Semester III

SY B. Tech. Information Technology

(KJSCE SVU 2020)

Course Code	Course Title			
116U04C301	**Discrete and Applied Mathematics**			
	TH	**P**	**TUT***	**Total**
Teaching Scheme(Hrs.)	**3**	**-**	**1**	**4**
Credits Assigned	**3**	**-**	**1**	**4**

Examination Scheme	Marks						
	CA		**ESE**	**TW**	**O**	**P&O**	**Total**
	ISE	**IA**					
	30	**20**	**50**	**25**	**--**	**--**	**125**

* Batch wise Tutorial

Course prerequisites: Applied Mathematics-I, Applied Mathematics –II

Course Objectives:
The objective of this course is to introduce different methods of finding Laplace Transform and Inverse Laplace transform of given function. The course also familiarizes students with the concepts of Relations, functions and different discrete structures. It will familiarize the students with different concepts of graph.

Course Outcomes
At the end of successful completion of the course the student will be able to
   CO1. Apply Different methods to find Laplace Transform and Inverse Laplace Transform of
       a function
   CO2. Find Fourier series, Fourier Integral and Fourier Transform of functions.
   CO3. Apply Relations, Functions and different discrete structures to solve Engineering
        problems.
   CO4. Apply various concepts of Graph theory to solve Engineering problems.

Module No.	Unit No.	Details	Hrs.	CO
1		**Laplace Transform**	12	CO1
	1.1	Definition of Laplace Transform, Laplace Transform of sin(at), cos(at),sinh(at), cosh(at), erf(t), Heavi-side unit step, dirac-delta function, Laplace Transform of periodic function		
	1.2	Properties of Laplace Transform (without proof): Linearity, first shifting theorem, second shifting theorem, multiplication by t , division by t, Laplace Transform of derivatives and integrals, change of scale.		
	1.3	Inverse Laplace Transform: Partial fraction method, convolution theorem, Application of Laplace Transform: Solution of ordinary differential equations		
2		**Fourier Series**	12	CO2
	2.1	Introduction: Definition, Dirichlet's conditions, Euler's formulae		
	2.2	Fourier Series of Functions: Exponential, trigonometric functions, even and odd functions, half range sine and cosine series .		
	2.3	Complex form of Fourier series.		
3		**Relations and Functions**	9	CO3
	3.1	Pigeon hole principle		
	3.2	Relations: Definition, Types of relations, Equivalence relations, Partial ordering relations		
	3.3	Functions: Definition, Types of functions: Injective, Surjective, Bijective, Invertible function, Composite function .		
4		**Algebraic Structure**	6	CO3
	4.1	Operations, Semi-groups, Groups, Rings, Integral Domains and Fields .		
	4.2	Isomorphism and Homomorphism of groups .		
5		**Graph Theory**	8	CO4
	5.1	Introduction to graphs, graph terminology, representing graphs and graph isomorphism, connectivity.		
	5.2	Euler and Hamilton paths .		
	5.3	Introduction to Planar graphs .		
	5.4	Introduction to trees, Isomorphism of trees, Prefix code , application of trees to coding and decoding of a message		
		Total	45	

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	B. S. Grewal	*Higher Engineering Mathematics*	Khanna Publications, India	43rd Edition 2014
2.	Erwin Kreyszig	*Advanced Engineering Mathematics*	Wiley Eastern Limited, India	10th Edition 2015
3.	N.P. Bali and Manish Goyal	*A Textbook of Engineering Mathematics*	Laxmi Publications LTD, India	9th Edition 2016
4.	P. N. Wartikar and J. N. Wartikar	*A text book of Applied Mathematics Vol I & II*	Pune VidyarthiGruha , India	6th Edition 2012

Term-Work will consist of Tutorials covering entire syllabus of "Discrete and Applied Mathematics" (116U04C301). Students will be graded based on continuous assessment of their term work. At least 2 tutorials will be conducted with the help of Mathematical and Statistical software in the Laboratory.

Course Code	Course Title						
116U04C302	**Data Structures**$^{\$}$						
	TH			**P**		**TUT**	**Total**
Teaching Scheme(Hrs.)	3			-		-	3
Credits Assigned	3			-		-	3
Examination Scheme	**Marks**						
	CA		**ESE**	**TW**	**O**	**P&O**	**Total**
	ISE	**IA**					
	30	20	50		--	--	100

$ Course Common with Computer Engineering

Course prerequisites: Programming Language

Course Objectives:

The objective of this course is to introduce different types of data structure and how user can use data structure in software development. The course also familiarizes students with the concepts of advanced data structures such as balanced search trees, hash tables, priority queues, sorting and searching. Students will be master in the implementation of linked data structures such as linked lists and binary trees using any preferable language. Course mainly focuses on choosing the appropriate data structure for a specified application.

