20	20	80	--	--	100

Course Objectives: Students will try to:

1. Conceptualize the basics of organizational and architectural issues of a digital computer.
2. Analyze processor performance improvement using instruction level parallelism.
3. Learn the function of each element of a memory hierarchy.
4. Study various data transfer techniques in digital computer.
5. Articulate design issues in the development of processor or other components that satisfy design requirements and objectives.
6. Learn microprocessor architecture and study assembly language programming.

Course Outcomes: Students will be able to:

1. Describe basic organization of computer and the architecture of 8086 microprocessor.
2. Implement assembly language program for given task for 8086 microprocessor.
3. Demonstrate control unit operations and conceptualize instruction level parallelism.
4. Demonstrate and perform computer arithmetic operations on integer and real numbers.
5. Categorize memory organization and explain the function of each element of a memory hierarchy.
6. Identify and compare different methods for computer I/O mechanisms.

Prerequisite: Fundamentals of Computer, Digital Logic Design

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
0	Prerequisite	basic combinational and sequential logic circuits, binary numbers and arithmetic, basic computer organizations	02	
I	Overview of Computer Architecture &	Introduction of Computer Organization and Architecture. Basic organization of computer and block level description of the functional	07	CO1

	Organization	units. Evolution of Computers, Von Neumann model. Performance measure of Computer Architecture. Architecture of 8086 family, 8086 Hardware Design, Minimum mode & Maximum mode of Operation. Study of bus controller 8288 & its use in Maximum mode.		
II	Programming 8086	Addressing modes, Instruction Set, Assembly Language Programming, Mixed Language Programming, Programs based on Stacks, Strings, Procedures, Macros, Timers, Counters & delay.	10	CO2
III	Processor Organization and Architecture	CPU Architecture, Register Organization, Instruction formats, basic instruction cycle. Instruction interpretation and sequencing. Control Unit: Soft wired (Micro-programmed) and hardwired control unit design methods. Microinstruction sequencing and execution. Micro operations, concepts of nano programming. Introduction to parallel processing concepts, Flynn's classifications, pipeline processing, instruction pipelining, pipeline stages, pipeline hazards.	11	CO3
IV	Data Representation and Arithmetic Algorithms	Number representation: Binary Data representation, two's complement representation and Floating-point representation. Integer Data arithmetic: Addition, Subtraction. Multiplication: Unsigned & Signed multiplication- Add & Shift Method, Booth's algorithm. Division of integers: Restoring and non-restoring division, signed division, basics of floating point representation IEEE 754 floating point(Single & double precision) number representation. Floating point arithmetic: Addition, subtraction	10	CO4
V	Memory Organization	Introduction to Memory and Memory parameters. Classifications of primary and secondary memories. Types of RAM and ROM, Allocation policies, Memory hierarchy and characteristics. Cache memory: Concept, architecture (L1, L2, L3), mapping techniques. Cache Coherency, Interleaved and Associative memory.	07	CO5
VI	I/O Organization	Input/output systems, I/O modules and 8089 IO processor. Types of data transfer techniques: Programmed I/O, Interrupt driven I/O and DMA.	05	CO6

Text Books:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw-Hill.
2. William Stallings, “Computer Organization and Architecture: Designing for Performance”, Eighth Edition, Pearson.
3. 8086/8088 family: Design Programming and Interfacing: By John Uffenbeck (Pearson Education)
4. Microprocessor and Interfacing: By Douglas Hall (TMH Publication).

References:

1. B. Govindarajulu, “Computer Architecture and Organization: Design Principles and Applications”, Second Edition, Tata McGraw-Hill.
2. Dr. M. Usha, T. S. Srikanth, “Computer System Architecture and Organization”, First Edition, Wiley-India.
3. John P. Hayes, “Computer Architecture and Organization”, McGraw-Hill.,Third Edition.
4. K Bhurchandi, “Advanced Microprocessors & Peripherals”, Tata McGraw-Hill Education

Assessment:

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination: Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions**, **each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC405	Automata Theory	03	--	01	03	--	01	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Oral & Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of two Tests					
ITC405	Automata Theory	20	20	20	80	--	--	--	100

$ 3 hours shown as theory to be taken class wise and 1 hour to be taken tutorial as batch wise

Course Objectives: Students will try:

1. To learn fundamentals of Regular and Context Free Grammars and Languages
2. To understand the relation between Regular Language and Finite Automata and machines.
3. To learn how to design Automata's and machines as Acceptors, Verifiers and Translators.
4. To understand the relation between Contexts free Languages, PDA and TM.
5. To learn how to design PDA as acceptor and TM as Calculators.
6. To learn how to co-relate Automata's with Programs and Functions.

