Scheme of Examination

and

Syllabus

for

Master of Computer Applications (2 Years)

Batch 2020 Onwards

SGT University, Gurgaon, Haryana

Eligibility Criteria

Candidate must have passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree & obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

OR

Candidate must have passed B.Sc./ B.Com./ B.A. with Mathematics at l0+2 Level or at Graduation Level (with additional bridge Courses as per the norms of the concerned University) & must have obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

Final Degree Award

- **MCA degree will be awarded if a student has earned a minimum of 80 credits at the end of four semesters.**
- **MCA ("Honours") degree will be awarded if a student has earned a minimum of 96 credits along with 7 CGPA at the end of four semesters.**

MCA (2020 onwards)

Sem (Duration)	Courses									L	T	P	hr/week	Credits
I (6 Months)	Problem Solving and Programming with C++(OOPS) 3-0-0(3)	Discrete Structure 3-0-0(3)	Advanced Database Management System 3-0-0(3)	OE-I 3-0-0(3)	Data Communication and Networks 3-0-0(3)	Problem Solving and Programming with C++(OOPS) Lab 0-0-4(2)	Data Communication and Networks Lab 0-0-2(1)	Personality Development and Communication Skills 0-0-2(1)	Advanced DataBase Management System Lab 0-0-2(1)	15	0	10	25	20
SWAYAM# Course-I (During 1st Semester)														According to No. of Weeks devoted
II (6 Months)	Human Value & Ethics 3-0-0(3)	Advanced Software Engineering & Testing 3-0-0(3)	Advanced Java/Basic * JAVA 3-0-0(3)	Advanced Operating System 3-0-0(3)	Data Structures & Algorithm Design 3-0-0(3)	Advanced Operating System Lab 0-0-2(1)	Advanced Java/Basic* JAVA Lab 0-0-4(2)	Advanced Software Engineering & Testing Lab 0-0-2(1)	Data Structures & Algorithm Design Lab 0-0-2(1)	15	0	10	25	20
SWAYAM# Course-II (During 2nd Semester)														According to no. of Weeks devoted
Summer Training$ (6 weeks)														6
III (6 Months)	Web Technology 3-0-0(3)	Programming in Python 3-0-0(3)	PE-I 3-0-0(3)	OE-II 3-0-0(3)	Mobile Application Development 3-0-0(3)	Web Technology Lab 0-0-2(1)	Programming in Python Lab 0-0-4(2)	PE-I Lab 0-0-2(1)	Mobile Application Development Lab 0-0-2(1)	15	0	10	25	20
SWAYAM# Course -III(During 3rd Semester)														According to no. of Weeks devoted
IV-A (3 Months)	PE-II 6-0-0(3)	Research Methodology 6-0-0(3)	PE-II Lab 0-0-8(2)	Capstone Project 0-0-8(2)						12	0	16	28	10
IV-B (3 Months)	Internship@ 0-0-0(16)									**0**	**0**	**0**	**0**	**16**

SWAYAM[#] Course -IV(During 4th Semester)														According to no. of Weeks devoted
								Total		**54**		**32**	**86**	**86(Core)+6(Summer Training)+10(Swayam Courses)**

Program Electives			
PE-I	Cloud Computing	PE-II	Application Development for Cloud Platform
	Artificial Intelligence		Machine Learning
	Data Science		Big Data & Hadoop
	IoT		Blockchain
	Cyber Security		Virtual Reality
PE-I Lab	Cloud Computing Lab	PE-II Lab	Application Development for Cloud Platform Lab
	Artificial Intelligence Lab		Machine Learning Lab
	Data Science Lab		Big Data & Hadoop Lab
	IoT Lab		Blockchain Lab
	Cyber Security Lab		Virtual Reality Lab

LIST OF OPEN ELECTIVE

13470104	Foreign Language-I	Theory	OE-1
13470105	Geoinformatics	Theory	OE-1
13470106	Natural disaster mitigation and management	Theory	OE-1
13470107	Engineering geology	Theory	OE-1
13470108	Solid waste management	Theory	OE-1
13470109	Personality and Career building	Theory	OE-1
13470308	Foreign Language-II	Theory	OE-II
13470309	Professional Communication Skills	Theory	OE-II
13470310	Supply Chain and Logistic Managements	Theory	OE-II
13470311	Hydrogen and Fuel Cells	Theory	OE-II
13470312	Signal and System	Theory	OE-II
13470313	Digital Electronics and Computer Organization	Theory	OE-II
13470314	Real Time Embedded System	Theory	OE-II
13470315	Sensors and Architecture Interfacing	Theory	OE-II
13470316	Electrical Measurements and Instrumentation	Theory	OE-II

Special Note:

PE: Program Elective

OE: Open Elective

(*): Students with Non-Computer background will be given this course.

(#): Swayam courses during Semester (I - III) are optional and will have credits according to no. of weeks i.e. 4 weeks= 1credit, 8 weeks= 2 credits and 12 weeks= 3 credits.

(#): Students need to choose a course from the list duly approved by BoS for current academic year/ semester.

(#): Credits will be considered only after successful submission of Certificate provided by the host institute of SWAYAM course.

@: Internship mentioned will be mandatory in IV-B for all students. Internship Program can be taken either in-house or outside in industry, final discretion resides with university authorities.

OE: Students can register for any one of the course from the list of Open Elective offered by various faculties at SGT University, faculties, list will be shared at start of each semester

($): Summer training after 2nd semester is optional. But it will be considered for credits if training has been started with prior approval from the department and Proper completion certificate mentioning duration of training will be submitted by students from some reputed industry of their domain.

Master of Computer Application (MCA)

Semester I

S.No	Subject Code	Subject Name	L	T	P	End Term Assessment	Internal Assessment	Total	Credit
Theory									
1	13470101	Problem Solving and Programming with C++(OOPS)	3	0	0	60	40	100	3
2	13470102	Discrete Structure	3	0	0	60	40	100	3
3	13470103	Advanced Database Management System	3	0	0	60	40	100	3
4		OE-I	3	0	0	60	40	100	3
5	13470110	Data Communication and Networks	3	0	0	60	40	100	3
Practical									
6	13470111	Problem Solving and Programming with C++(OOPS) Lab	0	0	4	40	60	100	2
7	13470112	Data Communication and Networks Lab	0	0	2	40	60	100	1
8	13470113	Personality Development and Communication Skills	0	0	2	40	60	100	1
9	13470114	Advanced DataBase Management System Lab	0	0	2	40	60	100	1
TOTAL			15	0	10	**460**	**440**	**900**	**20**

Master of Computer Application (MCA)

Semester II

S.No	Subject Code	Subject Name	L	T	P	End Term Assessment	Internal Assessment	Total	Credit
Theory									
1	13470201	Human Value & Ethics	3	0	0	60	40	100	3
2	13470202	Advanced Software Engineering & Testing	3	0	0	60	40	100	3
3	13470204/13470203	Advanced Java/Basic * JAVA	3	0	0	60	40	100	3
4	13470205	Advanced Operating System	3	0	0	60	40	100	3
5	13470206	Data Structures & Algorithm Design	3	0	0	60	40	100	3
Practial									
6	13470207	Advanced Operating System Lab	0	0	2	40	60	100	1
7	13470209/13470208	Advanced Java/Basic* JAVA Lab	0	0	4	40	60	100	2
8	13470210	Advanced Software Engineering & Testing Lab	0	0	2	40	60	100	1
9	13470211	Data Structures & Algorithm Design Lab	0	0	2	40	60	100	1
TOTAL						**460**	**440**	**900**	**20**

Master of Computer Application (MCA)

Semester III

S.No	Subject Code	Subject Name	L	T	P	End Term Assessment	Internal Assessment	Total	Credit
Theory									
1	13470301	Web Technology	3	0	0	60	40	100	3
2	13470302	Programming in Python	3	0	0	60	40	100	3
3		PE-I	3	0	0	60	40	100	3
4		OE-II	3	0	0	60	40	100	3
5	13470317	Mobile Application Development	3	0	0	60	40	100	3
Practical									
6	13470318	Web Technology Lab	0	0	2	40	60	100	1
7	13470319	Programming in Python Lab	0	0	4	40	60	100	2
8		PE-I Lab	0	0	2	40	60	100	1
9	13470325	Mobile Application Development Lab	0	0	2	40	60	100	1
TOTAL						**460**	**440**	**900**	**20**

PE-	13470303	Cloud Computing
	13470304	Artificial Intelligence
	13470305	Data Science
	13470306	IoT

I	13470307	Cyber Security
P E-I Lab	13470320	Cloud Computing Lab
	13470321	Artificial Intelligence Lab
	13470322	Data Science Lab
	13470323	IoT Lab
	13470324	Cyber Security Lab

Master of Computer Application (MCA)

Semester IV (A)

S.No	Subject Code	Subject Name	L	T	P	End Term Assessment	Internal Assessment	Total	Credit
Theory									
1		PE-II	6	0	0	60	40	100	3
2	13470406	Research Methodology	6	0	0	60	40	100	3
Theory									
3		PE-II Lab	0	0	8	40	60	100	2
4	13470412	Capstone Project	0	0	8	40	60	100	2
TOTAL						**200**	**200**	**400**	**10**

PE-II	13470401	Application Development for Cloud Platform
	13470402	Machine Learning
	13470403	Big Data & Hadoop
	13470404	Blockchain
	13470405	Virtual Reality
PE-II Lab	13470407	Application Development for Cloud Platform Lab
	13470408	Machine Learning Lab
	13470409	Big Data & Hadoop Lab
	13470410	Blockchain Lab
	13470411	Virtual Reality Lab

Master of Computer Application (MCA)

Semester IV (B)

S.No	Subject Code	Subject Name	L	T	P	End Term Assessment	Internal Assessment	Total	Credit
Practical									
1	13470413	Internship@	0	0	0	100	100	**200**	16

Semester I

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Advanced Database management System</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470103</td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Prerequisite (if any)</td><td>DBMS</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td>Tutorials = 0</td><td colspan="4">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">This module aims to give students in depth information about system implementation techniques, data storage, representing data elements, database system architecture, the system catalog, query processing and optimization, transaction processing concepts, concurrency control techniques, database recovery techniques.</td></tr>
<tr><td colspan="8">9. Learning objectives:
• To understand the basic concepts and terminology related to DBMS and Relational Database Design
• To the design and implement Distributed Databases.
• To understand advanced DBMS techniques to construct tables and write effective queries, forms, and reports</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Exposure for students to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries.</td></tr>
<tr><td colspan="8">● Know how of the file organization, Query Optimization, Transaction management, and database administration techniques</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 9</td><td colspan="5"></td></tr>
</table>

Formal review of relational database and FDs Implication, Closure, its correctness 3NF and BCNF, Decomposition and synthesis approaches,Basics of query processing, external sorting, file scans.		
Unit – 2	**Number of lectures = 9**	
Processing of joins, materialized vs. pipelined processing, query transformation rules, DB transactions, ACID properties, interleaved executions, schedules, serializability		
Unit – 3	**Number of lectures = 9**	
Correctness of interleaved execution, Locking and management of locks, 2PL, deadlocks, multiple level granularity, CC on B+ trees, Optimistic CC		
Unit – 4	**Number of lectures = 9**	
Time stamped, lock based techniques, Multiversion approaches, Comparison of CC methods, dynamic databases, Failure classification, recovery algorithm, XML and relational databases		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- R. Ramakrishnan, J. Gehrke, Database Management Systems, McGraw Hill, 2004
- A. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008.

Reference Books

- K. V. Iyer, Lecture notes available as PDF file for classroom use.

Semester I

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Advanced Database Management System Lab</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470114</td><td>0</td><td colspan="2">0</td><td colspan="2">2</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td></td><td>6. Frequency (use tick marks)</td><td>Even</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td>Tutorials = 0</td><td colspan="4">Practical = 24</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">● To explore the features of a Database Management Systems
● To interface a database with front end tools
● To understand the internals of a database system</td></tr>
<tr><td colspan="8">9. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Ability to use databases for building web applications.</td></tr>
<tr><td colspan="8">● Gaining knowledge about the internals of a database system.</td></tr>
<tr><td colspan="8">10. List of Experiments</td></tr>
</table>

11. Experiments should be Project Oriented

1. Basic SQL
2. Intermediate SQL
3. Advanced SQL
4. ER Modelling
5. Database Design and Normalization
6. Accessing Databases from Programs using JDBC
7. Building Web Applications using PHP & MySQL
8. Indexing and Query Processing
9. Query Evaluation Plans
10. Concurrency and Transactions
11. Big Data Analytics using Hadoop

During the course student must be do project on:

1. E- Commerce Management (Student can build an E-commerce platform, where a customer can register and buy a product)
2. Inventory Management (Student can build a project which can Increase the inventory turnover for any business)
3. Solution for Saving Student Records (Student can build a solution that saves student records for an educational institution)
4. Payroll Management Solution (create a database solution for managing payroll)

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using Virtual Link. Please add VLink

http://vlabs.iitb.ac.in/bootcamp/labs/dbms/exp8/exp/index.php

Semester I

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Data Communication and Networks</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470110</td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="2">4. Type of Course (use tick mark)</td><td colspan="2">Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Computer Network</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">This course covers the data communication and computer network. The main contents are: LAN, WAN, MAN & wireless networks Laying architecture of networks, OSI model AM,FM and PM Multiple Access protocol-ALOHA network layer addressing Layer-4 protocol TCP & UDP TCP/IP, Protocols, Internet Protocol , Transmission control, User Datagram Protocol , IP Address classes, Subnet addressing ,Internet Email-SMTP, POP, IMAP, FTP NNTP, HTTP, SNMP, TELNET. Includes weekly laboratory</td></tr>
<tr><td colspan="8">9. Learning objectives:
To understand the concepts of data communication and to study the functions of different layers used in communication the data over network.
To introduce IEEE standards employed in computer networking. To make the students to get familiarized with different protocols and network components.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">Understand the computer networks</td></tr>
<tr><td colspan="8">Design and analyze LAN</td></tr>
<tr><td colspan="8">Design and analyze WAN</td></tr>
<tr><td colspan="8">Design and analyze MAN</td></tr>
<tr><td colspan="8">Understand OSI, TCP/IP, HTTP etc</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 9</td><td colspan="5"></td></tr>
</table>

Introduction of Computer Networks, description of LAN, WAN, MAN & wireless networks **Basic terminology of computer networks:** - Bandwidth, physical and logical networks, Bridge, switch, HUB, Modem SCU/DSU

OSI Reference Model: Laying architecture of networks, OSI model, Function of each layer, Services and Protocols of each Layer.

Physical Layer: Representation of a bit on physical modem that is in wired network, optical network and wireless network, AM,FM and PM. Different types of media –twisted pair unshielded twisted pair, coaxial cable, optical Fiber cable and wireless.

Unit – 2	**Number of lectures = 9**	

Data Link Layer: framing error control and flow control. Error detection & correction CRC block codes parity and check sum, elementary data link protocol, sliding window protocol, channel allocation problem-static and dynamic. Multiple Access protocol-ALOHA, CSMA/CU, Token ring, FDDI.

Network Layer: network layer addressing, network layer datagram, IP addressed Classes. Sub netting-Sub network, Subnet mask, Routing algorithm-optionally principle, Shortest path routing, hierarchical routing, Broadcast routing, Multicast routing, DHCP, Routing protocol.

Unit – 3	**Number of lectures = 9**	

Transport layer: Layer-4 protocol TCP & UDP. Three-way hand shakes open connection.

Introduction to Network Management: Remote Monitoring Techniques: Polling, Traps, Performance Management, Introduction to Network Operating System: Client- Server Infrastructure, WINDOWS nt/2000.

Unit – 4	**Number of lectures = 9**	

TCP/IP : Introduction History of TCP/IP, Protocols, Internet Protocol , Transmission control, User Datagram Protocol , IP Address classes, Subnet addressing ,Internet Email-SMTP, POP, IMAP, FTP NNTP, HTTP, SNMP, TELNET,

Application Layer: Domain name system, E-mail, File transfer protocol, HTTP, HTTPS, World Wide Web.

12. Brief Description of self-learning / E-learning component

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The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended
Text Books ● Computer Networks: Tanenbaum, PHI, New Delhi, 12th Edition, 2020.
Reference Books
● Data Communication & Networking, Frouzen Tata McGraw Hill Publications, 8th Edition, 2020.
● Computer Networking: A Top-Down Approach, Kurose James F., Pearson Education; Ninth edition, 2020.
● Computer Networks - A System Approach, Elsevier; 14th edition, 2020.