Course Outcomes

At the end of successful completion of the course the student will be able to

CO1. Explain the different data structures used in problem solving.

CO2. Apply linear and non-linear data structure in application development..

CO3: Describe concepts of advance data structures like set, map & dictionary.

CO4. Demonstrate sorting and searching methods.

Module No.	Unit No.	Details	Hrs.	CO
1		**Introduction to Data Structures**	**04**	**CO1**
	1.1	Defining Data structure, Types of Data Structures, Abstract Data Type (ADT), Static and Dynamic Implementations		
	1.2	Applications of data structures.		
2		**Linear data structures : Linked List, Stack and Queue**	**16**	**CO2**
	2.1	Introduction and Representation of Linked List, Linked List v/s Array, Implementation of Linked List, Circular Linked List, Doubly Linked List, Application – Polynomial Representation and Addition, Other additional applications/Case study.		
		#Self-learning - Sparse matrix addition		
	2.2	The Stack as an ADT, Stack operations, Array Representation of Stack, Linked Representation of Stack, Application of stack – Polish Notation, Recursion and other applications/Case study.		
		#Self-learning - Application of stack in evaluation of postfix and prefix expression.		
	2.3	The Queue as an ADT, Queue operation, Array Representation of Queue, Linked Representation of Queue, Circular Queue, Priority Queue, and Double ended queue, Application of Queues – Simulation and other applications/Case study.		
		#Self-learning - Application of queue in Josephus's Problem.		
3		**Non-linear data structures: Tree and Graph**	**10**	**CO2**
	3.1	Basic tree terminologies, Types of trees, Binary tree representation, Binary tree operation, Binary tree traversal, Binary search tree implementation, Threaded binary trees. Different Search Trees -AVL tree, Multiway Search Tree, B Tree, B+ Tree, and Trie, Applications/Case study of trees.		
		#Self-learning Learning – Red-Black and Splay Trees.		
	3.2	Introduction to graph as a data structure, Terminologies, Representation, Traversals – Depth First Search (DFS) and Breadth First Search (BFS). Applications/Case study of Graphs.		
4		**Set, Map and Dictionary**	**7**	**CO3**
	4.1	Set ADT, Set Implementation, and Partitions with Union-Find operations, Tree based partition implementation.		
	4.2	Map ADT, Implementation, Hash Tables Application of Maps		

	4.3	Dictionary ADT, Implementation, Application of Dictionaries		
		#Self-earning - Exploring case studies on use of set, map and dictionary		
5		**Searching and Sorting**	**8**	**CO 4**
	5.1	Sort Concept, Sort Stability , Bubble Sort, Insertion Sort, Counting Sort		
		#Self-learning - Bucket and Radix sort		
	5.2	Search concept, Linear Search, Binary Search, Hashed List Search, Comparison of searching Techniques		
		Total	**45**	

 # Self-learning topics may be evaluated through IA and/or Lab.

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed	*Fundamentals Of Data Structures In C*	University Press	Second Edition 2008
2.	Michael T Goodrich Roberto Tamassia David Mount	*Data Structure and Algorithm in C++*	Wiley	Second Edition 2011
3.	Richard F. Gilberg & Behrouz A. Forouzan	*Data Structures A Pseudocode Approach with C*	CENGAGE Learning	Second Edition 2005
4.	Aaron M Tanenbaum Yedidyah Langsam Moshe J Augentstein	*Data structure Using C*	Pearson	Twelfth Impression 2013
5.	Jean Paul Tremblay, Paul G. Sorenson	*An introduction to data structures with applications*	Tata McGraw-Hill Education	Second Edition 1984

Course Code	Course Title			
116U04C303	**Database Management Systems**			
	TH	**P**	**TUT**	**Total**
Teaching Scheme(Hrs.)	**3**	-	-	**3**
Credits Assigned	**3**	-	-	**3**

Examination Scheme	Marks						
	CA		**ESE**	**TW**	**O**	**P&O**	**Total**
	ISE	**IA**					
	30	**20**	**50**	**--**	**--**	**--**	**100**

Course prerequisites: Nil

Course Objectives:

This course is imparting knowledge of database management system and its use in enterprise business. It enables students to perform entity-relationship modeling and relational database design Student will learn and use Structured Query Language (SQL). It gives knowledge of applying normalization techniques to the database. Along with it, students are also introduced to the concept of transactions and query processing.