Course Outcomes: The students will be able to:

1. Understand, design, construct, analyze and interpret Regular languages, Expression and Grammars.
2. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.
3. Understand, design, analyze and interpret Context Free languages, Expression and Grammars.
4. Design different types of Push down Automata as Simple Parser.
5. Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.
6. Compare, understand and analyze different languages, grammars, Automata and Machines and appreciate their power and convert Automata to Programs and Functions

Prerequisite: Basic Mathematical Fundamentals: Sets, Logic, Relations, Functions.

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	CO Mapping
I	Introduction and Regular	Languages: Alphabets and Strings. Regular Languages: Regular Expressions, Regular Languages, Regular Grammars, RL and LL	06	CO1

	Languages	grammars, Closure properties		
II	Finite Automata and machines	Finite Automata: FA as language acceptor or verifier, NFA (with and without ε) , DFA, RE to NFA, NFA to DFA, Reduced DFA , NFA-DFA equivalence, FA to RE. Finite State Machines: m/c with output Moore and Mealy machines. M/c as translators. Melay and Moore m/c conversion	09	CO2
III	Context Free Grammars	Context Free Languages: CFG, Leftmost and Rightmost derivations, Ambiguity, Simplification and Normalization (CNF) and Chomskey Hierarchy (Types 0 to 3)	08	CO3
IV	Push Down Automata	Push Down Automata: Deterministic (single stack)PDA, Equivalence between PDA and CFG.	05	CO4
V	Turing Machine	Turing Machine: Deterministic TM , Multi-track and Multi-tape TMs, concept of UTM and idea of system program. Issue and concept of Halting Problem	07	CO5
VI	Applications of Automata	1.Power and Limitations of Regular and Context Free Grammars and Machines 2.Designing Functions: FA: Acceptor and Verifier. FSM: Translator PDA: Simple Parser for WF parenthesis, palindromes etc. TM: Basic bit wise calculator(+ /- /AND/OR) and Translator **(Note Added)**	04	CO2 CO4 CO5 CO6

Text books

1. J.C.Martin, “Introduction to languages and the Theory of Computation”, TMH.
2. Kavi Mahesh, “Theory of Computation A Problem Solving Approach”, Wiley India

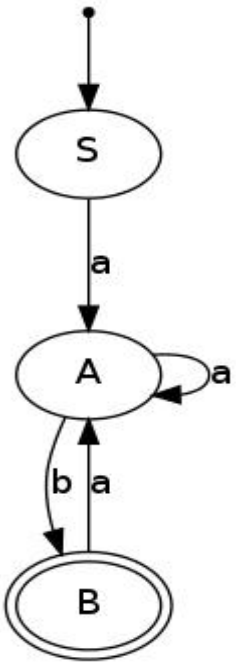
References

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education.
2. Daniel I.A. Cohen, “Introduction to Computer Theory”, John Wiley & Sons.
3. Theory of Computation - By Vivek Kulkarni from Oxford University.
4. N.Chandrashekhar& K.L.P. Mishra, “Theory of Computer Science, Automata Languages & Computations”, PHI publications.

Sample Example for Tutorial: Applications of Automata

An automata can be easily converted to functions by converting *States* to *functions* and *Transitions* to *function calls* or *gotos* begining with Starting state and *Accepting* in a terminating state.

A simple example of DFA is:

<table>
<tr><td rowspan="4"> 
</td><td>Functions</td></tr>
<tr><td>S(x)
{ if(x == 'a') goto A(next);
else print("Error"); }</td></tr>
<tr><td>A(x) { if(x == 'a') goto A(next);
else if(x == 'b') goto B(next);
else print("Error"); \}</td></tr>
<tr><td>B(x)
{ if(x == 'a') goto A(next);
else if(x == 'b') goto B(next);
else if(end) print("Accept");
else print("Error"); \}</td></tr>
</table>

Suggested Tutorials:

Sr. No.	Module	Detailed Content
I	Introduction and Regular Languages	1 Tutorial on design of RE, RG, RLG and LLG for given Regular Language.
II	Finite Automata and machines	3 Tutorials for converting RE to NFA, NFA to DFA to Reduced DFA, FA to RE. 1 Tutorial on design of Moore and Mealy machines.
III	Context Free Grammars	1 Tutorial on design of CFG and Leftmost and Rightmost derivations. 1 Tutorial for converting CFG to CNF.
IV	Push Down Automata	1 Tutorial on design of Push Down Automata.
V	Turing Machine	1 Tutorial on design of single tape Turing Machine. 1 Tutorial on design of Multi-track and Multi-tape TMs.
VI	Applications of Automata	2 Tutorials for converting Automata to Functions: a. FA to Acceptor / Verifier. b. FSM to Translator. c. PDA to Simple Parser for WF parenthesis, palindromes etc. d. TM to Basic bit wise calculator(+ /- /AND/OR) / Translator

Assessment:

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

End Semester Examination: Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions**, **each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus**.
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	TW/Practical	Tutorial	Total
ITL401	Networking Lab	--	02	--	--	1	--	1

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Oral	Total
		Internal assessment			End Sem. Exam			
		Test 1	Test 2	Avg. of 2 Tests				
ITL401	Networking Lab	--	--	--	--	25	25	50

Lab Objectives: Students will try:

1. To get familiar with the basic network administration commands.
2. To install and configure network simulator and learn basics of TCL scripting.
3. To understand the network simulator environment and visualize a network topology and observe its performance
4. To analyze the traffic flow and the contents of protocol frames.
5. To implement client-server socket programs.
6. To design and configure a network for an organization.

Lab Outcomes: Student will be able to

1. Execute and evaluate network administration commands and demonstrate their use in different network scenarios
2. Demonstrate the installation and configuration of network simulator.
3. Demonstrate and measure different network scenarios and their performance behavior.
4. Analyze the contents the packet contents of different protocols.
5. Implement the socket programming for client server architecture.
6. Design and setup a organization network using packet tracer.

Hardware Requirement:	**Software requirement:**
PC i3 processor and above	NS2.34, Protocol Analyzer (eg. Wireshark), Packet tracer (Eg. CISCO packet tracer)

Prerequisite: C Programming Language

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	LO Mapping
0	Prerequisite	Programming Language (C/java), Basic commands of windows and unix operating system, editor commands (eg nano/vi editor etc)	02	
I	Fundamentals of Computer Network	Understanding Basic networking Commands: Ping, Tracert, traceroute, ipconfig, ifconfig, nslookup, netstat	02	LO1
II	Basics of Network simulation	Installation and configuration of NS2 Introduction to Tcl Hello Programming	03	LO2
III	Simulation of Network Topology	Implementation of Specific Network topology with respect to 1. Number of nodes and physical layer configuration 2. Graphical simulation of network with Routing Protocols and traffic consideration (TCP, UDP) using NAM. 3. Analysis of network performance for quality of service parameters such as packet-delivery-ratio, delay and throughput 4. Comparative analysis of routing protocols with respect to QOS parameters using Xgraph/gnuplot for different load conditions.	05	LO3
IV	Protocol Analyzer	Installation of Wire shark Analysis of Packet headers,	04	LO4
V	Socket Programming	Socket Programming with C/Java 1.TCP Client, TCP Server	04	LO5

		2. UDP Client, UDP Server		
VI	Case study on designing network topology	A case study to design and configure any organization network eg. College network or campus network, using any packet tracer or network topology design software based on infrastructure requirements, servers and clients, traffic consideration and application requirements.	06	L06

Text Books:

1. Computer Network: Top Down approach, Behrouz Forouzan, Firoz Mossharraf. MGH
2. Packet analysis with Wire shark, Anish Nath, PACKT publishing

Reference Books:

1. NS2.34 Manual
2. Introduction to Network Simulator NS2, 2nd Edition, Teerawat Issariyakul, Ekram Hossain, Springer

Term Work:

Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral Exam: An Oral exam will be held based on the above syllabus.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	TW/Practical	Tutorial	Total
ITL402	Unix Lab	--	2	--	--	1	--	1

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Oral & Practical	Total
		Internal assessment			End Sem. Exam			
		Test 1	Test 2	Avg. of two Tests				

ITL402	Unix Lab	--	--	--	--	25	25	50

Lab Objectives: Students will try:

1. To introduce Basic Unix general purpose Commands
2. To learn network Unix commands.
3. To learn C programming in Unix editor environment.
4. To learn shell script and sed concepts.
5. To learn file management and permission advance commands.
6. To learn awk, grap, perl scripts.