Semester I

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Data Communication and Networks Lab</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470112</td><td>0</td><td colspan="2">0</td><td colspan="2">2</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Computer Network Lab</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td>Tutorials = 0</td><td colspan="4">Practical = 24</td></tr>
<tr><td colspan="8">8. Course Description
This course covers the data communication and computer network. The main contents are: LAN, WAN, MAN & wireless networks Laying architecture of networks, OSI model AM,FM and PM Multiple Access protocol-ALOHA network layer addressing Layer-4 protocol TCP & UDP TCP/IP, Protocols, Internet Protocol , Transmission control, User Datagram Protocol , IP Address classes, Subnet addressing ,Internet Email-SMTP, POP, IMAP, FTP NNTP, HTTP, SNMP, TELNET. Includes weekly laboratory</td></tr>
<tr><td colspan="8">9. Learning objectives:
• Familiarize students with different Networks components such as switch, routers etc.
• Make them comfortable in socket programming and internet programming.</td></tr>
<tr><td colspan="8">10.Course Outcomes (COs):</td></tr>
<tr><td colspan="8">• Understand basic Network Commands.</td></tr>
<tr><td colspan="8">• Understand the basic functioning of Switches and routers etc.</td></tr>
<tr><td colspan="8">• Understand the functioning of different layers.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">11. List of Experiments</td></tr>
<tr><td colspan="8">1. Introduction to basic Linux networking commands. (Commands ipconfig and getmac)
2. Introduction to basic Linux networking commands. (Commands tracert and pathping)
3. Introduction to basic Linux networking commands. (Commands arp and ping, netstat, finger)
4. Implement bit stuffing.
5. Implement bit de-stuffing
6. Write a program for hamming code generation for error detection
7. Write a program for hamming code generation for error correction
8. Implement cyclic redundancy check (CRC).
9. Write a program for congestion control using the leaky bucket algorithm.
10. 13. Implementation of the link state routing protocols.
11. Implementation of LZW compression algorithms.
12. Implementation of LZW decompression algorithms.</td></tr>
</table>

During the course student must do project on:

1. WiFi controlled Robot(Student will build a robot that can be controlled using WiFi)
2. Vehicle tracking system(Student can build a tracking system that sends exact location of a vehicle via SMS periodically)
3. Intelligent Tourist Information System (Student can build a system that will be helpful when visiting some new places and cities)
4. Smart energy tracking system using GSM (Student can build Smart energy meter system using GSM technology which can send updates about the energy consumption for a particular interval of time)

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php
http://www.vlab.co.in/broad-area-electronics-and-communications

Semester I

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Discrete Mathematics</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470102</td><td colspan="2">3</td><td colspan="2">0</td><td>0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core (✓)</td><td colspan="2">PE()</td><td>OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Basic Knowledge of Mathematics</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">The purpose of this course is to understand and use (abstract) discrete structures that are backbones of computer science. In particular, this class is meant to introduce logic, proofs, sets, relations, functions, counting, and probability, with an emphasis on applications in computer science.</td></tr>
<tr><td colspan="8">9. Learning objectives:
The objective of this course is to:
● Develop a foundation of set theory concepts and notation
● Explore a variety of various mathematical structures by focusing on mathematical objects, operations, and resulting properties
● Develop formal logical reasoning techniques and notation
● Demonstrate the application of logic to analyzing and writing proofs
● Develop the concept of relation through various representations (digraphs, matrices, lists).</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Construct proofs using direct proof, proof by contraposition, proof by contradiction, proof by cases
● Construct mathematical arguments using logical connectives and quantifiers and verify the correctness of an argument using propositional and predicate logic and truth tables.
● Demonstrate the ability to solve problems using counting techniques and combinatory in the context of discrete probability.
● Perform operations on discrete structures such as sets, functions, relations and sequence</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 9</td><td colspan="5">Title of the unit: Set Theory</td></tr>
<tr><td colspan="8">Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.</td></tr>
</table>

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. Functions: Definition, Classification of functions, Operations on functions.		
Unit – 2	**Number of lectures = 9**	**Title of the unit: Tree and Graphs**
Definition, Binary tree, Binary tree traversal, Binary search tree. Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.		
Unit – 3	**Number of lectures = 9**	**Title of the unit: Propositional Logic**
Proposition, well-formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers.		
Unit – 4	**Number of lectures = 9**	**Title of the unit: Partial Order Sets**
Definition, Partial order sets, Combination of partial order sets, Hasse diagram. Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E- Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

13. Books Recommended

- Elements of Distcrete Mathematics - Liu and Mohapatra, McGraw Hill Publications
- Discrete Mathematical Structures with Application to Computer Science - Jean Paul Trembley and R Manohar, McGraw-Hill Publications
- Discrete and Combinatorial Mathematics - R.P. Grimaldi, Addison Wesley
- Discrete Mathematics and Its Applications - Kenneth H. Rosen, McGraw-Hill
- Discrete Mathematical Structures - B. Kolman, R.C. Busby, and S.C. Ross, PHI Publications

Semester I

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Problem Solving and Programming with C++(OOPS) Lab</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470111</td><td>0</td><td colspan="2">0</td><td colspan="2">4</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Programming in ‘C’ & Data Structure</td><td>6. Frequency (use tick marks)</td><td>Even</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 48</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">9. Learning objectives:
● To understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
● To understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc
● To have the ability to write a computer program to solve specified problems</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Understand the features of C++ supporting object oriented programming</td></tr>
<tr><td colspan="8">● Understand the relative merits of C++ as an object oriented programming language</td></tr>
<tr><td colspan="8">● Understand the features of C++ supporting object oriented programming</td></tr>
<tr><td colspan="8">● Understand advanced features of C++ specifically stream I/O, templates and operator overloading</td></tr>
<tr><td colspan="8">● Understand the relative merits of C++ as an object oriented programming language</td></tr>
<tr><td colspan="8">11. List of Experiments</td></tr>
<tr><td colspan="8">1. Simple C++ programs to implement various control structures.
a. if statement
b. switch case statement and do while loop
c. for loop
d. while loop

2. Programs to understand structure & unions.
a. structure
b. union

3. Programs to understand pointer arithmetic.</td></tr>
</table>

4. Functions & Recursion.
a. recursion b. function

5. Inline functions.

6. Programs to understand different function call mechanism.
a. call by reference b. call by value

7. Programs to understand storage specifiers.

8. Constructors & destructors.

9. Use of "this" pointer using class

10. Programs to implement inheritance and function overriding.
a. multiple inheritance –access Specifiers
b. hierarchical inheritance – function overriding /virtual Function

11. Programs to overload unary & binary operators as member function &non member function.
a. unary operator as member function
b. binary operator as non member function

12. Programs to understand friend function & friend Class.
a. friend Function b. friend class

13. Programs on class templates

14. Using a C++ program check whether a student passed the exam or not based on total mark which shall be above 40%

15. Create a C++ program which takes two distances in an inch-feet system and stores in data members of two structure variables. Then, this program calculates the sum of two distances and displays it.

During the course student must be do project on:

1. Tic Tac Toe Game Project(This project will be without graphics which focus on logic /algorithm used in game. Two players can play this game.)

2. Supermarket Billing Project (Student can build product class with data members like product no, product name, price, qty, tax, discount. Product details is stored in a binary file. A customer can purchase a product and his invoice generated. Administrator can create, modify, view and delete product record.)
3. Fortune Teller Project in C++(Student can build console application which can determine the horoscope, and predict the future of user based on date of birth, name, and sex entered)

4. Search Engine (Student can build an academic search engine application which is designed to search relevant academic information and records in schools, colleges and universities)

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

http://vlabs.iitb.ac.in/vlabs-dev/labs/oops/index.php

Semester I

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td>2. Course Name</td><td colspan="2">Problem Solving and Programming with C++(OOPS)</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td>3. Course Code</td><td colspan="2">13470101</td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="2">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td>5. Pre-requisite (if any)</td><td colspan="2">Programming in ‘C’</td><td>6. Frequency (use tick marks)</td><td>Even</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td>Tutorials = 0</td><td colspan="4">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">This course introduces the concepts of object-oriented programming to students with a background in the procedural paradigm. The course begins with a brief review of control structures and data types with emphasis on structured data types and array processing. It then moves on to introduce the object-oriented programming paradigm, focusing on the definition and use of classes along with the fundamentals of object-oriented design. Other topics include an overview of programming language principles, simple analysis of algorithms, basic searching and sorting techniques, event-driven programming, memory management and an introduction to software engineering issues.</td></tr>
<tr><td colspan="8">9. Learning objectives:
• To develop programming skills of students, using object oriented programming concepts.
• To learn the concept of class and object using C++ and develop classes for simple applications.
• To Identify importance of object oriented programming and difference between structured oriented and object oriented programming features.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">• Implement, test and debug solutions in C++.</td></tr>
<tr><td colspan="8">• Identify the relative merits of different algorithmic designs.</td></tr>
<tr><td colspan="8">• Apply good programming style and understand the impact of style on developing and maintaining programs.</td></tr>
<tr><td colspan="8">• Design object oriented solutions for small systems involving multiple objects.</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td>Unit-1</td><td colspan="2">Number of lectures = 9</td><td colspan="5"></td></tr>
</table>

Problem Solving Concepts: General Problem Solving Concepts-Types of problems, problems solving with computers, difficulties with problem solving, Problem Solving Aspects, Problem Solving Concepts for computer- constants and variables, data types, functions, operators, expressions and equations,.

Unit – 2	**Number of lectures = 9**	

Foundations of Object Oriented Programming : Introduction to procedural, modular, object-oriented and generic programming techniques, Limitations of procedural programming, Need of object-oriented programming, fundamentals of object-oriented programming: objects, classes, data members, methods, messages, data encapsulation, data abstraction and information hiding, inheritance, polymorphism.

++ Extensions to C : Variable declarations, global scope, 'const', reference variables, operators in C++(scope resolution, new , delete), dynamic memory allocation, function prototypes, default and constant arguments, 'cin', 'cout', inline functions

Class: Defining a class, data members and member functions, public, private and protected members, inline member functions, static data members, static member functions, constructors, destructors, array of objects, classes, objects and memory, class as ADTs and code reuse

Unit – 3	**Number of lectures = 09**	

Overloading and Inheritance: Function overloading, friend function, friend class Operator Overloading : Introduction, Need of operator overloading, rules for operator overloading, overloading the unary and binary operators using member function, operator overloading using friend function, overloading relational and logical operators, overloading new, delete and assignment operator, type conversions Inheritance : Introduction, Need of inheritance, base and derived classes, member access control, types of inheritance, derived class constructor, constructors in multiple inheritance, overriding member functions, ambiguity in multiple inheritance, virtual base class Virtual functions : Pointers to objects, 'this' pointer, Pointers to derived class, virtual function, rules for virtual function, pure virtual function, abstract class, virtual destructors, early and late binding, container classes,

Unit – 4	**Number of lectures = 9**	

Templates, Exception Handling and File I/O: Namespaces: Introduction, Rules of namespaces, Templates : Introduction, Function template and class template, overloading function template, member function templates and template arguments Exception Handling: Introduction, Exception handling mechanism: try, catch and throw, Multiple Exceptions, Exceptions with arguments Managing Console I/O Operations: Introduction, C++ streams, stream classes, unformatted I/O, formatted I/O and I/O manipulators File I/O: Introduction, Classes for file stream operations, file operations (open, close, read, write, detect end of file), file modes, File pointers and their

manipulations, error handling during file operations

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/OOPS

13. Books Recommended

Text Books

- Programming and Problem Solving with C++ By Nell B. Dale, Chip Weems, 6th edition Jones & Bartlett Publishers, 2014

Reference Books

- "Problem Solving with C++ " by Walter Savitch Sixth Edition Pearson/Addison-Wesley, 2007
- Programming with C++ by John R. Hubbard, Atul Kahate, 3rd Edition, schaums series 2009

Semester-I

MCA

1. Name of the Department- Centre for Languages and Communication						
2. Course and Subject Name	**Personality Development and Communication Skills**	**L**	**T**	**P**		
3. Course Code	13470113	**0**	**0**	**2**		
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**	OE ()		
5. Pre-requisite (if any)	Proficiency in English	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practicals = 24**			
8. Course Description						
Personality Development and Communication Skills is designed to provide **professionals** with the tools that they need to **communicate** clearly and effectively. They often cover subjects such as **communication** theory, writing, speaking, correspondence, cross-culture communication and leadership **skills**.						
9. Learning objectives: • Enhancing listening-speaking Skills • Enhancement of Vocabulary and Pronunciation Skills. • Enhancement of Debating Skills which will further enhance public speaking Skills • Induce Reading and Thinking ability • Enhancing skills pertaining to industry						
10. Course Outcomes (COs):						
Upon successful completion of this course students will:						
• Able to convey their ideas in an expressive and effective way						
• Able to speak confidently before the audience						
• Able to get a holistic industry perspectives						
11. Unit wise detailed content						
Unit-1	**Number of practical = 4**	**Title of the unit:** Listening and Speaking Comprehension				
Listening and Speaking Comprehension: Greetings and self introduction**,** Audio clippings followed one response questionnaire						
Unit – 2	**Number of practical =6**	**Title of the unit: : Vocabulary Building and Pronunciation**				
Unit-2: Vocabulary Building and Pronunciation: Antonyms, Synonyms, Homophones, Homonyms, one word substitution, Idioms and Phrase and technical terminologies related to MCA course Understanding of Syllable, Stress, Pitch, and Intonation						
Unit – 3	**Number of practical =6**	**Title of the unit: Speaking Comprehension**				
Unit-3: Speaking Comprehension: Introduction to language used in social networking- code mixing and code switching, Panel Discussion with tug of words, Fish bowl technique, Situation based dialogues. Spontaneous throw of ideas leading to problem solving, situation based dialogues, case studies and group discussion.						
Unit – 4	**Number of practical =6**	**Title of the unit: Reading Comprehension**				
Unit-4: Reading Comprehension: Introduction to essence of reading. Types of Reading**,** Extensive reading						

session of newspaper, excerpt, articles, critical analysis on reading abstracts. Making a digital newspaper with innovative categories. Paragraphs, Précis, Essays, Reports, Proposal, Dissertation, Thesis, Letters, Emails

12. Brief Description of self learning / E-learning component

Students can practice from various sites online for Aptitude Building Questions. https://www.indiabix.com/, https://www.indiabix.com/online-test/aptitude-test , https://www.crazyengineers.com › ... › Engineering Jobs & Career Advice, https://testbook.com/aptitude etc.

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal:
https://elearning.sgtuniversity.ac.in/course-category/general/

13. Books Recommended (3 Text Books + 2-3 Reference Books)

- **Improve your Writing**, V.N. Arora, Lakshmi Chandra, Oxford University Press, New Delhi 2014
- **Technical Communication Principles and Practice'**, Meenakshi Raman and Sangeeta Sharma, Oxford University Press 2012
- **Communication Skills in English,** D. G. Saxena and Kuntal Tamang, Top Quark, 2011 cue
- '**Essential English Grammar**', Raymond Murphy, Cambridge University Press 1998

Semester II

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Advanced Operating System</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470205</td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Operating System</td><td>6. Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.</td></tr>
<tr><td colspan="8">9. Learning objectives:
To impart the knowledge on the need and requirement of an interface between Man and Machine. To teach the features of operating systems and the fundamental theory associated with process, memory and file management components of operating systems.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">The students will be able to
● Describe the general architecture of computers
● Describe, contrast and compare differing structures for operating systems
● Understand and analyse theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 09</td><td colspan="5"></td></tr>
<tr><td colspan="8">Introduction: Definition, Operating System Structure, Operating System Operations, Distributed system, Methodologies for implementation of O/S service, Processes: Process model, Process states, process hierarchies, implementation of Processes, data structures used such as Process table, PCB creation of processes, context switching, exit of Processes.</td></tr>
</table>

Inter-process communication: Race conditions, critical sections, problems of mutual exclusion, Peterson's solution, producer-customer problem, Reader Writer‟s Problem, Dining Philosophers Problem, semaphores, monitors, message passing.

Unit – 2	**Number of lectures = 09**	

Process scheduling: objective, preemptive vs. non-preemptive scheduling, comparative assessment of different algorithms such as round robin, priority bases scheduling. FCFS. SJF, multiple queues with feedback

Deadlocks: Conditions, modeling, detection and recovery, deadlock avoidance, deadlock prevention.

Memory Management: Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory, Demand Paging

Unit – 3	**Number of lectures = 08**	

File Management- File-System Interface- File Concept- Access Methods – Directory and Disk Structure – File-System Mounting – File Sharing- Protection- File-System Implementation- FileSystem Structure- File-System Implementation- Directory Implementation- Allocation Methods Free-Space Management – Efficiency and Performance

Unit – 4	**Number of lectures = 10**	

Mass Storage Structure- Disk Scheduling- Disk ManagementRAID Structure – Stable Storage Implementation- Protection and Security- Protection- Goals of Protection- Principles of ProtectionDomain of Protection- Access Matrix Implementation of Access Matrix- Access Control- Revocation of Access Rights SecurityThe Security Problem –Program Threats- System and Network Threats.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended
Text Books ● William Stallings, Operating Systems: Internals and Design Principles, 6 th Ed., Pearson Education
14. Reference Books
● Nutt G.J., Operating Systems, 3 rd Ed., Pearson Education.
● Silberschatz, Galvin, & Gagne, Operating System Concepts, 8 th Ed., Wiley
● Tanenbaum A.S., Modern Operating Systems, 3 rd Ed., Prentice Hall

Semester II

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Advanced Operating System Lab</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470207</td><td>0</td><td colspan="2">0</td><td colspan="2">2</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="3">5. Pre-requisite (if any)</td><td>6. Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 24</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">9. Learning objectives:
To impart the knowledge on the need and requirement of an interface between Man and Machine. To teach the features of operating systems and the fundamental theory associated with process, memory and file management components of operating systems..</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity</td></tr>
<tr><td colspan="8">● The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success</td></tr>
<tr><td colspan="8">● The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">11. List of Experiments</td></tr>
<tr><td colspan="8">1. Write a C program to simulate the FCFS CPU scheduling algorithms to find turnaround time and waiting time.
2. Write a C program to simulate the SJF CPU scheduling algorithms to find turnaround time and waiting time.
3. Write a C program to simulate the Round Robin (preemptive) CPU scheduling algorithms to find turnaround time and waiting time.
4. Write a C program to simulate the Priority CPU scheduling algorithms to find turnaround time and waiting time.
5. Write a C program to simulate the MVT and MFT memory management techniques.
6. Write a C program to simulate the paging technique of memory management.
7. Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance
8. Write a C program to simulate FIFO page replacement algorithms.
9. Write a C program to simulate LRU page replacement algorithms.
10. Write a C program to simulate LFU page replacement algorithms .</td></tr>
</table>

11. Write a C program to simulate producer-consumer problem using semaphores
12. Write a C program to simulate the concept of Dining-Philosophers problem.