Course Outcomes

At the end of successful completion of the course the student will be able to

CO1. Realize the features of Relational database management systems.
CO2. Apply data models to real world scenario.
CO3. Illustrate the concept of security, Query processing, indexing and Normalization for Relational database.
CO4. Apply the concept of transaction, concurrency control and recovery techniques

Module No.	Unit No.	Details	Hrs.	CO
1		**Database concepts and Systems**	**6**	**CO1**
	1.1	Introduction, Purpose of Database Systems, DBMS system architecture , Data Models, Data independence		
	1.2	Database languages, Database Users and Administrator		
	1.3	Different types of Database Systems		
2		● **Database Models and SQL**	**9**	**CO2**
	2.1	Database design phases, E-R Model		
	2.2	Constraints, E-R Diagrams, E-R design issues		
	2.3	Entity set, Extended E-R features		
	2.4	Relational model concepts, Constraints		
	2.5	Relational Algebra, Unary, Binary and Set theory relational operations		
	2.6	Data definition commands, attribute constraints, SET operations, Aggregate functions, Null Values, Nested sub queries, complex queries, Views Data control commands		
	2.7	Data manipulation commands, Insert, Update, Joined relations		
	2.8	Integrity and security, Domain constraints, Referential integrity, Triggers; Security and Authorization in SQL		
3		**Relational Database Design**	**10**	**CO3**
	3.1	Design guidelines for relational schemas, Functional dependencies		
	3.2	First Normal form, Second Normal form, Third normal form.		
	3.3	Decomposition using functional dependencies, Boyce Codd normal form; decomposition using multivalued dependencies, fourth normal form.		
	3.4	● The database design and implementation process		
4		● **Indexing, Hashing , Query processing and Optimization**	**10**	**CO3**
	4.1	Basic concepts, ordered indices: dense and sparse, multilevel indices, secondary indices		
	4.2	Hashing: Static hashing, dynamic hashing, comparison of ordered indexing and hashing		
	4.3	Query processing: Steps involved in query processing, measures of query cost, algorithms for SELECT and PROJECT operations.		

	4.4	Query Optimization: Overview, Transformation of relational expressions, Estimating statistics, Choice of evaluation plan		
5	● **Transactions, Concurrency control and Recovery system**		**10**	**CO4**
	5.1	Transaction Concepts, Transaction state, ACID properties, concurrent executions, Serializability, Recoverability.		
	5.2	Concurrency control, Lock based , Timestamp based, validation based protocol, Deadlock Handling		
	5.3	Recovery System, Failure classification, Recovery and Atomicity, Log based recovery, Shadow paging		
		Total	**45**	

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Elmasri and Navathe	*Fundamentals of Database Systems*	Pearson Education	7th Edition 2015
2.	Korth, Slberchatz,Sudarshan	*Database System Concepts*	McGraw – Hill	6th Edition 2010
3.	Raghu Ramakrishnan and Johannes Gehrke	*Database Management Systems*	McGraw Hill	3rd Edition 2002
4.	Paulraj Ponniah,	*Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals*	Wiley India	2nd Edition 2009
5.	McCreary, D., and Kelly	*Making sense of No SQL*	Manning Press	2014

● Instructor needs to provide additional resources to students for in-depth understanding and practical applicability of the indicated topic/topics.

Course Code	Course Title			
116U04C304	**Digital Systems**			
	TH	**P**	**TUT**	**Total**
Teaching Scheme(Hrs.)	**3**	**-**	**-**	**3**
Credits Assigned	**3**	**-**	**-**	**3**

Examination Scheme	Marks						
	CA		**ESE**	**TW**	**O**	**P&O**	**Total**
	ISE	**IA**					
	30	**20**	**50**		**--**	**--**	**100**

Course prerequisites: Nil

Course Objectives:

This course lays the foundation for understanding the basics of digital
Logic Design as well as Computer Organization and Architecture.

Course Outcomes

At the end of successful completion of the course the student will be able to

    CO 1. Solve problems on various number systems, Boolean algebra and
           graphical techniques.

    CO 2. Understand the basic building blocks, techniques used in digital logic design.

    CO 3. Design the combinational and sequential circuits using basic building blocks.

    CO 4. Understand the basic concepts of memory elements.

    CO 5. Understand the fundamental concepts of microprocessors.