Lab Outcomes: Student will be able to:

1. Identify the basic Unix general purpose commands.
2. Apply and change the ownership and file permissions using advance Unix commands.
3. Use the awk, grep, perl scripts.
4. Implement shell scripts and sed.
5. Apply basic of administrative task.
6. Apply networking Unix commands.

Prerequisite: C Programming Language and Operating System

Hardware requirement:

PC i3 and above.

Software requirement:

Unix, Editor, Bash shell, Bourne shell and C shell.

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	LO Mapping
0	Prerequisite	Programming syntax, Installation of Unix, concepts of operating system	02	--
I	Basic Commands	A brief history of UNIX, Unix Architecture. Logging into (and out of) UNIX systems, Changing your password, General format of UNIX commands. a) Installation of Unix operating system. b) User management in Unix. c) Study of Unix general purpose	04	LO1

		utility command list obtained from (cd, cp, ps, ls, mv, rm, mkdir, rmdir, man, who, cat, echo, more, date, time, kill, history, chmod, passwd, who am i, who, time, bc, history, clear, man, lost, chown, finger, pwd, cal, logout, shutdown) commands.		
II	Advance Commands	a) Study of Unix networking commands (ifconfig, ping, traceroute, netstat, nslookup, whois, hostname, tcpdump). b) Study of Unix file system (tree structure). c) Study of .bashrc, /etc/bashrc and Environment variables. d) Study File and directory permissions. e) Study of Editor Vi/other editor. f) Study of Bash shell, Bourne shell and C shell in Unix operating system.	04	LO1 LO2 LO5 LO6
III	Basic System administrative task	Process management Memory management File system management User management	04	LO1 LO2 LO5
IV	Shell scripts	a) Write a shell script program to display list of user currently logged in. b) Write a shell script program to display “HELLO WORLD”. c) Write a shell script program to develop a scientific calculator. d) Write a shell Script program to check whether the given number is	04	LO1 LO4

		even or odd. e) Shell script Program to search whether element is present is in the list or not.		
V	Shell scripts and sed	a) Shell script program to check whether given file is a directory or not. b) Shell script program to count number of files in a Directory. c) Shell script program to copy contents of one file to another. d) Create directory, write contents on that and Copy to a suitable location in your home directory. e) Use a pipeline and command substitution to set the length of a line in file to a variable. f) Write a program using sed command to print duplicated lines of Input.	06	LO1 LO4
VI	grep, awk, perl scripts	a) Write a grep/egrep script to find the number of words character, words and lines in a file. b) Write an awk script to develop a Fibonacci series. c) Write a perl script to compute the power of a given number. d) Write an awk script to display the pattern of given string or number. e) Write a perl script to check a number is prime or not. f) Write an egrep script to display	04	LO1 LO2 LO3

		list of files in the directory.		

Text Books:

1. Unix, concepts and applications by Sumitabha Das, McGraw-Hill
2. Mastering Shell Scripting, Randal. K. Michael , Second Edition, Wiley Publication

References:

1. Unix Shell Programming by Yashwant Kanetkar
2. Unix shell programming by forozun

Term Work:
Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments.
Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral & Practical Exam: An Oral & Practical exam will be held based on the above syllabus.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	TW/Practical	Tutorial	Total
ITL403	Microprocessor Programming Lab	--	2	--	--	1	--	1

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Oral	Total
		Internal assessment			End Sem. Exam			
		Test1	Test 2	Avg. of two Tests				
ITL403	Microprocessor Programming Lab	--	--	--	--	25	25	50

Lab Objectives: Students will try to:

1. Learn assembling and disassembling of PC.
2. Get hands on experience with Assembly Language Programming.
3. Study interfacing of peripheral devices with 8086 microprocessor.
4. Understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors.
5. Learn fundamentals of designing embedded systems
6. Write and debug programs in TASM/MASM/hardware kits

Lab Outcomes: Students will be able to :

1. Apply the fundamentals of assembly level programming of microprocessors.
2. Build a program on a microprocessor using arithmetic & logical instruction set of 8086.
3. Develop the assembly level programming using 8086 loop instruction set.
4. Write programs based on string and procedure for 8086 microprocessor.
5. Analyze abstract problems and apply a combination of hardware and software to address the problem
6. Make use of standard test and measurement equipment to evaluate digital interfaces.