During the course student must be do project on:

1. The Unix Shell (Student can build project How processes are handled (i.e., starting and waiting for their termination))
2. Web Servers and Synchronization (Student can modify an existing code to learn how to create and synchronize cooperating threads in Unix and gain exposure to how a basic web server is structured)
3. A "Better" Malloc
4. A “File System” (Build a file system using the FUSE library, Keep adding more and more system calls and features as time rolls)

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using Virtual Link. Please add VLink

Semester II

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td>2. Course Name</td><td colspan="2">JAVA PROGRAMMING (Advanced Java)</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td>3. Course Code (13470204)</td><td colspan="2">_</td><td colspan="2">3</td><td colspan="2">0</td><td>0</td></tr>
<tr><td colspan="2">4. Type of Course (use tick mark)</td><td colspan="2">Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td>5. Pre-requisite (if any)</td><td>Basic knowledge of C programming language.</td><td colspan="2">6. Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">The revolution in IT (Information Technology) is possible due to evolution of programming languages over the time. With the time, the programming languages become more simple, object oriented, robust and secure to use. Java is one of the programming language that imbibes all the above mentioned features and also, it is used to develop mobile, desktop GUI, web-based, cloud computing applications. This course aims to cover the advance concept of java programming language which includes network programming, database programming, and servlets.</td></tr>
<tr><td colspan="8">9. Learning objectives:
To understand the fundamentals of object-oriented programming in java, which includes the definition of classes, methods and use of java libraries.
To understand the application of java programming language in advance applications.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">Understanding the structure and model of the java programming language.</td></tr>
<tr><td colspan="8">Using java programming language to develop various applications.</td></tr>
<tr><td colspan="8">Develop software using java programming language.</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td>Unit-1</td><td colspan="2">Number of lectures = 10</td><td colspan="5"></td></tr>
</table>

Introducing classes, objects and methods: defining Class Fundamentals, Object & Object reference, Object Life time & Garbage Collection, Creating and Operating Objects, Constructor & initialization code block, Access Control, Modifiers, methods Nested , Inner Class &Anonymous Classes ,Abstract Class & Interfaces Defining Methods, Argument Passing Mechanism , Method Overloading, Recursion, Dealing with Static Members, Finalize() Method, Native Method. Use of "this "reference, Use of Modifiers with Classes & Methods, Design of Accessors and Mutator Methods Cloning Objects, shallow and deep cloning, Generic Class Types.

Extending Classes and Inheritance: Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Inheriting Data members and Methods, Role of Constructors in inheritance, Overriding Super Class Methods, Use of "super", Polymorphism in inheritance, Type Compatibility and Conversion Implementing interfaces.

Unit – 2	**Number of lectures = 9**	

Thread: Understanding Threads, Needs of Multi-Threaded Programming,Thread Life-Cycle, Thread Priorities ,Synchronizing Threads, Inter Communication of Threads ,Critical Factor in Thread –Deadlock.

GUI Programming: 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 Using Swing Components, Java Utilities (java.util Package) The Collection Framework : Collections of Objects , Collection Types, Sets , Sequence, Map, Understanding Hashing, Use of ArrayList& Vector.

Unit – 3	**Number of lectures = 8**	

Event Handling: Event-Driven Programming in Java, Event- Handling Process, Event-Handling Mechanism, The Delegation Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling.

Network Programming: Socket based communication &Remote method invocation (RMI).

Unit – 4	**Number of lectures = 9**	

Database Programming using JDBC: Introduction to JDBC,JDBC Drivers & Architecture, CURD operation Using JDBC, Connecting to non-conventional Databases.

Java Server Technologies (Servlet): Web Application Basics, Architecture and challenges of Web Application, Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment, Descriptor (web.xml), Handling Request and Response.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- Java, Herbert Schildt. "The Complete Reference." Complete Reference Series) 10th Edition| New York: McGraw-Hill Education (2017).

Reference Books

- SAMANTA, DEBASIS. Object-oriented Programming with C++ and Java. PHI Learning Pvt. Ltd., 2006..
- https://cse.iitkgp.ac.in/~dsamanta/java/index.htm, https://nptel.ac.in/courses/106/105/106105191/
- E. Balaguruswamy, "Programming with Java: A Primer", McGraw-Hill; Sixth edition, 2019.

Semester II

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td>2. Course Name</td><td colspan="2">JAVA PROGRAMMING Lab(Advance Java)</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td>3. Course Code (13470209)</td><td colspan="2"></td><td colspan="2">0</td><td colspan="2">0</td><td>2</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core (✔)</td><td colspan="2">PE()</td><td>OE ()</td></tr>
<tr><td>5. Pre-requisite (if any)</td><td colspan="2">Basic knowledge of C programming language.</td><td colspan="2">6. Frequency (use tick marks)</td><td>Even (✔)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 24</td></tr>
<tr><td colspan="8">8. Course Description
The revolution in IT (Information Technology) is possible due to evolution of programming languages over the time. With the time, the programming languages become more simple, object oriented, robust and secure to use. Java is one of the programming language that imbibes all the above mentioned features and also, it is used to develop mobile, desktop GUI, web-based, cloud computing applications. This course aims to cover the advance concept of java programming language which includes network programming, database programming, and servlets.</td></tr>
<tr><td colspan="8">9. Learning objectives:
● To understand the fundamentals of object-oriented programming in java, which includes the definition of classes, methods and use of java libraries.
● To understand the application of java programming language in advance applications.</td></tr>
<tr><td colspan="8">10.Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Understanding the structure and model of the java programming language.</td></tr>
<tr><td colspan="8">● Using java programming language to develop various applications.</td></tr>
<tr><td colspan="8">● Develop software using java programming language.</td></tr>
<tr><td colspan="8">11. List of Experiments</td></tr>
<tr><td colspan="8">1. WAP that describes a class person. It should have instance variables to record name, age and salary. Create a person object. Set and display its instance variables.
2. Write a program to show the concept of Constructors.
3. Write an application that shows thread synchronization.
4. Write an application that displays deadlock between threads.
5. Write an application that shows thread priorities.
6. WAP to add label and button in a frame.
7. WAP to add panel to GUI.
8. WAP to create a swing button.
9. WAP to create JFrame, JButton and method call inside the java constructor.
10. WAP to execute select query using JDBC.</td></tr>
</table>

11. WAP to update client information in the database.
12. WAP of database connectivity using JDBC-ODBC drivers.
13. WAP to implement simple servlet that generates the plain text.
14. WAP to display cookie id.
15. WAP to implement socket programming.
16.Write RMI based client-server programs.

During the course student must be do project on:

1	Implement bi-directional chat system using socket programming.
2	User Management Web Application
3	Employee Registration Module
4	Hospital Management System

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

https://www.geeksforgeeks.org/introduction-java-servlets/
https://www.geeksforgeeks.org/socket-programming-in-java/

Semester II

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Advanced Software Engineering & Testing</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470202</td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="2">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Software Engineering</td><td>6. Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">This course aims to equip students to develop techniques of software-intensive systems through successful requirements engineering, design, testing, maintenance and evolution, and project and quality management. Students build on their basic software engineering knowledge by extending it with specific techniques for maintenance, evolution, dependability, reliability, safety, security, and resilience.</td></tr>
<tr><td colspan="8">9. Learning objectives:
● To Know the Basics of Software Architecture
● To Understand various phases of Software Development Cycle
● Sufficient programming skills for the team development project.
● Appreciate the fundamentals of software testing and its application through the software life cycle.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Develop skills in designing and executing software tests suitable for different stages in the software life cycle.</td></tr>
<tr><td colspan="8">● Understand and appreciate the role of software testing in systems development, deployment and maintenance.</td></tr>
<tr><td colspan="8">● Develop a continuing interest in software testing, and obtain satisfaction from its study and practice.</td></tr>
<tr><td colspan="8">● Appreciate the responsibilities of software testers within software projects, the profession and the wider community.</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 09</td><td colspan="5"></td></tr>
</table>

Introduction: Programs vs. software products, emergence of software engineering, software life cycle, models. Software project management: Project management concepts, software process, Project planning, COCOMO Model A Heuristic estimation techniques, staffing level estimation, team structures, staffing, risk analysis and management. Requirement Analysis and specification: Requirements engineering, partitioning Software, prototyping,

Unit – 2	**Number of lectures = 08**	

Data Modeling, Functional Modeling and information flow: Data flow diagrams, data flow model, control flow model, the control and process specification, The data dictionary, Other classical analysis methods. System Design design principles, Functional independence, Cohesion, Coupling, Design documentation.

Unit – 3	**Number of lectures = 09**	

Testing and maintenance: Software Testing Techniques, Software testing Fundamentals, Verification Testing: Verification Methods, SRS Verification, User Documentation Verification, Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Structural Testing: Identification of Independent Paths: Control Flow Graph. Use Case Testing: Use Case Diagrams and Use Cases. Prioritization of test cases for Regression Testing: Regression Testing, Regression Test Case Selection, Prioritization guidelines.

Unit – 4	**Number of lectures = 10**	

Testing Activities: Unit Testing, Levels of Testing, Integration Testing, System Testing, Metrics and Models in Software Testing: What are Software Metrics, categories of Metrics, object Oriented Metrics used in testing, What should we measure during testing? Prediction Model: Reliability Modes, Fault Prediction Model.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- Software Engineering - A Practitioner‟s Approach, Roger S. Pressman, MGH Publications, New Delhi, Eighth edition, 2019.
- Effective Methods for Software Testing, William Perry, John Wiley & Sons, New York, Van Nostrand Reinhold, New York, 2nd Ed., 2006.

Reference Books
● An Integrated Approach to Software Engineering by Pankaj Jalote, Narosa Publications, New Delhi, 2010.
● Fundamentals of Software Engineering, Rajib Mall, PHI Learning; Fifth edition, 2019.
● Software Testing A Craftsman‟s approach, Paul C. Jorgenson, CRC Press.
● Testing Computer Software, Cem Kaner, Jack Falk, Nguyen Quoc, Van Nostrand Reinhold, New York, 2nd Ed.

Semester II

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Advanced Software Engineering & Testing Lab**	**L**	**T**		**P**	
3. Course Code	13470210	**0**	**0**		**2**	
4. Type of Course (use tick mark)		Core (✓)	**PE()**		**OE ()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 24**			
8. Course Description						
9. Learning objectives: ● Analyze the requirements for the given problem statement. ● Design and implement various solutions for the given problem.						
10. Course Outcomes (COs):						
● Create appropriate document for the software artifact.						
● Construct control flow graphs for the solution that is implemented.						
11. List of Experiments						

1. Write down the problem statement for a suggested system of relevance.
2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. To perform the function oriented diagram: Data Flow Diagram (DFD) and Structured chart.
4. To perform the user‘s view analysis for the suggested system: Use case diagram.
5. To draw the structural view diagram for the system: Class diagram, object diagram.
6. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.
7. Take any system (e.g. ATM system) and study its system specifications and report the various bugs.
8. Write the test cases for any known application(e.g. Banking application)
9. Create a test plan document for any application (e.g. Library Management System)
10. Study of any testing tool (e.g.Winrunner)
11. Study of any web testing tool (e.g. Selenium)
12. Study of any bug tracking tool (e.g. Bugzilla, bugbit)
13. Study of any test management tool (e.g. Test Director)
14. Study of any open source-testing tool (e.g. Test Link)

At the end of course student will be able to do project on:

1. Mini Project in C Hospital Management System

2. Library Management System and Enquiry System
3. School Management System
4. University Management System

At least one Project is mandatory for each student. Project can be done in a group of (2-3) students.

12. Brief Description of self-learning / E-learning component

https://elearning.sgtuniversity.ac.in/course-category/

Semester II

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td>2.Course Name</td><td colspan="2">JAVA PROGRAMMING (Basic Java)</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td>3. Course Code (13470203)</td><td colspan="2"></td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="2">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td>5. Pre-requisite (if any)</td><td>Basic knowledge of programming language e.g. C programming knowledge</td><td>6.Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
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<tr><td colspan="8">The revolution in IT (Information Technology) is possible due to evolution of programming languages over the time. With the time, the programming languages become more simple, object oriented, robust and secure to use. Java is one of the programming language that imbibes all the above mentioned features and also, it is used to develop mobile, desktop GUI, web-based, cloud computing applications. This course aims to cover the core concept of the java programming language.</td></tr>
<tr><td colspan="8">9. Learning objectives:
● To create, debug and run simple java programs in java SDK environment.
● To understand the fundamentals of object-oriented programming in java, which includes the definition of classes, methods and use of java libraries.
● To understand the application of java programming language in different technologies.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Understanding the structure and model of the java programming language.</td></tr>
<tr><td colspan="8">● Using java programming language to develop various applications.</td></tr>
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<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td>Unit-1</td><td colspan="2">Number of lectures = 10</td><td colspan="5"></td></tr>
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Importance and features of Java: Language Construct of java including Keywords,constants,Programming language Types and Paradigms, Computer Programming Hierarchy, How Computer Architecture Affects a Language? Why Java? Flavors of Java, Java Designing Goal, Role of Java Programmer in Industry, Features of Java Language, JVM –The heart of Java, Java's Magic Bytecode.Installing Java, Java Program Development, Java Source File Structure,Compilation, Executions.Lexical Tokens, Identifiers, Keywords, Literals, Comments,Primitive Datatypes, Operators Assignments.

Introducing classes, objects and methods: defining Class Fundamentals, Object & Object reference, Object Life time & Garbage Collection, Creating and Operating Objects , Constructor & initialization code block, Access Control, Modifiers, methods Nested , Inner Class &Anonymous Classes ,Abstract Class & Interfaces Defining Methods, Argument Passing Mechanism , Method Overloading, Recursion, Dealing with Static Members, Finalize() Method, Native Method. Use of "this " reference, Use of Modifiers with Classes & Methods, Design of Accessors and Mutator Methods Cloning Objects, shallow and deep cloning, Generic Class Types.

Unit – 2	**Number of lectures = 8**	

Extending Classes and Inheritance: Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Inheriting Data members and Methods, Role of Constructors in inheritance, Overriding Super Class Methods, Use of "super", Polymorphism in inheritance, Type Compatibility and Conversion Implementing interfaces.

Unit – 3	**Number of lectures = 9**	

Exception Handling: The Idea behind Exception,Exceptions & Errors,Types of Exception, Control Flow In Exceptions, JVM reaction to Exceptions,Use of try, catch, finally, throw, throws in Exception Handling,In-built and User Defined Exceptions, Checked and Un-Checked Exceptions.

Package: Organizing Classes and Interfaces in Packages, Package as Access Protection , Defining Package ,CLASSPATH Setting for Packages , Making JAR Files for Library Packages Import and Static Import Naming Convention For Packages.

Unit – 4	**Number of lectures = 9**	

Array & String: Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array, Operation on String, Mutable & Immutable String, Using Collection Bases Loop for String, Tokenizing a String, Creating Strings using StringBuffer .

A Collection of Useful Classes: Utility Methods for Arrays ,Observable and Observer Objects , Date & Times ,Using Scanner Regular Expression, Input/output Operation in Java(java.io Package),Streams and the new I/O Capabilities ,Understanding Streams, The Classes for Input and Output, The Standard Streams, Working with File Object, File I/O

Basics, Reading and Writing to Files, Buffer and Buffer Management, Read/Write Operations with File Channel, Serializing Objects .

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- Java, Herbert Schildt. "The Complete Reference." Complete Reference Series) 10th Edition| New York: McGraw-Hill Education (2017).

Reference Books

- SAMANTA, DEBASIS. Object-oriented Programming with C++ and Java. PHI Learning Pvt. Ltd., 2006.
- https://cse.iitkgp.ac.in/~dsamanta/java/index.htm, https://nptel.ac.in/courses/106/105/106105191/
- E. Balaguruswamy, "Programming with Java: A Primer", McGraw-Hill; Sixth edition, 2019.

Semester II

MCA

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<tr><td>3. Course Code (13470208)</td><td colspan="2"></td><td colspan="2">0</td><td colspan="2">0</td><td>2</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core (✔)</td><td colspan="2">PE()</td><td>OE ()</td></tr>
<tr><td>5. Pre-requisite (if any)</td><td colspan="2">Knowledge of C</td><td>6. Frequency (use tick marks)</td><td>Even (✔)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 24</td></tr>
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The revolution in IT (Information Technology) is possible due to evolution of programming languages over the time. With the time, the programming languages become more simple, object oriented, robust and secure to use. Java is one of the programming language that imbibes all the above mentioned features and also, it is used to develop mobile, desktop GUI, web-based, cloud computing applications. This course aims to cover the core concept of the java programming language.</td></tr>
<tr><td colspan="8">9. Learning objectives:
● To create, debug and run simple java programs in java SDK environment.
● To understand the fundamentals of object-oriented programming in java, which includes the definition of classes, methods and use of java libraries.
● To understand the application of java programming language in different technologies.</td></tr>
<tr><td colspan="8">10.Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Understanding the structure and model of the java programming language.</td></tr>
<tr><td colspan="8">● Using java programming language to develop various applications.</td></tr>
<tr><td colspan="8">● Develop software using java programming language.</td></tr>
<tr><td colspan="8">11. List of Experiments</td></tr>
<tr><td colspan="8">1. Write a program to swap two values using object reference. Your program should have a swap function.
2. Write an application that accepts one command line argument; display the line of reporting if number is even or odd.
3. WAP that describes a class person. It should have instance variables to record name, age and salary. Create a person object. Set and display its instance variables.
4. Write a program to show the concept of Constructors.
5. WAP that shows passing object as parameter.
6. WAP that illustrates method overriding.
7. WAP to illustrate dynamic polymorphism.</td></tr>
</table>

8. Write a program to show the concept of method overloading.
9. Write a program to show the concept of Inheritance.
10. WAP illustrating a super class variable a referencing as sub class object.
11. WAP illustrating all uses of super keywords.
12. Write an application that shows the usage of try, catch, throws and finally.
13. Write an application that shows how to create a user-defined exception.
14. Create a customized exception and also make use of all the 5 exception keywords.
15. Write a program to show the concept of packages.

During the course student must be do project on:

1. Library Management System and Enquiry System
2. School Management System
3. E-Healthcare Management System
4. Online quiz Management System

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

https://www.codecademy.com/learn/learn-java
https://www.learnjavaonline.org/

Semester II

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Data Structures and Algorithm Design</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470206</td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td></td><td>6. Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td>Tutorials = 0</td><td colspan="4">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">Topics include elementary data structures, (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, and their application to solving practical engineering problems.

