<u>UNIVERSITYOFMUMBAI</u>

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)

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 $L\{f(at)\}$, $L\{t^n f(t)\}$, $L\left\{\dfrac{f(t)}{t}\right\}$, $L\left\{\dfrac{d^n f(t)}{dt^n}\right\}$, $L\left\{\int_0^t f(u)\,du\right\}$ (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**
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- 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

		Data structures : Linear and non linear data structures		CO2
	Introduction to Data structures and Analysis	Arrays, Stacks, Queue, Linked list and Tree, Graph, Recursion, ADT (Abstract Data type).		CO3
				CO6
		Introduction to Analysis, Algorithms, characteristics of an algorithms, Time and Space complexities, Order of growth functions, Asymptotic notations		
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**
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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**
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- **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		LO 5
	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.		

		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.