Prerequisite: Logic Design, Programming Languages(C, C++), COA

Hardware Requirement:

- Motherboard, RAM, Processor, Connectors, Cables, SMPS, HDD, Monitor, Graphics card (optional), Cabinet.
- 8086 microprocessor experiment kits with specified interfacing study boards.

Software Requirement:

- Microsoft Macro Assembler (TASM)/Turbo Assembler(TASM)

NOTE: Programs can be executed on assembler or hardware boards,

Detailed syllabus:

Sr. No.	Module	Detailed Content	Hours	LO Mapping
I	PC Assembly	*1.* Study of PC Motherboard Technology (South Bridge and North Bridge). 2. Disassembling the System Unit & Identifying Internal Components and Connections. 3. Study of various connections and ports used in computer communication.	06	LO1
II	Arithmetic and logical operations in 8086 Assembly language programming	1. Program for 16 bit BCD addition 2. Program to evaluate given logical expression. 3. Convert two digit Packed BCD to Unpacked BCD. (any two)	04	LO2 LO6
III	Loop operations in 8086 Assembly language programming	1. Program to move set of numbers from one memory block to another. 2. Program to count number of 1's	06	LO3 LO6

		and 0;s in a given 8 bit number 3. Program to find the smallest/largest number from a given set of numbers. 4. Program to search for a given number (any three)		
IV	String and procedure in 8086 Assembly language programming	1. Check whether a given string is a palindrome or not.	04	LO4 LO6
V	Procedure in 8086 Assembly language programming	1. Compute the factorial of a positive integer 'n' using recursive procedure. 2. Generate the first 'n' Fibonacci numbers. (any one)	02	LO4 LO6
VI	Interfacing with 8086 microprocessor	3. Interfacing Seven Segment Display 4. Interfacing keyboard matrix 5. Interfacing DAC (any two)	04	LO5 LO6

Text Books:

1. Scott Mueller,"Upgrading and repairing PCs", Pearson,

2. John Uffenbeck, "8086/8088 family: Design Programming and Interfacing:"Pearson Education

Reference Books:

1. K Bhurchandi, "Advanced Microprocessors & Peripherals", Tata McGraw-Hill Education

Term Work:
Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments.
Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral Exam: An Oral exam will be held based on the above syllabus.

Course Code	Course Name	Theory	Practical	Tutorial	Theory	TW/Practical	Tutorial	Total
ITL404	Python lab	--	2+2*	--	--	02	--	02

Course Code	Course Name	Examination Scheme						
		Theory Marks				Term Work	Oral & Practical	Total
		Internal assessment			End Sem. Exam			
		Test1	Test 2	Avg. of two Tests				
ITL404	Python lab	--	--	--	--	50	50	100

*2 hours shown as practical's to be taken class wise lecture and other 2 hours to be taken as batch wise practicals in Lab.

Lab Objectives: The course will help the students to get familiar with:

1. Basics of Python programming
2. Decision Making and Functions in Python
3. Object Oriented Programming using Python
4. Files Handling in Python
5. GUI Programming and Databases operations in Python
6. Network Programming in Python

Lab Outcomes: Upon Completion of the course the learner should be able to:

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Express different Decision Making statements and Functions
3. Interpret Object oriented programming in Python
4. Understand and summarize different File handling operations
5. Explain how to design GUI Applications in Python and evaluate different database operations
6. Design and develop Client Server network applications using Python

Hardware & Software Requirements:

Hardware Requirements	Software Requirements	Other Requirements
PC With following Configuration 1. Intel PIV Processor 2. 2 GB RAM 3. 500 GB Harddisk 4. Network interface card	1. Windows or Linux Desktop OS 2. Python 3.6 or higher 3. Notepad ++ 4.Python IDEs like Pydev, Netbeans or Eclipse 5. Mysql	1. Internet Connection for installing additional packages

Prerequisite Subjects: Structured Programming Approach & Java Programming

Detailed Syllabus:

Sr. No.	Module	Detailed Content	Hours	LO Mapping
0	Prerequisite	Basic Programming syntax of Java/C. Installation and configuration of python.	02	
I	Basics of Python	**Theory**: Numbers in Python, Basic & Built-in Math functions, Number Formats, Strings, Quotes, print() Function, Assigning Values to Names & Changing Data Through Names, Copying Data, Tuples — Unchanging Sequences of Data, Lists — Changeable Sequences of Data, Dictionaries — Groupings of Data Indexed by Name, Special String Substitution Using Dictionaries , Arrays, Treating a String Like a List, Special Types, Ranges of Sequences, Working with Sets, Arrays. **Lab Experiment:** Write python programs to understand Expressions, Variables, Quotes, Basic Math operations, Strings: Basic String Operations & String Methods, List, Tuples, Dictionaries, Arrays. (Minimum Three Programs based on math operations, Strings and List/Tuples/ Dictionaries)	10	LO 1
II	Decision Making and Functions	**Theory:** If statement, if-elif-else, Repetition using while loop, for loop, break statement, Handling Errors- try: statement, except: statement, Functions-Grouping Code under a Name, defining a Function, describing a	10	LO 2

		function in the function, Checking & Setting Your Parameters, Calling Functions from within Other Functions, Functions Inside of Functions, Layers of Functions **Lab Experiment:** Write python programs to understand different decision making statements and Functions. (Minimum Three Programs based on Decision making, Looping Statements and Functions)		
III	Object Oriented Programming using Python programming	**Theory:** Creating a Class, Self Variables, Constructors, Types of Methods, Inner Classes, Constructors in Inheritance, Polymorphism,, The super() Method, Method Resolution Order (MRO), Operator Overloading, Method Overloading & Overriding, Interfaces in Python. Exceptions Handling: Errors in a Python Program, Exceptions, Exception Handling, Types of Exceptions, The Except Block, The assert Statement. Modules and Packages: Creating Modules and Packages, Documenting & Viewing Module, Basics of Testing Your Modules and Packages, Importing & exporting Modules. **Lab Experiment:** Write python programs to understand different Object oriented features in Python (Minimum four programs based on a) Classes & objects,	10	LO 3

		b) Constructors, c) Inheritance & Polymorphism, d) Exception handling		
IV	Files Handling	**Theory:** Types of Files in Python, Opening a File, Closing a File. Writing Text Files, Knowing Whether a File Exists or Not, Working with Binary Files, Appending Text to a File, Reading Text Files, File Exceptions, The with Statement Pickle in Python, Lambda and Filter, Map & range functions. **Lab Experiment:** Write python programs to understand different File handling operations	07	LO 4
V	GUI Programming and Databases	**Theory:** GUI Programming - Writing a GUI with Python: GUI Programming Toolkits, Creating GUI Widgets with Tkinter, Creating Layouts, Radio Buttons and Checkboxes, Dialog Boxes. Database Access - Python's Database Connectivity, Types of Databases Used with Python, Mysql database Connectivity with Python, Performing Insert, Deleting & Update operations on database **Lab Experiment:** Write python programs to understand GUI designing and database operations (Minimum Three programs based on GUI designing using Tkinter, Mysql database creation & Database connectivity with DML	07	LO 5

		operations using python		
VI	Web Programming	**Theory:** Understanding Protocols, Introduction to Sockets, TCP/IP Server, TCP/IP Client, UDP Server, UDP Client, File Server, File Client, Two-Way Communication between Server and Client, Multithreaded Client-Server Chat Application **Lab Experiment:** Write python programs to understand TCP and UDP Sockets in Python (Minimum One programs based on TCP or UDP Sockets)	06	LO 6

Text Books:

1. James Payne, "Beginning Python: Using Python 2.6 and Python 3.1",Wrox Publication
2. Dr. R. Nageswara Rao,"Core Python Programming" , Dreamtech Press, Wiley Publication.
3. Magnus Lie Hetland,"Beginning Python From Novice to Professional", Second Edition", Apress Publication.

Reference Books:

1. Wesley J Chun," Core Python Applications Programming",Third Edition, Pearson Publication.
2. E. Balguruswamy," Introduction to Computing and Problem Solving using Python", McGraw Hill Publication
3. Learn to Master Python, from Star EDU solutions , by ScriptDemics

Term Work:
Term Work shall consist of at least 12 to 15 practical's based on the above list. Also Term work Journal must include at least 2 assignments.
Term Work Marks: 50 Marks (Total marks) = 40 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral & Practical Exam: An Oral & Practical exam will be held based on the above syllabus.