Students study techniques for designing algorithms and for analyzing the time and space efficiency of algorithms. The algorithm design techniques include divide-and-conquer, greedy algorithms, dynamic programming.</td></tr>
<tr><td colspan="8">9. Learning objectives:
● Learn new data & file structure concepts and algorithms.
● Learn when and where these concepts would be used in real-world applications and programming contexts.
● Apply many of these concepts/algorithms by using them in programming projects.
● Date Structures are an integral part of algorithm design and Discrete Structures covers topics like graph theory.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Understand of the basic data structures.</td></tr>
<tr><td colspan="8">● The appropriate use of a particular data structure and algorithm to solve a problem.</td></tr>
<tr><td colspan="8">● Demonstrate a familiarity with major algorithms and data structures.</td></tr>
<tr><td colspan="8">● Apply important algorithmic design paradigms and methods of analysis.</td></tr>
<tr><td colspan="8">● Synthesize efficient algorithms in common engineering design situations.</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 09</td><td colspan="5"></td></tr>
</table>

Introduction to Data Structure: Data types, Abstract Data types, Arrays, Arrays as abstract data type, Arrays row major and column major, Sequences, Big Oh notations. **Stack:** Definition and Example, Representing Stack using static implementation, Applications, Infix, Prefix and postfix, Converting infix to postfix Expression, Evaluation Matching parentheses, Recursion and Simulating Recursion.

Queues: Definition and examples, Representing Queues using static implementation, Circular queues, Priority queues, Double-ended queues.

Unit – 2	**Number of lectures = 09**	

Linked Lists: List Types (singly, doubly, singly circular, doubly circular), Operations on all types of Lists – create, insert, delete Generalized Lists Applications, Dynamic implementation of stack and queues, Polynomial Addition, Dynamic Memory Allocation – First- Fit, Best – Fit, Worst-fit

Trees: Concept Rooted Tree Binary Tree – Linked and static Representation, Tree Traversals (Pre-order, In-order, Post-order using recursion), Binary Search Tree (create, delete, search, insert, display), AVL Trees.

Unit – 3	**Number of lectures = 08**	

Introduction: Algorithm, Analyzing algorithm, Designing algorithm, Concept of algorithmic efficiency, Run time analysis of algorithms, Asymptotic Notations.

Divide and Conquer: Structure of divide and conquer algorithms; examples; Greedy Method: Overview of the Greedy Paradigm, Examples of Exact Optimization solution (minimum cost spanning tree) Dynamic Programming: Overview, Difference between Dynamic Programming and Divide and Conquer, Applications: Shortest path in graph, Traveling salesman Problem.

Unit – 4	**Number of lectures = 10**	

Back Tracking: Overview, 8-queen problem, Graph Coloring Problem and Knapsack problem

Graphs: Representation using C Adjacency matrix and adjacency lists BFS and DFS by static and dynamic implementation, Finding shortest path (Dijkstra's Algorithm) **Searching:** Sequential, Binary, Hashing, Hash tables, Hash functions, Overflow handling techniques.

Sorting: Bubble sort, Insertion sort, Quick sort (recursive), Merge sort, Heap sort and Bucket sort. Complexity measures, Polynomial vs. non-polynomial time complexity; NP-hard and NP-complete classes, examples.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- Data Structures with C (Schaum's Outline Series), Seymour Lipschutz, McGraw Hill Education; 1st edition, 2017.
- Introduction of Computer Algorithm, T. H Cormen, Leiserson, Rivest and Stein, PHI, New Delhi.
- Fundamentals of Computer Algorithms. 2nd Edition, E. Horowitz, S. Sahni, and S.Rajsekran, University Press, Hyderabad.

Reference Books

- Computer Algorithms, Sara Basse, A.V. Gilder, Addison Wesley, New Delhi.
- Fundamentals of Data Structure, E. Horowitz, S. Sahni, and S.Rajsekran University Press, Hyderabad
- Data Structures Using C, Balagurusamy, McGraw Hill Education; First edition, 2016

Semester II

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Data Structures and Algorithm Lab</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470211</td><td>0</td><td colspan="2">0</td><td colspan="2">2</td></tr>
<tr><td colspan="2">4. Type of Course (use tick mark)</td><td colspan="2">Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Data Structure</td><td>6. Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 24</td></tr>
<tr><td colspan="8">8. Course Description The course is designed to develop skills to design and analyze simple linear and non linear data structures. It strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem. It enables them to gain knowledge in practical applications of data structures.</td></tr>
<tr><td colspan="8">9. Learning objectives:
● To impart the basic concepts of data structures and algorithms
● To understand concepts about searching and sorting techniques
● To understand basic concepts about stacks, queues, lists, trees and graphs
● To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">At the end of this lab session, the student will</td></tr>
<tr><td colspan="8">● Be able to design and analyze the time and space efficiency of the data structure ·</td></tr>
<tr><td colspan="8">● Be capable to identity the appropriate data structure for given problem ·</td></tr>
<tr><td colspan="8">● Have practical knowledge on the applications of data structures</td></tr>
<tr><td colspan="8">11. List of Experiments</td></tr>
<tr><td colspan="8">1. BASIC TECHNIQUES: Swapping of the contents of two variables- Finding the sum of digits of a given number- Reversing a given number.
2. DECISION MAKING: Finding the largest and the smallest of a given array- solving a quadratic equation- selecting an operation based on a menu.
3. LOOPING TECHNIQUES & ARRAYS: Finding the sum to n terms of a sine series- Matrix Multiplication- Transpose-Polynomial addition- Polynomial Multiplication- Sorting algorithms Searching algorithms.
4. CHARACTERS AND STRING HANDLING: Finding the length of string-reversal of string concatenation of two strings-checking whether it is a palindrome or not- converting upper case alphabets to lowercase and vice versa in a string.
5. Implementation of ADT Linked list.
6:
7. Implementation of Stack using arrays.
8. Implementation of Queue using arrays
9. Conversion of prefix expression into post-fix form using stacks.
10. Implementation of Binary tree and its Traversals a)Preorder b)Inorder c)Postorder.
11. Write a C Programming to implement the following Sorting techniques a)Bubblesort</td></tr>
</table>

b)Quick sort

12. Design, develop and execute a program in C to create a max heap of integers by accepting one element at a time and by inserting it immediately in to heap. Use the array representation of heap. Display the array at the end of insertion phase.
13. Design, develop and execute a program in C to implement doubly linked list where each node consist of integers. The program should support following functions.
    a. Create a doubly linked list
    b. Insert a new node
    c. Delete a node if it is found, otherwise display appropriate message
    d. Display the nodes of doubly linked list
14. Design, develop and execute a program in C to read a sparse matrix of integer values and make a transpose of it. Use the triple to represent an element in sparse matrix.
15. Design, develop and execute a program in C to implement singly linked list where each node consist of integers. The program should support following functions.
    a. Create a singly linked list
    b. Insert a new node
    c. Delete a node if it is found, otherwise display appropriate message
    d. Display the nodes of singly linked list

During the course student must be do project on:

1. Mini Project in C Personal Diary Management System
2. Typing Tutor Project Using C
3. Mini Calendar Using C
4. Student Database Management and Enquiry System

At least one Project is mandatory for each student.

Semester II

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Human Values & Ethics**	**L**	**T**		**P**	
3. Course Code	13470201	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE ()**	
5. Pre-requisite (if any)	Nil	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			
8. Course Description						
The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence. It is free from any dogma or value prescriptions. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with and within the student himself/herself finally.						
9. Learning objectives: ● To understand the significance of value inputs in a classroom and start applying them in their life and profession ● Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc. ● Understand the role of a human being in ensuring harmony in society and nature. ● Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.						
10. Course Outcomes (COs):						
● Understand the significance of value inputs in a classroom and start applying them in their life and profession						
● Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.						
● Understand the role of a human being in ensuring harmony in society and nature.						
● Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 09**	**Introduction to Value Education**				

Value Education; Concept, Meaning, Definition, and Need for Value Education. , The Content and Process of Value Education., Basic Guidelines for Value Education, Self-exploration as a means of Value Education., Happiness and Prosperity as parts of Value Education.

Unit – 2	**Number of lectures = 09**	**Harmony in the Human Being**

Human Being is more than just the Body, Harmony of the Self ('I') with the Body, Understanding Myself as Co-existence of the Self and the Body, Understanding Needs of the Self and the needs of the Body, Understanding the activities in the Self and the activities in the Body.

Unit – 3	**Number of lectures = 09**	**Harmony in the Family and Society and Harmony in the Nature**

Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love, Comprehensive Human Goal, The Five Dimensions of Human Endeavour, Harmony in Nature: The Four Orders in Nature.

Unit – 4	**Number of lectures = 09**	**Social & Professional Ethics**

The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct., Holistic Alternative and Universal Order, Human Rights violation and Social Disparities.
Value based Life and Profession, Professional Ethics and Right Understanding. , Competence in Professional Ethics, Issues in Professional Ethics – The Current Scenario.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- A.N Tripathy, New Age International Publishers,
- Bajpai. B. L , , New Royal Book Co, Lucknow, Reprinted,
- Bertrand Russell Human Society in Ethics & Politics

Reference Books

- Corliss Lamont, Philosophy of Humanism
- Gaur. R.R. , Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books,
- Gaur. R.R. , Sangal. R , Bagaria. G.P, Teachers Manual Excel Books,
- I.C. Sharma . Ethical Philosophy of India Nagin & co Jalandhar
- Mortimer. J. Adler, - Whatman has made of man
- William Lilly Introduction to Ethic Allied Publisher

Semester III

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Cyber Security</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470307</td><td colspan="2">3</td><td colspan="2">0</td><td>0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">PE(✓)</td><td>OE ()</td></tr>
<tr><td colspan="2">5. Prerequisite (if any)</td><td></td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">This module aims to give students in depth knowledge about Cyber Crimes, Cyber Security, various cyber threats, hacking, cryptography techniques and network security.</td></tr>
<tr><td colspan="8">9. Learning objectives:
• To understand the basic concepts of various cyber security challenges and threats.
• To understand the cyber crimes and cyber security policies.
• To learn the different cryptographic techniques and understand the in dpth knowledge of network security.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">• Exposure for students to evaluate cybercrime situations and recommend appropriate cyber security laws.</td></tr>
<tr><td colspan="8">• Know how to compute private keys by key exchange algorithms and recognize security principles and needs for an organization/institute.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 9</td><td colspan="5"></td></tr>
<tr><td colspan="8">Introduction to Cyber Security: Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Ethics in Cyber Security: Privacy, Intellectual property in the cyberspace, Professional ethics, Fair user and ethical hacking, Trademarks, Internet fraud, Electronic evidence, Forensic technologies, Digital evidence collections.</td></tr>
<tr><td colspan="2">Unit – 2</td><td>Number of</td><td colspan="5"></td></tr>
</table>

	lectures = 9	
Cybercrimes and Cyber Security: Tools and methods used in cybercrime: Introduction, Password cracking, Keyloggers and spywares, Virus and worms, Phishing and identity theft, Trojan horses and backdoors, Steganography. Cyber Security Regulations, The Indian IT Act, Cybercrime and punishment, Cost of Cybercrimes and IPR Issues, Web threats for organizations.		
Unit – 3	**Number of lectures = 9**	
Cryptography: Introduction to Cryptography, Basic concepts, Cryptosystems, Crypto analysis, Ciphers & Cipher modes, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography.		
Unit – 4	**Number of lectures = 9**	
Network Security: Overview of Firewalls- Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- William Stalling, Cryptography and Network security-Principles and Practices, Pearson Education, Ninth Indian Reprint 2005.
- James Graham, Ryan Olson, Rick Howard, Cyber Security Essentials, CRC Press, Taylor & Francis, 2011.

Reference Books

Chander, Harish, "Cyber Laws And It Protection", PHI Learning Private Limited, Delhi, India

Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,“Introduction to Information Security and Cyber Law” Willey Dreamtech Press.

Semester III

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Cyber Security Lab</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470324</td><td colspan="2">0</td><td colspan="2">0</td><td>2</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">PE(✓)</td><td>OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td></td><td colspan="2">6. Frequency (use tick marks)</td><td>Even</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 24</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">● To give practical exposure on basic security attacks, encryption algorithms, authentication techniques. Apart from security algorithms, firewall configuration is also introduced.
● To provide practical knowledge to understand various hacking and forensic tools.</td></tr>
<tr><td colspan="8">9. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Ability to identify basic security attacks and services.</td></tr>
<tr><td colspan="8">● Use symmetric and asymmetric key algorithms for cryptography</td></tr>
<tr><td colspan="8">• Will gain the knowledge to implement various security attacks.</td></tr>
<tr><td colspan="8">10. List of Experiments</td></tr>
</table>

11. Experiments should be Project Oriented

1. Implementation of Caesar Cipher technique
2. Implement DES Encryption and Decryption
3. Implement the AES Encryption and decryption
4. Implement RSA Encryption Algorithm
5. Implementation of Hash Functions
6. Configuring Software and Hardware firewall.
7. Firewalls, Packet Analyzers, Filtering methods.
8. Malware – Keylogger, Trojans, Keylogger countermeasures
9. Understanding Data Packet Sniffers
10. Implementing Web Data Extractor and Web site watcher.

During the course student must be do project on:

1. Ethical Hacking (i.e. IP Spoofing attack demonstration)
2. Network Security Management (Student can build a project which can help to improve the network security)
3. Mobile Security (Student can build a project on mobile malware detection, and evasion strategies for both Android and IOS)

4. Stenography (Student can build a project using stenography techniques for data protection for different application domains)

At least one project is mandatory for each student

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using Virtual Link. Please add VLink

http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Byte_Karma/labs/exp1/index.html

Semester III

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Internet of things**	**L**		**T**	**P**	
3. Course Code	13470306	**3**		**0**	**0**	
4. Type of Course (use tick mark)		**Core ()**		**PE(✓)**	**OE ()**	
5. Pre requisite 6. (if any)	Web Fundamentals	**7. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
8. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**		**Practical = 0**		

9. Brief Syllabus

An overview of Internet of Things technology and architecture associated with IoT system,. Discussion of important protocol required for IoT communication. The Internet of Things covers a huge range of industries and use cases that scale from a single constrained device up to massive cross-platform deployments of embedded technologies and cloud systems connecting in real-time.

10. Learning objectives: The objective of this course is to impart knowledge on IoT, its architecture and various protocols, processor for development & case study of IoT applications.

11. Course Outcomes: On completion of this course, the students will be able to

- Overview of IoT
- Understand the Architectural
- Understand the various IoT Protocols
- Real Time Applications – Case study

12. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Introduction to IOT**

Basics of IoT system, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs

Unit-2	**Number of lectures = 09**	**IOT Protocols**

Bluetooth Low Energy, Zigbee Smart Energy, TLS, DTLS, CoAP, OMA, MAC 802.15.4 etc.

Unit-3	**Number of lectures = 09**	**IOT Processors**

Raspberry Pi / Ardiuno Processor: Features & hardware involved in the processor, Programming concepts & instructions, Programming examples.

Unit-4	**Number of lectures = 9**	**IoT Applications**

Lighting as a service, Intelligent Traffic systems, Smart Parking, Smart water management, Case study: IOT for Smart city Barcelona.

13. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

14. Books Recommended

- Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014.
- Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
- Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications
- Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-onApproach)", 1 st Edition, VPT, 2014.

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Internet of Things Lab**	**L**	**T**		**P**	
3. Course Code	13470323	**0**	**0**		**2**	
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE ()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 24**			

8. Course Description

9. Learning objectives:

- To get introduced with hardware & software for the IoT application development board.
- To be familiar with communication protocol
- To explore the hardware & software features.
- Design & develop any hardware applications.

10. Course Outcomes (COs):

- Understand the characteristics of IoT applications development board & software.
- Understand the interfacing with sensors & actuators.
- Understand the designing and developed the IoT applications.

11. List of Experiments

1. Study and understanding of development board for IoT applications.
2. Explore the software used for programming and its programming model.
3. Interaction with analog/digital comunication port.
4. Interfacing of LED's
5. Interfacing of switches to control the operation of LED's.
6. Interfacing of DC motors
7. Interfacing of matrix keyboard with IoT processor
8. Interfacing of LCD module
9. Interfacing of relays.
10. Uses of ADC characteristics
11. Interfacing with analog sensors
12. Interfacing with digital sensors.

During the course student will be able to do project on:

1. IoT based Alarm Clock (It can use more than a traditional alarm clock does to wake up or remind of something important to the user. For instance, it can turn on the smart lights or switch off the fan, etc.)
2. Robot Using Arduino (This project will help students to understand how Arduino works as well as how to interface DC motors, IR sensors, etc.)

3. Smart Street Light (Done By sensing and approaching vehicles)
4. Facial Recognition Door (Student can build a project that can be used to prevent a robbery in a home.

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using Virtual Link. Please add VLink

Semester III

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Artificial Intelligence Lab</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470321</td><td colspan="2">0</td><td colspan="2">0</td><td>2</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">PE(✔)</td><td>OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td></td><td colspan="2">6. Frequency (use tick marks)</td><td>Even</td><td>Odd (✔)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="9">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="3">Tutorials = 0</td><td colspan="3">Practical = 24</td></tr>
<tr><td colspan="9">8. Course Description</td></tr>
<tr><td colspan="9">9. Learning objectives:
● To acquire knowledge on intelligent systems and agents, formalization of knowledge, reasoning with and without uncertainty, machine learning and applications at a basic level.
● To Design appropriate heuristics for a particular problem</td></tr>
<tr><td colspan="9">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="9">● Understand basic principles and techniques of intelligent systems and their practical applications.</td></tr>
<tr><td colspan="9">● Formalization and design of systems capable of automated reasoning.</td></tr>
<tr><td colspan="9">● Implementation and application of machine learning techniques in prediction problems.</td></tr>
<tr><td colspan="9">● Implementation and application of data mining techniques</td></tr>
<tr><td colspan="9">● Formalize and implement constraints in search problems</td></tr>
<tr><td colspan="9">11. List of Experiments</td></tr>
<tr><td colspan="9">1. Program to implement binary search algorithm.

2. Program to implement quick sort algorithm.

3. Program to implement depth first spanning tree.

4. Program to implement Knapsack problem.

5. Program to implement Strassen Multiplication.

6. Program to implement Matrix Multiplication using Divide and Conquer Approach.

7. Program to implement the Traveling Salesman Problem.</td></tr>
</table>

8. Program to implement Depth First Search using Traversal Method.

9. Program to implement Breadth First Search using Traversal Method.

10. Study of Machine Learning and Machine learning algorithms.

11.Program to implement 8 -Queen Problem.

12.Program to implement 15 –Puzzle problem.