Module No.	Unit No.	Details	Hrs.	CO
1		**Number Systems, Codes, Logic gates and Simplification Techniques**	13	CO1
	1.1	Introduction to digital Systems, Number systems-Binary, octal, and hexa-decimal number systems, Codes-Binary code, BCD code, excess-3 code, gray code, ASCII code		
	1.2	Binary Arithmetic, Binary Addition and Subtraction (1's and 2's complement method)		
	1.3	Basic Digital Circuits: NOT, AND, OR, NAND, NOR, EXOR, EX-NOR		
	1.4	Theorems and Properties of Boolean Algebra, Standard SOP and POS form. Simplification of expressions, K-map method (2,3,4), NAND-NOR Realization.		
2		**Combinational Logic Design**	09	CO2
	2.1	Introduction to combinational logic design, Half and Full Adder, Half and Full Subtractor, Ripple carry Adder, Magnitude comparator		
	2.2	Multiplexers and De-multiplexers/Decoder, Binary Encoder, Priority Encoder, Code Conversion.		
	2.3	Design of combinational logic systems using Logic gates , Multiplexer, Demultiplexer, Encoder and Decoder		
3		**Sequential Logic Design**	10	CO3
	3.1	Flip Flops: SR, D, JK, JK Master Slave and T Flip Flop, Truth Tables and Excitation Tables, Flip-flop conversion		
	3.2	Counters: Design of Asynchronous and Synchronous Counters, Modulo Counters, Up- Down counter.		
	3.3	Shift Registers: Bidirectional Shift Register, Ring and Johnson Counter.		
4		**Functional Units of Digital Systems**	07	CO4
	4.1	Von Neumann architecture, Functional units of Computer, Basic Instruction Cycle, Interrupts		
	4.2	Memory sub-system-Typical architecture of RAM and ROM, SRAM and DRAM – architecture and comparison, Memory hierarchy		

5	**Introduction to Microprocessors**		06	CO5
	5.1	Introduction to Functional Block diagram of microprocessor 8086		
	5.2	MOV Instruction Formats, Addressing modes of microprocessor 8086		
	5.3	Segmented memory and interleaved memory architecture in 8086		
		Total	45	

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1	R. P. Jain	*Modern Digital Electronics*	Tata McGraw Hill	4th Edition, 2009
2	Donald P Leach, Albert Paul Malvino	*Digital principles and Applications*	Tata McGraw Hill	8 th Edition, 2014
3	William Stallings	*Computer Organization and Architecture*	Pearson Education India	10th Edition, 2016
4	D. V. Hall,	*Microprocessor and Interfacing Programming Hardware*	Tata McGraw Hill	2nd Edition, 2006
5	Shibu K. V.	*Introduction to embedded Systems*	McGraw Hill Education India Private Limited	2nd edition, July 2017

Course Code	Course Title			
116U04C305	**Data Communication and Networking**			
	TH	**P**	**TUT**	**Total**
Teaching Scheme(Hrs.)	**3**	**-**	**-**	**3**
Credits Assigned	**3**	**-**	**-**	**3**

Examination Scheme	Marks						
	CA		**ESE**	**TW**	**O**	**P&O**	**Total**
	ISE	**IA**					
	30	**20**	**50**		**--**	**--**	**100**

Course prerequisites: Fundamentals of Computer Programming

Course Objectives:

This course provides an understanding of the concepts and mechanisms underlying the telecommunications and networking. Starting with the basics of data communication and types of networks, it introduces the transmission media. It also explains how two public networks, telephones and cable TV can be used for data transfer. A thorough background of the ISO- OSI model and the TCP/IP model will be given. The Application layer, Transport layer, Internet layer, Data link layer and Physical layers are covered in detail along with the protocols used. Top-down approach is used for this course will give students a better perception in terms of both usefulness and ease of understanding.

Course Outcomes

At the end of successful completion of the course the student will be able to

- CO1 . Understand the data communication systems, network topologies and network devices
- CO2. Enumerate the layers of the OSI model and TCP/IP model, their functions and Protocols.
- CO3. Build the skills of sub-netting and routing mechanisms.
- CO4. Execute their knowledge of computer communication principles, including Error detection and correction, multiplexing, flow control, and error control.