During the course student must be do project on:

1. Online Logistic Chatbot System (Student can make a client-server chat module so that it will be easy for client to make any query any time at any location regarding any object)
2. Facial Emotion Recognition(Student can design an application for judging/recognize emotions of any kind on face)
3. Question paper generator system(A database of all related questions can be made, at last it automatically generates a question paper as per required pattern.)
4. Online AI Shopping With M-Wallet System(A user can make a shopping application by which shopping of objects can be done with AI means with the help of a mobile wallet.)

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

https://nlp-iiith.vlabs.ac.in/
http://vlab.co.in/participating-institute-iiit-hyderabad

Semester III

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Artificial Intelligence</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470304</td><td colspan="2">3</td><td colspan="2">0</td><td>0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">PE(✓)</td><td>OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td></td><td>6. Frequency (use tick marks)</td><td>Even</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">Artificial Intelligence (AI) is designed to help learners decode the mystery of artificial intelligence (AI) and its business applications. This course provides an overview of AI concepts and workflows, machine learning and deep learning, and performance metrics.</td></tr>
<tr><td colspan="8">9. Learning objectives:
● To introduce the basic principles, techniques, and applications of Artificial Intelligence.
● To cover knowledge representation, logic, inference, problem solving, search algorithms, game theory, perception, learning, planning, and agent design.
● To experience programming in AI language tools.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● To apply the basic principles, models, and algorithms of AI to recognize, model.</td></tr>
<tr><td colspan="8">● To solve problems in the analysis and design of information systems.</td></tr>
<tr><td colspan="8">● To analyze the structures and algorithms of a selection of techniques related to searching, reasoning, machine learning, and language processing.</td></tr>
<tr><td colspan="8">Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 9</td><td colspan="5"></td></tr>
</table>

Introduction: Background and history, Overview of AI applications areas.

The predicate calculus: Syntax and semantic for propositional logic and FOPL, Clausal form, inference rules, resolution and unification.

Knowledge representation: Network representation-Associative network & conceptual graphs, structured representation- Frames & Scripts.

Intelligent Agents, Structure of Intelligent Agents

Unit – 2	**Number of lectures = 09**	

Search strategies: Strategies for state space search-data driven and goal driven search; Search algorithms- uninformed search (depth first, breadth first, depth first with iterative deepening) and informed search (Hill climbing, best first, A* algorithm, mini-max etc.), computational complexity, Properties of search algorithms-Admissibility, Monotonicity, Optimality, Dominance, etc.

Production system: Types of production system, Control of search in production system.

Unit – 3	**Number of lectures = 09**	

Rule based expert systems: Architecture, development, managing uncertainty in expert systems(Bayesian probability theory, Stanford certainty factor algebra, Nonmonotonic logic and reasoning with beliefs, Fuzzy logic, Dempter/Shaffer and other approaches to uncertainty.

Knowledge acquisition: Types of learning, learning automata, genetic algorithms, intelligent editors, learning by induction.

Unit – 4	**Number of lectures = 9**	

Machine Learning and Pattern Recognition: Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data – EM algorithm, Reinforcement learning, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbour (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/AI

1. **Books Recommended**

Text Books

- George F. Luger, William A. Stubblefield, Artificial Intelligence, The Benjamin / Cummings Publishing Company, Inc

Reference Books

- Dan W. Patterson Introduction to Artificial Intelligence and Expert system PHI
- Eugene Charniak, Drew McDermott Introduction to Artificial Intelligence Addison Wesley.
- Guide to expert systems, Donald A. Waterman, Pearson Education.
- Nils J. Nilsson Principles of Artificial Intelligence Narosa publishing house.
- Jackson Peter, Introduction to Expert systems, 3rd ed., (Addison Wesley)

Semester III

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Cloud Computing</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470303</td><td colspan="2">3</td><td colspan="2">0</td><td>0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">PE(✓)</td><td>OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Computer Network, Operating System, Algorithms</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">This course covers a series of current cloud computing technologies, including technologies for Infrastructure as a Service, Platform as a Service, Software as a Service, and Physical Systems as a Service. The course is also highly project oriented, involving hand-on exploration of existing technologies as well as development of new technologies.</td></tr>
<tr><td colspan="8">9. Learning objectives:
• To introduce Cloud Computing Technologies as used in Industry.
• To give understanding Service Models & Deployment Model in Cloud Computing.
• To familiarize the Concept of Virtualisation & learn the use cases of Cloud Computing with the help of Case Study.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Applying key comparative methodologies to assess the comparative advantages and disadvantages of public vs. private computing clouds</td></tr>
<tr><td colspan="8">● Applying relevant methods to assess the important security and sustainability challenges involved in adopting various cloud architectures</td></tr>
<tr><td colspan="8">● Applying Cloud Computing to Industry Use Cases</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 09</td><td colspan="5"></td></tr>
</table>

Introduction to Cloud Computing, History of Cloud Computing, Cloud service providers, Pros and Cons of Cloud Computing, Benefits of Cloud Computing, Cloud computing vs. Cluster computing vs. Grid computing.		
Unit – 2	**Number of lectures = 09**	
Cloud Computing Architecture, Service Models (XaaS), Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS). Application of Service Models.		
Unit – 3	**Number of lectures = 9**	
Deployment Models, Public cloud, Private cloud, Hybrid cloud, Community cloud,Concept of Virtualisation, Cloud security, Cloud Economics		
Unit – 4	**Number of lectures = 09**	
Case Study on Open Source & Commercial Clouds: Eucalyptus, Microsoft Azure, Amazon EC2.		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- Cloud Computing (Wind) by Dr. Kumar Saurabh, 2nd Edison, Wiley India

Reference Books

- Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
- Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012

Semester III

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Cloud Computing Lab</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470320</td><td colspan="2">0</td><td colspan="2">0</td><td>2</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">PE(✓)</td><td>OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Computer Network, Operating System, Algorithms</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 24</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">9. Learning objectives:
● To analyze, design and provide optimal solution for Computer Science & Engineering and multidisciplinary problems.
● To pursue research by applying knowledge of mathematics and fundamentals of computer science.
● To exhibit recently emerging technical skills and adapt to current trends by engaging in lifelong learning.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Understand the significance of problem analysis</td></tr>
<tr><td colspan="8">● Design and development of solutions to very complex engineering problems</td></tr>
<tr><td colspan="8">● Enabling modern tools usage.</td></tr>
<tr><td colspan="8">● Understand the recent trends in computation and sustainability</td></tr>
<tr><td colspan="8">● Design & Analyze cloud computing use cases and applicability.</td></tr>
<tr><td colspan="8">11. List of Experiments</td></tr>
<tr><td colspan="8">1. To understand the Industry Use-Cases of Cloud Computing.
2. Creating a Warehouse Application in SalesForce.com.
3. Creating an Application in SalesForce.com using Apex programming Language.
4. Implementation of SOAP Web services in C#/JAVA Applications.
5. Deploying & Testing the Web Service.
6. Implementation of Para-Virtualization using VM Ware‘s Workstation/ Oracle‘s Virtual Box.
7. Installation of Guest OS.
8. Installation of Hadoop.
9. Configuration of Hadoop.
10. Understanding Map Reduce.
11. Case Study: Facebook.
12. Case Study: Google App Engine.
13. Case Study: AWS.
14. Case Study: Netflix.</td></tr>
</table>

During the course student must be do project on:

1. Wood Count (Student can create an application using Hadoop Map/Reduce)
2. eBug Tracker (Student can build a Bug Tracking System)
3. Detecting Data Leaks via Sql Injection (Student can build project is to prevent SQL injection while firing queries to database and to make the database secured
4. Data Duplication Removal Using File Checksum (Project to identify redundant data quickly and correctly by using file checksum technique)

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using Virtual Link.

i. https://hadoop.apache.org/
ii. https://aws.amazon.com/
iii. https://cloud.google.com/appengine

Semester III

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Data Science Lab**	**L**	**T**		**P**	
3. Course Code	13470322	**0**	**0**		**2**	
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE ()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 24**			

8. Course Description:

Data Science (DS) is a new, exponentially-growing field, which consists of a set of tools and techniques used to extract useful information from data. Data Science is an interdisciplinary, problem-solving oriented subject that learns to apply scientific techniques to practical problems. The course orients on practical classes and self-study during preparation of datasets and programming of data analysis tasks.

9. Learning objectives:

- Illustrate R objects.
- Make use of different types of datasets for analysis in R.
- Define relations among variables using correlation and covariance analysis.
- Analyze and differentiate the data models for predictions using R.

10. Course Outcomes (COs):

- Use standard Big Data tools and Data Science librairies
- Carry out real-world projects with a variety of real datasets, both at rest and in motion
- Design large scale data science and engineering problems
- Present tangible solution to a real-world Data Science problem

11. List of Experiments

1. R AS CALCULATOR APPLICATION

a. Using with and without R objects on console

b. Using mathematical functions on console

c. Write an R script, to create R objects for calculator application and save in a specified location in disk

2. DESCRIPTIVE STATISTICS IN R

a. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars & cars datasets.

b. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.

3. READING AND WRITING DIFFERENT TYPES OF DATASETS

a. Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.

b. Reading Excel data sheet in R.

c. Reading XML dataset in R.

4. VISUALIZATIONS

a. Find the data distributions using box and scatter plot.
b. Find the outliers using plot.
c. Plot the histogram, bar chart and pie chart on sample data.

5. CORRELATION AND COVARIANCE

a. Find the correlation matrix.
b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data.
c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.

6. REGRESSION MODEL

Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. require (foreign), require(MASS).

7. MULTIPLE REGRESSION MODEL

Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.

8. REGRESSION MODEL FOR PREDICTION

Apply regression Model techniques to predict the data on above dataset.

9. CLASSIFICATION MODEL

a. Install relevant package for classification.
b. Choose classifier for classification problem.
c. Evaluate the performance of classifier.

10. CLUSTERING MODEL

a. Clustering algorithms for unsupervised classification.
b. Plot the cluster data using R visualizations.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using Virtual Link. Please add VLink

Semester III

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<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Data Science</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470305</td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="2">4. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">PE(✓)</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Basic Maths</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">Data Science (DS) is a new, exponentially-growing field, which consists of a set of tools and techniques used to extract useful information from data. Data Science is an interdisciplinary, problem-solving oriented subject that learns to apply scientific techniques to practical problems. The course orients on practical classes and self-study during preparation of datasets and programming of data analysis tasks.</td></tr>
<tr><td colspan="8">9. Learning objectives:
• To develop fundamental knowledge of concepts underlying data science projects
• To explain how math and information sciences can contribute to building better algorithms and software.
• To develop applied experience with data science software, programming, applications and processes</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Able to formulate the problem of knowledge extraction as combinations of data filtration, analysis and exploration methods.</td></tr>
<tr><td colspan="8">● Know basic notions and definitions in data analysis, machine learning.</td></tr>
<tr><td colspan="8">● Know standard methods of data analysis and information retrieval</td></tr>
<tr><td colspan="8">● Possess main software and development tools of data scientist</td></tr>
<tr><td colspan="8">● Learn to develop complex analytical reasoning.</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td colspan="2">Number of lectures = 09</td><td colspan="4"></td></tr>
<tr><td colspan="8">Introduction to Data Science: Meaning of Data Science, Relationship between Big Data and Data Science, Benefits and uses of data science and big data. Facets of data: Structured versus Unstructured data, natural language, machine generated data, graph-based data, audio, image and video data
Data Science Process: Goal setting, retrieving data, data preparation, data cleansing and transformation, exploratory data analysis, data visualization, Model building and performance evaluation, presentation.</td></tr>
<tr><td colspan="2">Unit – 2</td><td colspan="2">Number of lectures = 09</td><td colspan="4"></td></tr>
<tr><td colspan="8">Data set and its features, Meaning of the terms: observations and variables, Discrete and continuous</td></tr>
</table>

variables, quantitative and qualitative variables, dependent and independent variables, variables classified on scale: Nominal, Ordinal, Interval and Ratio variables.

Unit – 3	**Number of lectures = 09**	

Data Munging and data munging tasks: renaming variables, Data type conversion, encoding, decoding and recoding data, Merging datasets, transforming data, imputation, handling anomalous values, missing values and outliers.

Unit – 4	**Number of lectures = 9**	

Machine Learning for Data Science: Meaning, definition and applications of machine learning, Steps involved in a machine learning project, Building a machine learning model: representing training examples, target function, representation of target function, learning algorithms, Basic terminology: features, feature vector, instance space, target function, training data, hypothesis space, inductive bias and Occam's razor principle. Bias versus variance, overfitting and underfitting.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- Joel Grus, Data Science from Scratch, O'Reilly.
- Tom M. Mitchell, Machine Learning, McGraw Hill Education.

Reference Books

- Davy Cielen, Arno D.B. Meysman, Mohamed Ali, Introducing Data Science - Big Data, Machine Learning and More Using Python Tools, Manning Publications Co.
- Rachel Schutt & Cathy O'Neil, Doing Data Science, O'Reilly
- Jiawei Han, Micheline Kamber, Jian Pei , Data Mining Concepts and Techniques, Morgan Kaufmann.
- Ethem Alpaydin, Introduction to Machine Learning, PHI.
- Shai Shalev-Shwartz, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press.

Semester III

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Mobile Application Development</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470317</td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>OOPS</td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td>Tutorials = 0</td><td colspan="4">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">This course provides a basic understanding of Android development, including the use of content providers, creating audio and video services. This course focuses on helping people become an Android application developer and releasing high-quality apps to the marketplace. Learn about the various stages of development on the Android platform and study topics related to UI, application services, permissions and security, graphics and video resources, data persistence, monitoring tools, mobile app marketing, application hosting and more. Develop core Java development skills while you explore key concepts for building rich applications using advanced features. Learn from instructors and guest speakers working in the industry.</td></tr>
<tr><td colspan="8">9. Learning objectives:
• learn the set up and installation of Android.
• learn Android App development
• learn user interfaces and Controls.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● Understand the basics of Android devices and Platform.</td></tr>
<tr><td colspan="8">● Acquire knowledge on basic building blocks of Android programming required for App development</td></tr>
<tr><td colspan="8">● Understand persistence Data storage mechanism in Android</td></tr>
<tr><td colspan="8">● Understand advanced application concepts like networking, Animations and Google Maps services etc</td></tr>
<tr><td colspan="8">● Develop and publish Android applications in to Android Market</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 09</td><td colspan="5"></td></tr>
</table>

Introduction: Introduction to mobile application development, trends, introduction to various platforms, introduction to smart phones

Android platform: Android platform features and architecture, versions, comparison added features in each version. ART (Android Runtime), ADB (Android Debug Bridge).

Development environment/IDE: Android studio and its working environment, gradle build system, emulator setup

Application anatomy: Application framework basics: resources layout, values, asset XML representation and generated R.Javafile

Unit – 2	**Number of lectures = 09**	

GUI for Android: Introduction to activities, activities life-cycle, Android v7 support library form API21 for lower version support

Intent: intent object, intent filters, adding categories, linking activities, user interface design components

Views and View Groups: Basic views, picker views, adapter views, Menu, App Bar etc, basics of screen design; different layouts. App widgets.

Lollipop Material design: new themes, new widgets, Card layouts. Recycler View

Fragments: Introduction to activities, activities life-cycle.

Unit – 3	**Number of lectures = 09**	

Different Data persistence schemes: Shared preferences, File Handling, managing data using SQLite database. Content providers: user content provider, Android in build content providers.

Services: introduction to services – local service, remote service and binding the service, the communication between service and activity, Intent Service. Multithreading: Handlers, AsyncTask

Android network programming: HttpUrlConnection, Connecting to REST-based and SOAP based Web services. Broad cast receivers:LocalBroadcastManager, Dynamic broadcast receiver, System Broadcast. PendingIntent, Notifications. Telephony Manager: Sending SMS and making calls.

Unit – 4	**Number of lectures = 9**	

Location based services: Google maps V2 services using Google API,

Animations and Graphics: Property Animation, View Animations, Drawable Animations

Media and Camera API: Working with video and audio inputs, camera API

Sensor programming: Motion sensors, Position sensors, Environmental sensors.

Publishing Android Apps: Guide lines, policies and process of uploading Apps to Google play

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- Dawn Griffiths, David Griffiths,"Head First: Android Development" ,OReilly2015,ISBN: 9781449362188
- David Tainar - Mobile Computing: Concepts Methodologies, Tools & Applications.