Module No.	Unit No.	Details	Hrs.	CO
1		**Introduction**	**05**	**CO1**
	1.1	Data Communications, Networks, The Internet , Protocols and Standards, Uses of Computer networks		
	1.2	Network Models: Layered tasks ,The OSI Model, Layers in the OSI Model, TCP/IP Protocol Suite		
2		**The Application Layer**	**09**	**CO2**
	2.1	Providing services, Application layer paradigms: Client Server and Peer to Peer paradigm. Client Server paradigm: Application programming Interface, Using services of the Transport layer. Peer to Peer Paradigm: P2P networks, Protocols, A popular P2P Network (BitTorrent).		
	2.2	Standard client server applications: Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Remote Logging(Telnet),Email(SMTP,MIME,POP3),File Transfer(FTP) and SNMP		
3		**The Transport Layer**	**07**	**CO2**
	3.1	The Transport Layer Services, Protocols: UDP, TCP		
	3.2	User datagram protocols: User datagram, services and UDP application		
	3.3	TCP features and services, Flow control, Error Control, Congestion Control, TCP segment, TCP Connection Establishment, Data transfer , TCP Connection Release		
4		●**The Network Layer**	**08**	**CO 3**
	4.1	Network Layer Design Issues, IP Addressing, Sub-netting		
	4.2	The Network Layer In The Internet: The IP Protocol, IPv4 header, IPv6 header, Routing Algorithms, Congestion Control Algorithms, Quality Of Service		
		# Self learning: Internet Control protocols, Routing protocols (Intra-domain-RIP,OSPF and Inter-domain-BGP)		
5		**The Data Dink Layer & Physical layer (Host layer)**	**16**	**CO4**
	5.1	Error detection and correction: Types of errors, redundancy, detection versus correction, forward error correction versus retransmission, Error detection, Error		

		correction, Hamming Code ,CRC, Checksum		
	5.2	Data Link Control: Framing, Fixed size and variable size framing; Flow and Error control, Protocols for Noiseless and Noisy Channels, Piggybacking, HDLC, PPP. Multiple Access: Random Access, Controlled Access, Channelization.		
	5.3	Data and Signals: Analog and Digital Signals, Transmission impairments, Data Rate Limits, Performance. Digital transmission: Digital –to-Digital Conversion, Analog –to-Digital Conversion.Analog transmission: Digital –to-Analog Conversion, Analog –to-Analog Conversion.		
	5.4	Transmission Media: Guided Media, Unguided Media, Switching and Multiplexing.		
		Total	**45**	

 # Self-learning topics may be evaluated through IA and/or Lab.

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	B. A. Forouzan and Firouz Mosharraf	*Computer Networks A Top down Approach*	Tata McGraw Hill,India	1st Edition, 2011
2.	James F. Kurose and Keith W. Ross	*Computer Networking: A top down approach*	Pearson, India	5th Edition, 2012
3.	A. S. Tanenbaum	*Computer Networks*	Prentice Hall, India	5th Edition, 2014
4.	B. F. Ferouzan	*TCP/IP Protocol Suite*	Tata McGraw Hill,India	4th Edition,2010
5.	Williams Stallings	*Data & Computer Communications*	Pearson	9th Edition, 2017

● Instructor needs to provide additional resources to students for in-depth understanding and practical applicability of the indicated topic/topics.

Course Code	Course Title			
116U04L301	**Programming Laboratory-I** @			
	TH	**P**	**TUT**	**Total**
Teaching Scheme(Hrs.)	--	**2**	**1**	**3**
Credits Assigned	--	**1**	**1**	**2**
Examination Scheme	**Marks**						

	CA		ESE	TW	O	P&O	Total
	ISE	**IA**					
	--	--	--	**50**	--	**25**	**75**

@Java Programming

Course prerequisites: Knowledge of Object Oriented Programming language(116U06L108)

Course Objectives:

The objective of the course is to impart knowledge of Java Programming language. The course introduces the implementation of Object Oriented Methodology concepts to solve problem using Java Programming. Further the course also covers concepts of Packages, Multithreading, Collection classes, GUI programming with JDBC and Functional Programming in java

Course Outcomes

At the end of successful completion of the course the student will be able to

   CO1. Apply fundamental Object Oriented Methodology concepts using java programming.
   CO2. Apply String manipulation functions ,inheritance and polymorphism using Java
          programming.
   CO3. Demonstrate the concept of packages, multithreading and exception handling in java.
   CO4. Illustrate the use of collection classes ,functional programming and GUI
          programming with java.