Reference Books

- Barbara L Ciaramtaro - Mobile technology consumption
- Paul Deital,HarveyDeital, Alexander Wald, "Android 6 for Programmers ,App Driven approach",2015, Prentice Hall ,ISBN: 9780134289366
- http://developer.android.com/training/index.htmlas on Date 21.4.2016

Semester III

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Programming in Python**	**L**	**T**		**P**	
3. Course Code	13470302	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE ()**	
5. Pre-requisite (if any)	Basics of Programming	**6. Frequency (use tick marks)**	Even ()	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			
8. Course Description						
An introduction to the Python programming language. Covers details of how to start and stop the interpreter and write programs. Introduces Python's basic datatypes, files, functions, and error handling.						
9. Learning objectives: ● To Learn concepts of various Python script at the shell prompt, Python types, expressions to solve relative problems						
10. Course Outcomes (COs):						
● To utilize high-level data types such as lists and dictionaries						
● To import and utilize a module read from and write to a text file						
● Understand the difference between mutable and immutable types						
● To demonstration of IDE‟s: IDLE, IPython, IPython Notebook, hosted environments						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 09**					
Introduction, Python basic data types, files, functions, and error handling. Working with Data, introduction to tuples, lists, dictionaries, and sets. Students will also learn how to effectively use Python's very powerful list processing primitives such as list comprehensions. Finally, this section covers critical aspects of Python's underlying object model including variables, reference counting, copying, and type checking.						
Unit – 2	**Number of**					

	lectures = 09	
More information about how to organize larger programs into functions. A major focus of this section is on how to design functions that are reliable and can be easily reused in other settings. Also covers technical details of functions including scoping rules and documentation strings. Modules and Libraries. How to organize programs into modules and details on using modules as a tool for creating extensible programs. Concludes with a tour of some of the most commonly used library modules including those related to system administration, text processing, subprocesses, XML parsing, binary data handling, and databases. Also includes information on how to install third-party library modules		
Unit – 3	**Number of lectures = 09**	
An introduction to object-oriented programming in Python. Describes how to create new objects, overload operators, and utilize Python special methods. Also covers basic principles of object oriented programming including inheritance and composition. Inside the Python Object System. A detailed look at how objects are implemented in Python. Major topics include object representation, attribute binding, inheritance, memory management, and special properties of classes including properties, slots, and private attributes.		
Unit – 4	**Number of lectures = 9**	
This includes effective use of documentation strings, program testing using both the doctest and unittest modules, and effective use of assertions. The Python debugger and profiler are also described. Iterators and Generators. Covers the iteration protocol, iterable objects, generators and generator expressions. A major focus of this section concerns the use of generators to set up data processing pipelines--a particularly effective technique for addressing a wide variety of common systems programming problems (e.g., processing large datafiles, handling infinite data streams, etc.). Text I/O Handling. More information on text-based I/O. Topics include text generation, template strings, and Unicode. Some Advanced Topics. A variety of more advanced programming topics including variable argument functions, anonymous functions (lambda), closures, decorators, static and class methods, and packages. Python Integration Primer. A survey of how Python is able to interact with programs written in other programming languages. Topics include network programming, accessing C code, COM extensions, Python, and Iron Python.		
12. Brief Description of self-learning / E-learning component This learning method gives students to find out their learning capability. Students involve some sort of choice in this learning. As self directed learning learners can determine which modules or scenarios to review again and again. https://elearning.sgtuniversity.ac.in/course-category/		

13. Books Recommended
Text Books ● Learning to Program Using Python by Cody Jackson ● Python for complete beginners by Dr. Martin Jones
Reference Books
● Fundamentals of Python: First Programs by Ken Lambert
● Learning Python, 5th Edition by Mark Lutz, O'Reilly Media.
● Easy GUI Programming in Python by Ken Lambert
● The Practice of Computing Using Python by Bill Punch and Rich Enbody

Semester III

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Programming in Python Lab</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470319</td><td>0</td><td colspan="2">0</td><td colspan="2">4</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td></td><td>6. Frequency (use tick marks)</td><td>Even ()</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td>Tutorials = 0</td><td colspan="4">Practical = 48</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">9. Learning objectives:
● To learn concepts of various Python script at the shell prompt.
● To give understanding of various Python data types and expressions to solve relative problems</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● To utilize high-level data types such as lists and dictionaries</td></tr>
<tr><td colspan="8">● To import and utilize a module • read from and write to a text file.</td></tr>
<tr><td colspan="8">● understand the difference between mutable and immutable types</td></tr>
<tr><td colspan="8">● To demonstration of IDE‟s: IDLE, IPython, IPython Notebook, hosted environments.</td></tr>
<tr><td colspan="8">● To utilize high-level data types such as lists and dictionaries</td></tr>
<tr><td colspan="8">11. List of Experiments</td></tr>
<tr><td colspan="8">1. Demonstrate the working of ‘id’ and ‘type’ functions
2. To find all prime numbers within a given range.
3. To print ‘n terms of Fibonacci series using iteration.
4. To demonstrate use of slicing in string
5. To add 'ing' at the end of a given string (length should be at least 3).
6. To compute the frequency of the words from the input. The output should output after sorting the key alphanumerically
7. Write a program that accepts a sequence of whitespace separated words as input and prints the words after removing all duplicate words and sorting them alphanumerically.
8. To demonstrate use of list & related functions
9. To demonstrate use of Dictionary& related functions
10. To demonstrate use of tuple, set& related functions
11. To implement stack using list
12. To implement queue using list
13. To read and write from a file
14. To copy a file
15. To demonstrate working of classes and objects
16. To demonstrate class method & static method
17. To demonstrate constructors
18. To demonstrate inheritance
19. To demonstrate aggregation/composition</td></tr>
</table>

During the course student must be do project on:

1. To create a small GUI application for insert, update and delete in a table using Oracle as backend and front end for creating form
2. Dice Rolling Simulator (This beginner-level project will help build a strong foundation for fundamental programming concepts)
3. Number Guessing (To compute the difference between the two, and to check whether an actual number was inputted or not)
4. Random Password Generator (Student can build a program that intakes some words from the user and then generates a random password using those words.

At least one Project is mandatory for each student.

Semester III

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Web Technology</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470301</td><td>3</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Computer Fundamentals</td><td>6. Frequency (use tick marks)</td><td>Even</td><td>Odd (✓)</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td>Tutorials = 0</td><td colspan="4">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">To help the students to understand the concept of HTML, CSS, Java script, PHP and MYSQL.</td></tr>
<tr><td colspan="8">9. Learning objectives:
Upon successful completion of the course in this discipline the student will be able to develop a complete dynamic website with data base as backend.
● To learn fundamental language of internet i.e. HTML and cascading style sheets.
● To learn basics of client side JavaScript and server side programming constructs.
● To design multimedia pages over web.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● How to design and develop a dynamic website.
● Basic knowledge of web services which are useful for the same.
● Acquainted with the difference between client side and server side scripting.
● Import multimedia pages over web.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td colspan="2">Number of lectures = 10</td><td colspan="4"></td></tr>
<tr><td colspan="8">HTML :- Basics of HTML, formatting and fonts, hyperlink, tables, images, forms, XHTML, Meta tags, Browser architecture and Web site structure. Overview and features of HTML5.

Style Sheets: Introduction to CSS, Need for CSS, basic syntax and structure using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding</td></tr>
</table>

lists, positioning using CSS.

Unit – 2	Number of lectures = 9	

Java Script:-

Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators, Statements, Document and its associated objects, Events and Event Handlers, Core JavaScript (Properties and Methods of Each)

Unit – 3	Number of lectures = 08	

PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC.

Unit – 4	Number of lectures = 9	

MYSQL: Introduction to Database and MYSQL, RDBMS-Understanding Tables, Records & Fields, SQL language, MYSQL queries.

Working with MYSQL Admin: Working with PHP My admin, data types, creating Database and tables, dropping Database and tables, adding fields, selecting table, Altering fields properties.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- PHP for the Web: Visual QuickStart Guide, Ullman, Pearson Education; Fifth edition, 2017.

Reference Books

- Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, Javascript, PHP, Java, Jsp, XML and Ajax, Black Book, Kogent Learning Solutions Inc., Dreamtech Press; 1 edition, 2009.
- Mastering HTML, CSS & Javascript Web Publishing, Laura Lemay, BPB Publications; First edition, 2016.
- Beginning HTML5 with CSS3, Christopher Murphy , Apress publisher,1st ed. Edition, 2012.

Semester III

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	Web Technology Lab	**L**	**T**		**P**	
3. Course Code	13470318	**0**	**0**		**2**	
4. Type of Course (use tick mark)		Core (✓)	**PE()**		**OE ()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even	Odd (✓)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 12**			

8. Course Description

To help the students to understand the concept of HTML, CSS, Javascript and PHP

9. Learning objectives:

Upon successful completion of the course in this discipline the student will be able to develop a complete dynamic website with database as backend.

10. Course Outcomes (COs):

- Hand on practice on HTML and learned the need and basics of CSS and the concepts of client side JavaScript
- How to design and develop a dynamic website.
- Import multimedia pages over the web.

11. List of Experiments

List of Experiments:

1. Create a Web Page using basic tags in html 5
2. Write a program to create all types of list in HTML
3. Create a table using Html 5 and CSS
4. Write a program using labels, radio buttons, and submit buttons
5. Create a simple webpage using HTML
6. Use frames to Include Images and Videos.
7. Add a Cascading Style sheet for designing the web page.
8. Design a web page with validation using JavaScript.

9	How to make all fields of a form mandatory in javascript
10	Create a registration form and validate it using javascript
11	Perform database connectivity in PHP
12	Create a dynamic web page using PHP

During the course student must be do project on:

1. Hotel management system using HTML, CSS and Javascript.
2. Quiz Game using HTML, CSS and Javascript.
3. Online Shopping.
4. Online Photo gallery system

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using Virtual Link.

https://html-iitd.vlabs.ac.in/List%20of%20experiments.html

Semester III

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Mobile Application Development Lab**	**L**	**T**		**P**	
3. Course Code	13470325	**0**	**0**		**2**	
4. Type of Course (use tick mark)		**Core ()**	**PE(✔)**		**OE ()**	
5. Pre-requisite (if any)	OOPS	**6. Frequency (use tick marks)**	Even	Odd (✔)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 24**			

8. Course Description

9. Learning objectives:

The objective of this course is to

- Develop basic Android application
- Creating Activities
- Using Intents for activity communication
- Develop the GUI application.

10. Course Outcomes (COs):

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

- Understand android application hierarchy, UI components and their purpose
- Create activity, do activity to activity communication using intents and transfer data between/among intents.
- Apply style to android UI components
- Able to use and implement menus, notifications & implement notification using Notification
- Compact Builder class
- Configure and implement context menu and option menu as a part of android app.
- Deploy and test the applications using Android AVD.

11. List of Experiments

1. Create a basic mobile application
2. Working with forms
3. Android App- working with intents
4. Apply style and theme in an android app
5. Create an Android app that does payment process via a context menu
6. Create an Android app that does a currency converter operations using an options menu
7. Create an Android notification app that displays notification about the messages received
8. Create an Android app for sending data from first activity to second activity.
9. Create an Android app for getting result from second activity (Using startActivityForResult)
10. Create an Android app for storing user data using SQLITE

During the course student must be do project on:

1. Cab booking android application (Student can design an application for cab booking)
2. Android women safety app (Student can design an application by which user can get help from nearest police station)
3. Organ Donation Android Application
4. Personal Diary for visually impaired with Microsoft cognitive services.

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

Semester IV

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	Application Development for Cloud PlatformLab	**L**	**T**		**P**	
3. Course Code	13470407	**0**	**0**		**8**	
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE ()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 6 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 48**			

8. Course Description

To help the students to understand:

- The concept of cloud computing and describe the choices that are available to developers when creating cloud applications
- Describe infrastructure as a service, platform as a service, and software as a service

9. Learning objectives:

Upon successful completion of the course in this discipline the student will be able creating cloud applications and deploy on cloud platform.

10. Course Outcomes (COs):

- Evaluate various cloud delivery models.
- Assess cloud characteristics and service attributes, for compliance with enterprise objectives.
- Key security and control considerations within cloud computing environments
- Understand Cloud Segments and Cloud Deployment Models

11. List of Experiments

List of Experiments:

1. Create your own cloud using a local server
2. To Create a Warehouse Application on cloud.
3. Configuring Eclipse to work with the cloud development platform
4. Push applications from Eclipse to the cloud development platform
5. Building a mobile application to test on a real device.
6. Creating an IBM SDK for Node.js application
7. Create a callback function
8. Creating an Express server object
9. Creating a Hello World Express application
10. Creating Simple HTML view for your application
11. Create and Deploy Applications in KubernetesClusteronMinikub
12. Launching an application and deployment on cloud

During the course student must be do project on:

- E-Learning Platform using Cloud Computing
- University Campus Online Automation Using Cloud Computing
- Cloud Based Student Information Chatbot Project
- eBug Tracker – Bug Tracking System Project

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using Virtual Link.

https://html-iitd.vlabs.ac.in/List%20of%20experiments.html

Semester IV

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Application Development for Cloud Platform</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470401</td><td>6</td><td colspan="2">0</td><td colspan="2">0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core (✓)</td><td colspan="2">PE()</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td></td><td>6. Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 6 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td>Tutorials = 0</td><td colspan="4">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">To help the students to understand:
• The concept of cloud computing and describe the choices that are available to developers when creating cloud applications
• Describe infrastructure as a service, platform as a service, and software as a service</td></tr>
<tr><td colspan="8">9. Learning objectives:
Upon successful completion of the course in this discipline the student will be able creating cloud applications and deploy on cloud platform.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">At the end of the course, the student can:
• Earn basic knowledge of Cloud Technologies in use today
• Strategic plan to move applications and services to the Cloud
• Understand Cloud Segments and Cloud Deployment Models
• Importance of security in cloud computing
• Static Application Development using Service models</td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 8</td><td colspan="5"></td></tr>
<tr><td colspan="8">CLOUD BASED APPLICATIONS:-Introduction, Contrast traditional software development and development for the cloud. Public v private cloud apps. Understanding Cloud ecosystems – what is SaaS/PaaS, popular APIs, mobile.</td></tr>
<tr><td colspan="2">Unit – 2</td><td>Number of lectures = 9</td><td colspan="5"></td></tr>
<tr><td colspan="8">DESIGNING CODE FOR THE CLOUD : Class and Method design to make best use of the Cloud</td></tr>
</table>

infrastructure; Web Browsers and the Presentation Layer: Understanding Web browsers attributes and differences. Building blocks of the presentation layer: HTML, HTML5, CSS, Silverlight, and Flash.

Unit – 3	**Number of lectures = 10**	

WEB DEVELOPMENT TECHNIQUES AND FRAMEWORKS: - Building Ajax controls, introduction to Javascript using JQuery, working with JSON, XML, REST. Application developement Frameworks e.g. Ruby on Rails , .Net, Java API's or JSF; Deployment Environments – Platform As A Service (PAAS) ,Amazon, vmForce, Google App Engine, Azure, Heroku, AppForce.

Unit – 4	**Number of lectures =10**	

Developing Cloud Application with SDK for Node.JS: Explaining the origin and purpose of the Node.js JavaScript framework ,Writing a simple web server with Node.js, Import Node.js modules into your script, Deploying an IBM SDK for Node.js application on an IBM Cloud account, Explaining the concept of anonymous callback functions, Explaining the concept of asynchronous callback functions, Handling inbound HTTP method calls for a server resource .

Web Services and Application Deployment: Understanding the Watson Natural Language Understanding service, Create and Deploy Applications in KubernetesClusteronMinikub, Application Development using real time platform, Launching an application and deployment on cloud.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- Chris Hay, Brian Prince, Azure in Action [ISBN: 978-1935182481]
- Henry Li, Introducing Windows Azure [ISBN: 978-1-4302-2469-3]

Reference Books

- Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, MatiasWoloski, Developing Applications for the Cloud on the Microsoft Windows Azure Platform [ISBN: 9780735656062]
- Eugene Ciurana, Developing with Google App Engine [ISBN: 978-1430218319]
- Charles Severance, Using Google App Engine [ISBN: 978-0596800697]

Semester IV

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Blockchain Lab</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470410</td><td>0</td><td colspan="2">0</td><td colspan="2">8</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core ()</td><td colspan="2">PE(✔)</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Cryptography</td><td>6. Frequency (use tick marks)</td><td>Even (✔)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 6 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 48</td></tr>
<tr><td colspan="8">8. Course Description
Learn the fundamental concepts of Blockchain and implement them in Java</td></tr>
<tr><td colspan="8">9. Learning objectives:
• Understand how blockchain systems work, To securely interact with them, Design, build, and deploy smart contracts and distributed applications, Integrate ideas from blockchain technology into their own projects.</td></tr>
<tr><td colspan="8">10.Course Outcomes (COs):
• Investigate blockchain technologies, their core components, protocols, and use cases.
• Critically appraise the challenges and disruptive aspects of blockchain technologies.
• Build and critically evaluate blockchain applications.
• Evaluate the state of the art and emerging use cases of blockchain</td></tr>
<tr><td colspan="8">11. List of Experiments
1. WAP to generate the prime number using Rabin-Miller Test.

2. Write a program to perform encryption and decryption
using the following algorithms:
a) Ceaser Cipher
b) Substitution Cipher
c) Hill Cipher

3. Write a program to implement the DES algorithm logic.
4. Write a program to implement the BlowFish algorithm Logic.
5. Write a program to implement the Rijndael algorithm logic.
6. Write a program to implement RSA Algoithm.
7. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one ofthe parties (Alice) and the JavaScript application as otherparty (bob).
8. Calculate the message digest of a text using the SHA-3algorithm in JAVA.

During the course student must be do project on:
1. AES Encryption for Shell Scripts
2. Encryption of text in files while saving on hard disk.
3. Implementation Diffie-Hellmann Key Exchange with OpenSSL</td></tr>
</table>

4. Implementation of File to Image Encryption

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

https://www.geeksforgeeks.org/introduction-java-servlets/
https://www.geeksforgeeks.org/socket-programming-in-java/

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Big Data & Hadoop**	**L**	**T**		**P**	
3. Course Code	13470403	**6**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE ()**	
5. Pre-requisite (if any)	Cloud Computing	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 6 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Course Description

Today's world is data-driven world. Increasingly, the efficient operation of organizations across sectors relies on the effective use of vast amounts of data. This course provides grounding in basic and advanced analytic methods and an introduction to big data analytics technology and tools.

9. Learning objectives:

- Learn about the basics of data Science and to understand the various supervised and unsupervised learning techniques.
- Bring together several key technologies used for manipulating, storing, and analyzing big data from advanced analytics perspectives.
- Realize the Hadoop architecture and implementation of MapReduce Application.

10. Course Outcomes (COs):

- Understanding of Big Data problems with easy to understand examples
- History and advent of Hadoop right from when Hadoop wasn't even named Hadoop
- What is Hadoop Magic which makes it so unique and powerful
- Understanding the difference between Data science and data engineering, which is one of the
    a. big confusions in selecting a carrier or understanding a job role.

11. Unit wise detailed content

Unit-1	**Number of lectures = 09**	

Data Import and Export, Attribute and Data Types, Descriptive Statistics, Exploratory Data Analysis, Visualization Before Analysis, Dirty Data, Visualizing a Single Variable, Examining Multiple Variables, Data Exploration Versus Presentation

Unit – 2	**Number of lectures = 09**	

Working with Big Data:
Google File System, Hadoop Distributed File System (HDFS) — Building blocks of Hadoop(Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local,Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.Writing MapReduce Programs:

Unit – 3	**Number of lectures = 09**	

Hadoop l/O:

The Writable Interface, WritableComparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, BytesWritable, Nul1Writable, ObjectWritable and Genericwritable, Writable collections, Implementing a Custom Writable: Implementing a RaWComparator for speed, Custom comparators		
Unit – 4	**Number of lectures = 9**	
Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin		
12. Brief Description of self-learning / E-learning component The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal. https://elearning.sgtuniversity.ac.in/course-category/		
13. Books Recommended		
Text Books ● Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly Hadoop in Action by ● Chuck Lam, MANNING Publ ● Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly		
Reference Books		
Hadoop for Dummies by Dirk deR0os, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown,		

Semester IV

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Big Data & Hadoop Lab**	**L**	**T**		**P**	
3. Course Code	13470409	**0**	**0**		**8**	
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE ()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 6 weeks of one semester)						
Lectures = 0		**Tutorials = 0**	**Practical = 48**			

Course Description:

The course begins with a brief introduction to the Hadoop Distributed File System and MapReduce, then covers several open source ecosystem tools, such as Apache Spark, Apache Drill, and Apache Flume. Finally, these tools are applied to real-world use cases. Ideal for business managers, students, developers, administrators, analysts or anyone interested in learning

8. the fundamentals of transitioning from traditional data models to big data models.