Module No.	Unit No.	Details	Hrs.	CO
0		**Introduction to Test Case Driven Development**	**01**	
	0.1	Testing a code, Manual and Automated Testing, Basic structure of Test Case, Writing Test Cases		
1		**Classes, Objects and Arrays**	**03**	**CO1**
	1.1	Features of Java programming Language, JDK and JVM , Classes Object , Method, Member, Dot Operator, Command Line Argument, Input using Scanner Class		
	1.2	Constructor, Constructor Overloading, Garbage Collection		
	1.3	1D Array, 2D Array, Jagged Array, Array of Objects		
2		**String Handling and Inheritance**	**03**	**CO2**
	2.1	String Class and Methods, String Buffer Class and Methods		
	2.2	Types of Inheritance, Polymorphism – method overloading, method overriding		
	2.3	Final class and method, Abstract class, Interface		
3		**Exception Handling, Packages and Multithreading in Java**	**03**	**CO3**
	3.1	Types of Exception, try-catch-finally, throw, throws Input using BufferedReader Class		
	3.2	User Defined Exception		
	3.3	Creating and Using User Defined Package		
	3.4	Introduction to Multithreading, Thread Life Cycle, Creating Threads using Runnable Interface and Thread Class		
4		**Collection Classes and Functional Programming**	**03**	**CO4**
	4.1	Collection classes- ArrayList, HaspMap, HashTable		
	4.2	Introduction to functional programming, lambda expressions, method references, predefined functional interfaces, Streams API		
5		**GUI Programming with Java**	**02**	**CO4**
	5.1	Introduction to GUI Programming		
	5.2	Introduction to JDBC,CRUD operation in JDBC		
		#Self Learning : Classes of swing package		
		Total	**15**	

Module 0 is to introduce the concepts of software testing in the syllabus. It will have no weightage in End-semester examination. It may be evaluated through IA and/or Lab.
 # Self-learning topics may be evaluated through IA and/or Lab.

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Herbert Schildt	*Java: The Complete Reference*	Tata McGraw-Hill Publishing Company Limited	Tenth Edition, 2017
2.	Sachin Malhotra, Saurab Choudhary	*Programming in Java*	Oxford University Press	Second Edition, 2018
3.	D.T. Editorial Services	*Java 8 Programming Black Book*	Dream tech Press	Edition 2015

- **Term-Work will consist of Tutorials and laboratory work covering entire syllabus of Programming Laboratory-I" (116U04L301) with Java Programming. Students will be graded based on continuous assessment of their term work.**
- **Practical and Oral examination will be based on tutorial work, laboratory work and entire syllabus of Programming Laboratory-I" (116U04L301) with Java Programming.**

Course Code	Course Title			
116U04L301	**Programming Laboratory-I**@			
	TH	**P**	**TUT**	**Total**
Teaching Scheme(Hrs.)	--	**02**	**01**	**3**
Credits Assigned	--	**01**	**01**	**2**

Examination Scheme	Marks						
	CA		**ESE**	**TW**	**O**	**P&O**	**Total**
	ISE	**IA**					
	--	--	--	**50**	--	**25**	**75**

@Python Plus

Course prerequisites: Basics of Python Programming

Course Objectives:

The objective of this laboratory course is to impart knowledge of testing python applications, multithreading, scientific and mathematical computing, database handling, GUI design and networking based applications using various python libraries.

Course Outcomes

At the end of successful completion of the course the student will be able to

      CO1. Understanding the usage of multithreading.

      CO2. Inculcate the knowledge of python libraries like numpy, pandas, matplotlib for scientific- computing and data visualization.

      CO3. Designing a graphical interface for python applications

      CO4. Demonstrate handling database with python and to understand network programming with Python scapy.

Module No.	Unit No.	Details	Hrs.	CO
0		**Introduction to Unit Testing**	01	
	0.1	Testing a python code, Automated vs Manual Testing, Unit Testing vs Integration Testing, Test case writing, Basic Test structure, Test Runners, Writing Assertions		
1		**Multithreading in Python**	02	CO1
	1.1	Multithreading in Python, Process vs Thread, Lifecycle of a Thread, Thread Class, Methods of thread object		
		# Self Learning: Thread Synchronization, Locking Mechanism, Semaphore		
2		**Introduction to Numpy for data computing**	02	CO2
	2.1	Introduction to modules, Packages and Exploratory Data Analysis, Reading different data formats in Python		
	2.2	Numpy in Python for data computing, array creation, array attributes, array manipulation methods, Shaping and transposition, mathematical operations, indexing and slicing, broadcasting		
		# Self Learning: Data reading and cleansing using numpy		
3		**Scientific computing using Pandas and visualization using Matplotlib**	04	CO2
	3.1	Pandas for data computing, series and data frames, Data reading using Pandas		
	3.2	Analyzing dataset with Pandas, statistical functions		
	3.3	Use of Matplotlib for data Visualization, Bar graphs, Pie charts, area plots, pivot table, scatter plots, histograms, sub plot function, boxplot		
4		**GUI design using Tkinter**	02	CO3
	4.1	Introduction to Tkinter, Labels, widget, Buttons, check box, sliders, Layout management, Event Creation		
		# Self Learning: Python Date and Time		
5		**Database connectivity and Networking in Python**	04	CO4
	5.1	SQL Relational Databases Connection: Exception handling, Cursor, Row Objects, CRUD operations accomplishment using python, Transactions and Rollbacks		
	5.2	Introduction to Socket Programming, Scapy for Network Analysis		
		# Self Learning: Python network scanner, Telnet connection using python		

	Total	**15**	

Module 0 is to introduce the concepts of software testing in the syllabus. It will have no weightage in End-semester examination. It may be evaluated through IA and/or Lab.
 # Self-learning topics may be evaluated through IA and/or Lab.