9. Learning objectives:

Provide the skills needed for building computer system for various applications in a career in Computer Science field.

- Explain the characteristics of Big Data
- Describe the basics of Hadoop and HDFS architecture
- List the features and processes of MapReduce
- Describe the basics of Pig

10. Course Outcomes (COs):

- History and advent of Hadoop right from when Hadoop wasn't even named Hadoop
- What is Hadoop Magic which makes it so unique and powerful
- Understanding the difference between Data science and data engineering, which is one of the
    a. big confusions in selecting a carrier or understanding a job role
- And most importantly, demystifying Hadoop vendors like Cloudera, MapR and Hortonworks
    a. by understanding about them.

11. List of Experiments

1. Introduction to Hadoop
2. Hadoop Distributed File System
3. Hadoop Architecture
4. MapReduce & HDFS Hadoop Eco Systems
5. Introduction to Pig
6. Introduction to Hive
7. Introduction to HBase
8. Other eco system Map Hadoop Developer
9. Moving the Data into Hadoop
10. Moving The Data out from Hadoop
11. Reading and Writing the files in HDFS using java program
12. The Hadoop Java API for MapReduce o Mapper Class o Reducer Class o Driver Class
13. Writing Basic MapReduce Program In java
14. Understanding the MapReduce Internal Components
15. Hbase MapReduce Program

During the course student must be do project on:

1. Eco System (Map Hadoop Developer)
2. Facebook/Twitter Analysis
3. Malicious user Detection in Big Data collection
4. Text Mining Project

At least one Project is mandatory for each student.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using Virtual Link. Please add VLink

Semester IV

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Blockchain**	**L**	**T**		**P**	
3. Course Code	13470404	**3**	**0**		**2**	
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE ()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			
8. Course Description						
An introduction to the blockchain, architecture and design, blockchain consensus protocols, Hyperledger Fabric						
9. Learning objectives: • To understand emerging abstract models for Blockchain Technology. • To identify major research challenges and technical gaps existing between theory and practice in cryptocurrency domain						
10. Course Outcomes (COs):						
● To identify the problems for machine learning and select the either supervised, unsupersvised or reinforcement learning						
● To explain theory of probability and statistics related to machine learning						
● To investigate concept learning, ANN, Bayes classifier, k nearest neighbor,						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 09**					
Introduction to Blockchain: Digital Money to Distributed Ledgers , Design Primitives: Protocols, Security, Consensus, Permissions, Privacy.Blockchain Architecture and Design: Basic crypto primitives: Hash, Signature,) Hashchain toBlockchain, Basic consensus mechanisms						
Unit – 2	**Number of lectures = 09**					
Consensus: Requirements for the consensus protocols, Proof of Work (PoW), Scalability aspectsof Blockchain consensus protocolsPermissioned Blockchains:Design goals, Consensus protocols for Permissioned Blockchains						
Unit – 3	**Number of**					

	lectures = 09	
Hyperledger Fabric : Decomposing the consensus process , Hyperledger fabric components,Chaincode Design and Implementation, Hyperledger Fabric, Beyond Chaincode: fabric SDK and Front End, Hyperledgercomposer tool		
Unit – 4	**Number of lectures = 09**	
Blockchain in Financial Software and Systems (FSS): Settlements, KYC, Capital markets, Insurance, Blockchain in trade/supply chain: Provenance of goods, visibility, trade/supplychain finance, invoice management discounting, Blockchain for Government: Digital identity, land records and other kinds of recordkeeping between government entities,		
12. Brief Description of self-learning / E-learning component This learning method gives students to find out their learning capability. Students involve some sort of choice in this learning. As self directed learning learners can determine which modules or scenarios to review again and again. https://elearning.sgtuniversity.ac.in/course-category/		
13. Books Recommended		
Text Books ● Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press		
Reference Books		
● Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy		
● J.A.Garay et al, The bitcoin backbone protocol - analysis and applications EUROCRYPT 2015 LNCS VOl 9057.		

Semester IV

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Machine Learning</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470402</td><td colspan="2">6</td><td colspan="2">0</td><td>0</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">PE(✓)</td><td>OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td>Basics of Programming</td><td>6. Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 6 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 36</td><td colspan="2">Tutorials = 0</td><td colspan="3">Practical = 0</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">An introduction to the machine learning concepts. Supervised learning, Unsupervised Learning, Re-enforcement learning, Machine Learning algorithms.</td></tr>
<tr><td colspan="8">9. Learning objectives:
● To define machine learning and problems relevant to machine learning.
● To differentiate supervised, unsupervised and reinforcement learning
● To apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in machine learning.
● To perform statistical analysis of machine learning techniques.
○</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● To identify the problems for machine learning and select the either supervised, unsupersvised or reinforcement learning</td></tr>
<tr><td colspan="8">● To explain theory of probability and statistics related to machine learning</td></tr>
<tr><td colspan="8">● To investigate concept learning, ANN, Bayes classifier, k nearest neighbor,</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8"></td></tr>
<tr><td colspan="8">11. Unit wise detailed content</td></tr>
<tr><td colspan="2">Unit-1</td><td>Number of lectures = 09</td><td colspan="5"></td></tr>
<tr><td colspan="8">Introduction to Machine Learning, Artificial Intelligence, Machine Learning vs AI., Types of Machine Learning, Supervised, Unsupervised, Reinforcement, Process of Machine Learning, Overfitting, Underfitting, Variance, Bias, Linear Algebra, Probability, Stats Calculus (Derivates)</td></tr>
<tr><td colspan="2">Unit – 2</td><td>Number of lectures = 09</td><td colspan="5"></td></tr>
<tr><td colspan="8">Supervised Learning, Classification, Random Forest, Decision Trees, Logistic Regression, Support</td></tr>
</table>

Vector Machines, KNN, Naïve Bayes, Regression, Linear Regression, Regularization Techniques (LASSO), Polynomial Regression		
Unit – 3	**Number of lectures = 09**	
Unsupervised Learning, Clustering, K-Means, K Nearest Neighbours, Association Rule Learning, Dimensionality Reduction, PCA, SVD, tSNE, Reinforcement Learning, Markov Decision, Monte Carlo Prediction		
Unit – 4	**Number of lectures = 9**	
Neural Networks/Deep Learning, CNN, RNN/LSTM/GRU, Transfer Learning, Natural Language Processing, Text Mining, Generation, Predictive Analytics – Forecasting, Logistic, Time Series (ARIMA), Ensemble Techniques, Boosting, Bagging		

12. Brief Description of self-learning / E-learning component

This learning method gives students to find out their learning capability. Students involve some sort of choice in this learning. As self directed learning learners can determine which modules or scenarios to review again and again.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education

Reference Books

- Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics
- Ethem Alpaydın, Introduction to machine learning, second edition, MIT press.

Semester IV

MCA

<table>
<tr><td colspan="8">1. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">2. Course Name</td><td>Machine Learning Lab</td><td>L</td><td colspan="2">T</td><td colspan="2">P</td></tr>
<tr><td colspan="2">3. Course Code</td><td>13470408</td><td>0</td><td colspan="2">0</td><td colspan="2">4</td></tr>
<tr><td colspan="3">4. Type of Course (use tick mark)</td><td>Core ()</td><td colspan="2">PE(✓)</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">5. Pre-requisite (if any)</td><td></td><td>6. Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="8">7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td>Tutorials = 0</td><td colspan="4">Practical = 48</td></tr>
<tr><td colspan="8">8. Course Description</td></tr>
<tr><td colspan="8">9. Learning objectives:
● Make use of Data sets in implementing the machine learning algorithms
● Implement the machine learning concepts and algorithms in any suitable language of choice.</td></tr>
<tr><td colspan="8">10. Course Outcomes (COs):</td></tr>
<tr><td colspan="8">● To understand the implementation procedures for the machine learning algorithms.</td></tr>
<tr><td colspan="8">● To design Java/Python programs for various Learning algorithms.</td></tr>
<tr><td colspan="8">● To apply appropriate data sets to the Machine Learning algorithms.</td></tr>
<tr><td colspan="8">● To identify and apply Machine Learning algorithms to solve real world problems</td></tr>
<tr><td colspan="8">● To understand the implementation procedures for the machine learning algorithms.</td></tr>
<tr><td colspan="8">11. List of Experiments</td></tr>
<tr><td colspan="8">1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for</td></tr>
</table>

clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data sets for your experiment and draw graphs.

During the course student must be do project on:

1. Optimal Road Trip Planning (Analyzing optimal road trip planning using Genetic Algorithm with Google maps)
2. Road Accident Analysis using Machine Learning
3. Gaming Agent AI
4. Twitter sentiment Analysis using Machine Learning

At least one Project is mandatory for each student.

MCA IV

1. Name of the Department- MCA , Computer Science & Engineering						
2. Course Name	**Research Methodology**	**L**	**T**		**P**	
3. Course Code	13470406	**6**	**0**		**0**	
4. Type of Course (use tick mark)		**Core (✓)**	**PE()**		**OE ()**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 6 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Course Description

In this course, You will learn how to develop hypotheses and research questions, sampling analysis and also the reliability of product and design research projects. You will be exposed to the broad range of designs used in research from laboratory and field experiments, surveys, content analysis, focus groups and in-depth interviewing. Specifically, in research, explain and apply science, describe the research process and the principle activities, skills and ethics associated with the research process.

9. Learning objectives:

- Students will be able to select appropriate methodologies like survey analysis, data analysis, case study and interview. In modern phase
- Students will be able to identify and analysis technique based on different research methods.
- Students will be able to construct a questionnaire based on several types of situation.

10. Course Outcomes (COs): After study this subject

- Explain the relationship between theory and research.
- Comparative study of the major quantitative and qualitative research methods in research.
- Researcher easily uses the methodology, hypothesis and tool.
- Know the importance of research ethics and how to use research ethics into the research process.

11. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Introduction to Research and its Design**

Meaning of research, Purpose of research, Types of research, Scope, objectives and significance of Legal Research and selection of Choosing of problem, Feature & Criteria of a good research problem.

Unit – 2	**Number of lectures = 09**	**Research Design & Case Study**

Types of Research, Different research designs, Merits & Demerits of Doctrinal and Non-Doctrinal, Methods and Techniques of Data Collection. Qualitative methods observation, interview & case study

method, Meaning, Assumptions of case study method, Advantages and disadvantages of case study method, Making case study effective, Case study as a method of business research.

Unit – 3	**Number of lectures = 09**	**Sampling Theory**

Sampling procedure, Characteristics & Type of good sample Methods of sampling, Need, Advantages, ANOVA, Sources of Data, Primary and Secondary, Classification and Tabulation of Data Processing, Analysis and Interpretation of Data.

Unit – 4	**Number of lectures = 09**	**Hypothesis & Report writing**

Introduction, Meaning and Examples of hypothesis, Hypothesis tested, Types of hypothesis, Null hypothesis, Formulation hypothesis, Need for having a working hypothesis, Problems in formulation of hypothesis, Testing of hypothesis, Steps involved in Applying Test (Chi Square, t-Test, z-Test), Significance of statistics in Socio-legal Research, Use of Computer in the Research field work and report writing.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- Montgomary, Douglas C. (2007) 5/e, Design and Analysis of Experiments (Wiley India)
- Montgomary, Douglas C. & Runger, George C. (2007) 3/e, Applied Statistics & probability for Engineers (Wiley India)

Reference Books

- CONNAWAY (L S) & POWELL (R R). Basic research methods for librarians (Ed.5), (2010) Libraries unlimited. California.
- GOODE (WJ) and HATT (PK): Methods in social research. McGraw-Hill, (1982) New York.
- KOTHARI (C R). Research methodology: Methods & Techniques (Rev. Ed.), (2006) New Age International. New Delhi.
- Krishnswamy, K.N., Shivkumar, Appa Iyer and Mathiranjan M. (2006) Management Research Methodology; Integration of Principles, Methods and Techniques (Pearson Education, New Delhi)

Semester IV

MCA

1. Name of the Department- Computer Science & Engineering						
2. Course Name	**Virtual Reality**	**L**	**T**		**P**	
3. Course Code	13470405	**6**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE(✓)**		**OE ()**	
5. Pre-requisite (if any)	Computer Graphics	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 6 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Course Description

In this course, the students will learn the use of virtual reality in 3D Animation. Students will also learn various techniques of virtual reality.

9. Learning objectives:

- Learn the concepts of virtual reality
- Learn about visual physiology
- Learn about visual perception and tracking systems
- Learn the concepts of Audio and Interfaces

10. Course Outcomes (COs):

- Apply the concepts of virtual reality.
- Apply visual physiology in 3D Animation
- Apply the concepts of visual perception and tracking systems
- Apply concepts of Audio and Interfaces.

11. Unit wise detailed content

Unit-1	**Number of lectures = 9**	

Introduction:

Course mechanics Goals and VR definitions , Birds-eye view (general) , Birds-eye view , Birds-eye view (software) , Birds-eye view (sensation and perception)

Geometry of Virtual Worlds:

Geometric modeling , Transforming models , Matrix algebra and 2D rotations, 3D rotations and yaw, pitch, and roll , 3D rotations and yaw, pitch, and roll, Axis-angle representations Quaternions , Converting and multiplying rotations , Converting and multiplying rotations, Homogeneous transforms , The chain of viewing transforms , Eye transforms , Eye transforms, Canonical view transform , Viewport transform , Viewport transform.

Unit – 2	**Number of lectures = 09**	

Light and Optics:

Three interpretations of light, Refraction, Simple lenses, Diopters, Imaging properties of lenses, Lens

aberrations, Optical system of eyes

Visual Physiology:

Photoreceptors, Sufficient resolution for VR, Light intensity, Eye movements, Eye movements, Eye movement issues for VR, Neuroscience of vision

Unit – 3	**Number of lectures = 09**	

Visual Perception:

Depth perception, Depth perception, Motion perception, Frame rates and displays, Frame rates and displays

Tracking Systems:

Overview , Orientation tracking , Tilt drift correction , Yaw drift correction , Tracking with a camera , Perspective n-point problem , Filtering , Lighthouse approach

Unit – 4	**Number of lectures = 09**	

Visual Rendering:

Visual Rendering-Overview , Visual Rendering-overview, Shading models , Rasterization, Pixel shading , VR-specific problems , Distortion shading, Post-rendering image warp

Audio and Interfaces:

Physics and physiology, Auditory perception, Auditory localization, Rendering, Specialization and display , Combining other senses

Interfaces -overview, Locomotion, Manipulation, System control, Social interaction, Evaluation of VR Systems

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

- George Mather, Foundations of Sensation and Perception: Psychology Press; 2 edition, 2009.
- Peter Shirley, Michael Ashikhmin, and Steve Marschner, Fundamentals of Computer Graphics, A K Peters/CRC Press; 3 edition, 2009.

Reference Books

- Alan B Craig, William R Sherman and Jeffrey D Will, Developing Virtual Reality Applications: Foundations of Effective Design, Morgan Kaufmann, 2009.
- Gerard Jounghyun Kim, Designing Virtual Systems: The Structured Approach, 2005.
- Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, 3D User Interfaces, Theory and Practice, Addison Wesley, USA, 2005.
- Oliver Bimber and Ramesh Raskar, Spatial Augmented Reality: Meging Real and Virtual Worlds, 2005.
- Burdea, Grigore C and Philippe Coiffet, Virtual Reality Technology, Wiley Interscience, India, 2003.

Semester IV

MCA

<table>
<tr><td colspan="8">13. Name of the Department- Computer Science & Engineering</td></tr>
<tr><td colspan="2">14. Course Name</td><td colspan="2">Virtual RealityLab</td><td colspan="2">L</td><td colspan="2">T</td><td>P</td></tr>
<tr><td colspan="2">15. Course Code</td><td colspan="2">13470411</td><td colspan="2">0</td><td colspan="2">0</td><td>8</td></tr>
<tr><td colspan="3">16. Type of Course (use tick mark)</td><td colspan="2">Core ()</td><td colspan="2">PE(✓)</td><td colspan="2">OE ()</td></tr>
<tr><td colspan="2">17. Pre-requisite (if any)</td><td></td><td colspan="2">18. Frequency (use tick marks)</td><td>Even (✓)</td><td>Odd ()</td><td>Either Sem ()</td><td>Every Sem ()</td></tr>
<tr><td colspan="9">19. Total Number of Lectures, Tutorials, Practical (assuming 6 weeks of one semester)</td></tr>
<tr><td colspan="3">Lectures = 0</td><td colspan="3">Tutorials = 0</td><td colspan="3">Practical = 48</td></tr>
<tr><td colspan="9">20. Course Description</td></tr>
<tr><td colspan="9">● To give practical exposure on various virtual reality techniques and their application.
● To provide practical knowledge of different virtual reality hardware devices .</td></tr>
<tr><td colspan="9">21. Course Outcomes (COs):</td></tr>
<tr><td colspan="9">● Completeunderstanding different virtual reality hardware and software tools.</td></tr>
<tr><td colspan="9">● Develop Virtual Reality applications.</td></tr>
<tr><td colspan="9"></td></tr>
<tr><td colspan="9">22. List of Experiments</td></tr>
</table>

11. Create a simple animation using OpenGL
12. Write a Program to compress image using Python.
13. Practical Study of any virtual reality tool/software. (i.e.3DS MAX, BLENDER, GOOGLE VR)
14. Create a short movie clip using open source tool
15. Perform CRO based experiment using Virtual Reality.
16. Developing architecture of a house using Virtual Reality.
17. Explore human anatomy using Virtual Reality.
18. Simulation of Fight/Vehicle/Space Station.
19. Developing concept of Virtual class room with multiplayer.