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	Daniel Arbuckle	*Learning Python Testing*	Packt Publishing	1st Edition, 2014
2.	Wesly J Chun	*Core Python Applications Programming*	Pearson Publications	3rd Edition, 2015
3.	Wes McKinney	*Python for Data Analysis*	O'Reilly	1st edition, 2017
4.	Albert Lukaszewsk	*MySQL for Python*	Packt Publishing	1st Edition, 2010
5.	Eric Chou	*Mastering Python Networking*	Packt Publishing	2nd edition, 2017

- **Term-Work will consist of Tutorials and laboratory work covering entire syllabus of Programming Laboratory-I" (116U04L301) with Python Programming. Students will be graded based on continuous assessment of their term work.**
- **Practical and Oral examination will be based on tutorial work, laboratory work and entire syllabus of Programming Laboratory-I" (116U04L301) with Python Programming.**

Course Code	Course Title			
116U04L301	**Programming Laboratory I@**			
	TH	**P**	**TUT**	**Total**
Teaching Scheme(Hrs.)	**0**	**2**	**1**	**3**
Credits Assigned	**0**	**1**	**1**	**2**

Examination Scheme	Marks						
	CA		**ESE**	**TW**	**O**	**P&O**	**Total**
	ISE	**IA**					
	-	**-**	**-**	**50**	**--**	**25**	**75**

@ C++ Programming

Course prerequisites: Programming in C

Course Objectives:

The major objective of the course is to introduce fundamental concept of Object Oriented Programming (OOP) using C++. Students will be able to develop the skills with the comprehensive capabilities that are required for the efficient programming. Develop applications for a range of problems using object-oriented programming techniques.

Course Outcomes

At the end of successful completion of the course the student will be able to

  CO1. Inculcate fundamental concepts of Object Oriented Programming.
  CO2. Implement the principles of Data Abstraction Inheritance & Polymorphism.
  CO3. Understand the concepts of streams and templates.
  CO4. Implement exception handling and test driven development using C++.

Module No.	Unit No.	Details	Hrs.	CO
0		**Introduction to Test Case Driven Development**	**01**	
	0.1	Testing a code, Manual and Automated Testing, Basic structure of Test Case, Writing Test Cases		
1		●**Introduction C++ fundamentals**	**02**	**CO1**
	1.1	C Vs. C++, C++ Basics: I/O in C++, Object-Oriented Thinking: Different paradigms for problem solving, need for OOP paradigm, differences between OOP and Procedure oriented programming, Overview of OOP concepts Abstraction, Encapsulation, Inheritance and Polymorphism.		
	1.2	Pointers, Dynamic memory allocation and de-allocation using calloc, malloc and realloc and free, Pointers and functions		
2		●**Classes, Data Abstraction & Operator Overloading**	**03**	**CO2**
	2.1	Introduction, Class Scope and accessing Class Members, Separating Interface from Implementation, Controlling Access Function And Utility Functions		
	2.2	Initializing Class Objects: Constructors, Using Default Arguments With Constructors, Using Destructors, Classes : Const(Constant) Object And Const Member Functions, Object as Member of Classes, Friend Function and Friend Classes, Using This Pointer, Dynamic Memory Allocation with New and Delete, Pointers to objects, Static Class Members, Container Classes And Integrators, Proxy Classes, Function overloading.		
	2.3	Fundamentals of Operator Overloading, Restrictions On Operators Overloading, Operator Functions as Class Members vs. as Friend Functions, Overloading, <<, >> Overloading Unary Operators, Overloading Binary Operators.		
3		●**Inheritance, Virtual Functions and Polymorphism**	**03**	**CO2**
	3.1	Introduction to Inheritance, Base Classes And Derived Classes, Protected Members, Casting Base- Class Pointers to Derived- Class, Using Member Functions, Overriding Base – Class Members in a Derived Class, Public, Protected		

		and Private Inheritance, Using Constructors and Destructors in derived Classes, Implicit Derived –Class Object To Base-Class Object Conversion, Composition Vs. Inheritance.		
	3.2	Introduction to Virtual Functions, Abstract Base Classes And Concrete Classes, Polymorphism, New Classes And Dynamic Binding, Virtual Destructors, Pointers to virtual functions		
4	●**I/O Streams, files and Templates**		**03**	**CO3**
	4.1	Concept of streams, cin and cout objects, C++ stream classes, Unformatted and formatted I/O, manipulators, File stream, C++ File stream classes, File management functions,		
	4.2	Templates, Exceptions and STL : What is template? function templates and class templates, Overview and use of Standard Template Library,		
5	●**Exception Handling and Test Driven Development**		**03**	**CO4**
	5.1	Introduction, Basics of C++ Exception Handling: Try Throw, Catch, Throwing an Exception, Catching an Exception, Rethrowing an Exception, Exception specifications, Processing Unexpected Exceptions, Stack Unwinding, Constructors, Destructors and Exception Handling, Exceptions and Inheritance.		
	5.2	Test Driven Development using C++		
		Total	**15**	

Module 0 is to introduce the concepts of software testing in the syllabus. It will have no weightage in End-semester examination. It may be evaluated through IA and/or Lab.

 # Self-learning topics may be evaluated through IA and/or Lab.

● Instructor needs to provide additional resources to students for in-depth understanding and practical applicability of the indicated topic/topics.

Recommended Books:

Sr. No.	Name/s of Author/s	Title of Book	Name of Publisher with country	Edition and Year of Publication
1.	B. Stroutstrup	*The C++ Programming Language*	Pearson Education India	3rd Edition 1 January 2002
2.	E Balagurusamy	*Object oriented Programming with C++*	Tata McGraw-Hill	8th Edition 24 September 2020
3.	Robert Lafore	*Object Oriented Programming C++*	Pearson Education India	4th edition 1 January 2008
4.	Herbert Schildt	*C++: The Complete Reference*	McGraw Hill Education	4th edition 1 July 2017
5.	Jeff Langr	*Modern C++ Programming with Test-Driven Development : Code Better, Sleep Better*	O'Reilly	1st edition 5th November 2013

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- **Practical and Oral examination will be based on tutorial work, laboratory work and entire syllabus of Programming Laboratory-I" (116U04 L301) with C++ Programming**

Course Code	Course Title			
116U04L302	**Data Structures Laboratory**			
	TH	**P**	**TUT**	**Total**
Teaching Scheme(Hrs.)	-	**2**	-	**2**
Credits Assigned	-	**1**	-	**1**

	Marks						
	CA		ESE	TW	O	P&O	Total
Examination Scheme	ISE	IA					
	-	-	-	**25**	-	**25**	**50**

- **Term-Work will consist of practical covering entire syllabus of "Data Structures" (116U04C302). Students will be graded based on continuous assessment of their term work.**
- **Practical and Oral Examination will be based on laboratory work and entire theory syllabus of "Data Structures" (116U04C302).**

Course Code	Course Title			
116U04L303	**Database Management Systems Laboratory**			
	TH	**P**	**TUT**	**Total**
Teaching Scheme(Hrs.)	-	**2**	-	**2**
Credits Assigned	-	**1**	-	**1**

Examination Scheme	Marks					
	CA		**ESE**	**TW**	**O**	**P&O**	**Total**
	ISE	**IA**					
	-	-	-	**25**	-	**25**	**50**

- **Term-Work will consist of practical covering entire syllabus of "Database Management Systems" (116U04C303). Students will be graded based on continuous assessment of their term work.**
- **Practical and Oral Examination will be based on laboratory work and entire theory syllabus of "Database Management Systems" (116U04C303).**

Course Code	Course Title			
116U04L304	**Digital Systems Laboratory**			
	TH	**P**	**TUT**	**Total**
Teaching Scheme(Hrs.)	-	**2**	-	**2**
Credits Assigned	-	**1**	-	**1**

Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	-	-	-	**25**	**25**	-	**50**

- **Term-Work will consist of practical covering entire syllabus of "Digital Systems" (116U04C304). Students will be graded based on continuous assessment of their term work.**
- **Oral Examination will be based on laboratory work and entire theory syllabus of "Digital Systems" (116U04C304).**

Course Code	Course Title			
116U04L305	**Data Communication and Networking Lab**			
	TH	**P**	**TUT**	**Total**
Teaching Scheme(Hrs.)	-	**2**	-	**2**
Credits Assigned	-	**1**	-	**1**

Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	-	-	-	**25**	**25**	-	**50**

- **Term-Work will consist of practical covering entire syllabus of "Data Communication and Networking" (116U04C305) . Students will be graded based on continuous assessment of their term work.**
- **Oral Examination will be based on laboratory work and entire theory syllabus of "Data Communication and Networking" (116U04C305) .**