During the course student must be do project on:

1. Build a Virtual Reality web application using open source tool
2. Gaming (Students can build a project to develop simple game using VRML techniques)
3. Studentscan build a Virtual Reality Driving Test Simulator.
4. Students can build interaction equipment in the University VR Centre using Virtual Reality display.

At least one Project is mandatory for each student.

23. Brief Description of self-learning / E-learning component

https://www.vrlabacademy.com/Experiments.html?MenuCode=VR-VERSION

Open Elective

14. Name of the Department- Centre for languages and Communication						
15. Course Name	**FL- German language-I**	**L**	**T**		**P**	
16. Course Code	**13470104**	**3**	**0**		**0**	
17. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE (✓)**	
18. Pre-requisite (if any)		**19. Frequency (use tick marks)**	Even ((✓)	Odd)	Either Sem ()	Every Sem ()
20. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			
21. Course Description						
Basic communication in simple German, Simple conversational phrases, formation of simple sentences, negative sentences, interrogative sentences, simple vocabulary related to house, family, common objects, simple prepositions and conjugation of verbs.						
1. Learning objectives: The students will be: 1.Familiar with the basic level of German Language 2.Able to understand communication in German language 3.Can read simple sentences of day to day Life						
22. Course Outcomes (COs):						
Upon successful completion of this course students will:						
i) Understanding of the pronunciation of German words.						
ii) Introduce them.						
iii) Able to write effectively						
23. Unit wise detailed content						
Unit-1	**Number of lectures = 08**	**Title of the unit: Getting to know people**				
Getting to know people Alphabet Vocabulary Introduction						

Unit – 2	Number of lectures = 08	Title of the unit: Arrival
Arrival Pronouns and Verbs Question formation		
Unit – 3	**Number of lectures = 08**	**Title of the unit: Seeing the Sights**
Seeing the Sights Finding your way on foot How do I get to…. How to point out something Verbs Again (Grammar)		
Unit – 4	**Number of lectures = 10**	**Title of the unit: Public Transportation**
Public Transportation What to say to the conductor Some contractions More action Verbs On Nouns and Articles (grammar) **All about Time and Numbers** What time is it ? Ordinal Numbers Our Travel plans Grammar **Countries and Languages** I am ……. I am travelling to... Lost in the way.		
24. Brief Description of self-learning / E-learning component ➢ Learngermanwtihjenny.com ➢ Learngermanwithanja.com ➢ Smartergerman.com ➢ Lingoda.com		

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/general

25. Books Recommended

Text book

Barron's German (Learn Deutsch) The Fast and Fun Way. Third Edition by Paul and Heywood Wald, coordinating Editor. 2004

Reference Books

Deutsch als Fremd Sprache A1 by Dengler, Rusch, Schmitz and Sieber. Klett Langenscheidt, Munchen. Published by Goyal Publishers

Lernziel Deutsch: Deutsch als Fremdsprache by Wolfgang Hieber. 2007. Max HueberVerlag (Max Hueber Publication) Munchen

German Elementary Grammar by Kars

1. Name of the Department- Centre for languages and Communication						
2. Course Name	**FL- German language-II**	**L**	**T**		**P**	
3. Course Code	**13470308**	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE (✓)**	
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Course Description

Can understand sentences and commonly used expressions associated with topics directly related to his/her direct circumstances (e.g., personal information or information about his/her family, shopping, work, immediate surrounding). Can make him/ herself understood in simple, routine situations dealing with a simple and direct exchange of information on familiar and common topics. Can describe his/her background and education, immediate surroundings and other things associated with immediate needs in a simple way

2. Learning objectives:

The students will be:

1. Enabled to write/frame simple sentences in day to day Life.
2. Able to understand communication in German language
3. Able to speak simple sentences of day to day Life

9. Course Outcomes (COs):

Upon successful completion of this course students will:

iv) Understand simple German conversation.

v) Write German language easily.

vi) Able to speak simple sentences.

10. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Cars and Vans**

Cars and Vans

Road signs

At the Car Rental Office

Essential phrases for Drivers
Road signs
At the service station
The Car
Essential Expressions about your car
Grammar :
The Imperative
Modal Verbs

Unit – 2	**Number of lectures = 09**	**Title of the unit: At the Grocery store**

At the Grocery store
How do you say
Grammar :
More important Verbs

Unit – 3	**Number of lectures = 09**	**Title of the unit: Weather / Season**

Weather / Season
How is the weather
If today is Tues day , then….
Grammar…
Adjective

Unit – 4	**Number of lectures = 9**	**Title of the unit: Airplanes and Trains**

Airplanes and Trains

The Plane
Asking for something
All Aboard
Grammar :
Reflexive Pronouns
Direct Object Pronouns

Ordering Food
Meals / Food
Breakfast
The Table
The main Meal , The Noon meal
To give and take

11. Brief Description of self-learning / E-learning component

- Learngermanwtihjenny.com
- Learngermanwithanja.com
- Smartergerman.com
- Lingoda.com

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant

lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/general

12. Books Recommended

Text book

Barron's German (Learn Deutsch) The Fast and Fun Way. Third Edition by Paul and Heywood Wald, coordinating Editor. 2004

Reference Books

Deutsch als Fremd Sprache A1 by Dengler, Rusch, Schmitz and Sieber. Klett Langenscheidt, Munchen. Published by Goyal Publishers

Lernziel Deutsch: Deutsch als Fremdsprache by Wolfgang Hieber. 2007. Max HueberVerlag (Max Hueber Publication) Munchen

German Elementary Grammar by Kars

1. Name of the Department- Centre for Languages and Communication						
2. Course Name	Professional Communication Skills	**L**	**T**		**P**	
3. Course Code	13470309	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE (✓)**	
5. Pre-requisite (if any)	Proficiency in English	**6. Frequency (use tick marks)**	Even (✓)	Odd ()	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practicals = 0**			
8. Course Description						
Professional communication courses are designed to provide business **professionals** with the tools that they need to **communicate** clearly and effectively. They often cover subjects such as **communication** theory, writing, speaking, intercultural **communication**, correspondence, **communications** history, and leadership **skills**.						
9. Learning objectives: 1. Enhancing listening-speaking Skills 2. Enhancement of Vocabulary and Pronunciation Skills. 3. Enhancement of Debating Skills which will further enhance public speaking Skills 4. Induce Reading and Thinking ability 5. Enhancing skills pertaining to industry						
10. Course Outcomes (COs):						
Upon successful completion of this course students will:						
1. Able to convey their ideas in an expressive and effective way						
2. Able to speak confidently before the audience						
3. Able to get a holistic industry perspectives						
11. Unit wise detailed content						
Unit-1	**Number of lectures = 9**	**Title of the unit:** Listening and Speaking Comprehension				
Listening and Speaking Comprehension: Greetings and self introduction**,** Review of Animated mute short stories, Audio clippings followed one response questionnaire						
Unit – 2	**Number of lectures = 9**	**Title of the unit: : Vocabulary Building and Pronunciation**				
Unit-2: Vocabulary Building and Pronunciation: Introduction to app based dictionary-Merriam Webster and Vocab24						

Understanding of Syllable, Stress, Pitch, and Intonation**,** Word building with compounding process

Unit – 3	**Number of lectures =9**	**Title of the unit: Speaking Comprehension**

Unit-3: Speaking Comprehension: Introduction to language used in social networking- code mixing and code switching, Panel Discussion with tug of words, Fish bowl technique, Situation based dialogues. Spontaneous throw of ideas leading to problem solving, situation based dialogues, case studies.

Unit – 4	**Number of lectures = 9**	**Title of the unit: Reading Comprehension**

Unit-4: Reading Comprehension: Introduction to essence of reading. Types of Reading**,** Extensive reading session of newspaper, excerpt, articles, stories, critical analysis on reading abstracts. Making a digital newspaper with innovative categories.

Writing Comprehension: Paragraphs, Essays, Short stories, Articles, Reports, Proposal, Dissertation, Thesis, Letters, Emails, Note taking, Note making

12. Brief Description of self learning / E-learning component

Students can practice from various sites online for Aptitude Building Questions. https://www.indiabix.com/, https://www.indiabix.com/online-test/aptitude-test , https://www.crazyengineers.com › ... › Engineering Jobs & Career Advice, https://testbook.com/aptitude etc.

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal:

https://elearning.sgtuniversity.ac.in/course-category/general/

13. Books Recommended (3 Text Books + 2-3 Reference Books)

1. **Improve your Writing**, V.N. Arora, Lakshmi Chandra, Oxford University Press, New Delhi 2014
2. **Technical Communication Principles and Practice'**, Meenakshi Raman and Sangeeta Sharma, Oxford University Press 2012
3. **Communication Skills in English,** D. G. Saxena and Kuntal Tamang, Top Quark, 2011 cue
4. '**Essential English Grammar**',Raymond Murphy, Cambridge University Press 1998

1. Name of the Department: Centre for Languages & Communication						
2. Course Name	**Personality & Career Building**	**L**	**T**		**P**	
3. Course Code	**13470109**	3	0		0	
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE(√)**	
5. Pre-requisite (if any)	English Language Proficiency, Aptitude Building Basics	**6. Frequency (use tick marks)**	Even	Odd (√)	Either Sem ()	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Brief Syllabus

i. Strategies and Skills Required for Career building/Recruitment/ Team building
ii. Group Discussion and Role Play
iii. Business/job Correspondence
iv. Time and Work, Data Interpretation
v. Algebra and Simple Reasoning

9. Learning objectives:

1. Negotiation skills
2. Team work
3. Ready to apply for a job
4. Implementing logical Aptitude in decision making

10. Course Outcomes (COs):

i. able to get an idea of industry perspective
ii. able to develop a logical thought process related to every aspect of life
iii. to interpret data and convert it into information
iv. able to hold meaningful group discussions
v. able to develop and respond to daily situations using critical thinking

Unit wise detailed content

Unit-1	**Number of lectures =9**	**Title of the unit:** Strategies and Skills Required for Career building/Recruitment/ Team building

Learning of different strategies to be used: Negotiation, Assertions, Politeness through Conversation, Assertive Strategies, Leadership Skills, Team Work, Management Skills through Group Activities

Unit - 2	**Number of lectures = 9**	**Title of the unit:** Group Discussion and Role Play

Listening and Speaking Comprehension through Group Discussion and audio-visual aids, Do's and Don'ts of Group Discussions related to various topics (Day- Today life/Social Issues/Political and

others		
Unit - 3	**Number of lectures = 9**	**Title of the unit:** Business/job Correspondence
Resume Writing, Letter Writing, Job Application Letter Linear and Quadratic Equation, Function Basics, Inequalities, Progression, Set Theory/ Venn Diagram, Pie Chart, Permutation and Combination, Probability, Visual reasoning, Alphabet based reasoning		
Unit - 4	**Number of lectures = 9**	**Title of the unit: Time and Work, data Interpretation**
Time and Work, Time speed distance, Table, Line Graph, bar Graph, Cube, Dice, Calendars, Test on Pie and Bar Charts, Comprehensive Practice Test-I on Area Covered, Comprehensive Practice test-2 on Area Covered		

vi. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal:

https://elearning.sgtuniversity.ac.in/course-category/general/

vii. Books Recommended (3 Text Books + 2-3 Reference Books)

1. Sanjay Kumar and Pushp Lata 'Communication Skills', OUP 2012
2. Raymond Murphy 'Essential English Grammar', Cambridge University Press 1998
3. Meenakshi Raman and Sangeeta Sharma 'Technical Communication Principle and Practice', OUP 2012
4. Meenakshi Raman and Prakash 'Business Communication' OUP 2011
5. Hory Samkar Mukerjee 'Business Communication Connecting at Work' OUP 2013

1. Name of the Department- Mechanical Engineering						
2. Course Name	**Supply Chain and Logistic Management**	**L**	**T**		**P**	
3. Course Code	13470310	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE (✓)**	
5. Pre-requisite (if any)	**IEM**	**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (✓)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Course Description

This is a course in supply chain management (SCM), a term which denotes the integration of key business processes from end user through original suppliers for the purpose of adding value for the firm, its key supply chain members, to include customers and other stakeholders. This course presents a framework for SCM that requires cross-functional integration of key business processes within the firm and across the network of firms that comprise the supply chain.

9. Learning objectives:

- **i)** An understanding of the primary differences between logistics and supply chain management.
- **ii)** An understanding of the individual processes of supply chain management and their interrelationships within individual companies and across the supply chain.
- **iii)** An understanding of the management components of supply chain management.
- **iv)** An understanding of the tools and techniques useful in implementing supply chain management.
- **v)** Knowledge about the professional opportunities in supply chain management.

10. Course Outcomes (COs):

- **i)** Explore opportunities for cost reduction through Supply Chain efficiency.
- **ii)** Understand how optimization can improve revenue streams.

11. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Logistic Managements**

Introduction, Logistics system design, Demand planning, Multiple channel distribution, Multi-echlon system, Model development, Concept of warehousing, Methods of storage, Primary and secondary transportation, Logistics information system, Logistics costing

Unit – 2	**Number of lectures = 09**	**Title of the unit:Supply Chain Management**

Understanding the Supply Chain, Process view, Decision phases and importance of supply chain, Supply chain management and logistics, supply chain and the value chain, Competitive advantage,

supply chain and competitive performance, changing competitive environment, Supply Chain drivers and obstacle		
Unit – 3	**Number of lectures = 9**	**Title of the unit: Matching supply and demand**
The lead-time gap, Improving the visibility of demand, supply chain fulcrum, forecast for capacity, execute against demand, Demand management and aggregate planning, Collaborative planning, forecasting and replenishment.		
Unit – 4	**Number of lectures = 9**	**Title of the unit: Strategic Management**
Creating the responsive supply chain Product 'push' versus demand 'pull' The Japanese philosophy, Foundations of agility, Route map to responsiveness. Strategic lead-time management: Time-based competition, Lead-time concepts, Logistics pipeline management. Planning and managing inventories in a supply chain: managing economies of scale in supply chain cycle inventory, managing uncertainty in supply chain, determining optimal level of product availability.		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

13. Books Recommended

i) Chopra, S. and Meindl, P. Supply Chain Management,Prentice Hall, (2010).

ii) Christopher, M. Logistics & Supply Chain Management, FT Prentice Hall, (2011).

iii) John T. Mentzer, J. T. Supply Chain Management, illustrated edition, SAGE Publications (2001).

iv) Michael H. Hugos, M. H. Essentials of Supply Chain Management, John Wiley, (2011).

v) Simchi-Levi, D.,Kaminsky, P., Simchi-Levi, E. Designing and Managing the Supply Chain, McGraw Hill Higher Education. (2011)

1. Name of the Department- Mechanical Engineering						
2. Course Name	**Hydrogen and Fuel Cells**	**L**	**T**		**P**	
3. Course Code	13470311	**3**	**0**		**0**	
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE (✓)**	
5. Pre-requisite (if any)	**IC Engines, Automobile Engineering**	**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (✓)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials = 0**	**Practical = 0**			

8. Course Description

This course provides students a brief overview on Hydrogen and Fuel cells. This includes understanding the newest energy variants. Also give overview how to store and utilize these energies.

9. Learning objectives:

i) The objective of the course is to provide comprehensive and logical knowledge of hydrogen production, storage and utilization. In addition, provides an understanding of various fuel cell technologies

10. Course Outcomes (COs):

i) Evaluate the performance of fuel cells under different operating conditions.

ii) Select and defend appropriate fuel cell technology for a given application.

iii) Design and develop suitable hydrogen storage system to be used along with fuel cell system.

iv) Minimize environmental hazards associated with the use of hydrogen storage and fuel cell technology.

11. Unit wise detailed content

Unit-1	**Number of lectures = 09**	**Title of the unit: Introduction of hydrogen energy systems**

Properties of hydrogen as fuel, Hydrogen pathways introduction-current uses, general introduction to infrastructure requirement for hydrogen production, storage, dispensing and utilization, and hydrogen production plants.

Unit – 2	**Number of lectures = 09**	**Title of the unit:Hydrogen production processes**

Thermal-Steam reformation, thermo chemical water splitting, gasification-pyrolysis, nuclear thermal catalytic and partial oxidation methods. Electrochemical-Electrolysis, photo electro chemical, Biological-Anaerobic digestion, fermentation micro-organism, PM based electrolyzer

Unit – 3	**Number of lectures = 09**	**Title of the unit:Hydrogen Storage and utilization**

Physical and chemical properties, general storage methods, compressed storage-composite cylinders, glass micro sphere storage, zeolites, metal hydride storage, chemical hydride storage and cryogenic storage, carbon-based materials for hydrogen storage.

Overview of hydrogen utilization, IC Engines, gas turbines, hydrogen burners, power plant, domestic cooking gas, marine applications, hydrogen dual fuel engines.

Unit – 4	**Number of lectures = 9**	**Title of the unit: Fuel cells**

History – principle - working - thermodynamics and kinetics of fuel cell process – performance evaluation of fuel cell – comparison on battery Vs fuel cell, Types of fuel cells – AFC, PAFC, SOFC, MCFC, DMFC, PEMFC, microbial fuel cells, relative merits and demerits.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

13. Books Recommended

i) Sorenson B, Hydrogen and Fuel Cells: Emerging Technologies and Applications, Bent Sorenson, Academic Press (2005). 2. 3.

ii) Hordeski MF, Hydrogen and Fuel Cells: Advances in Transportation and Power, The Fairmont Press, Inc. (2009)

iii) Busby RL, Hydrogen and Fuel Cells: A Comprehensive Guide, Penn Well Books (2005).

1.Name of the Department		**CIVIL ENGINEERING**				
2. Course Name	**Geoinformatics**	**L**	**T**		**P**	
3. Course Code	13470105	3	0		0	
4.Type of Course		**Core ()**	**PE()**		**OE(✓)**	
5. Pre-requisite (if any)	**Surveying**	**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (✓)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 36		**Tutorials = 00**	**Practical =00**			

8. **Brief Syllabus:**

This course is intended to provide an introduction to the techniques used in radar remote sensing. The course covers the underlying principles of the measurement techniques and the interaction of microwaves with natural surfaces. The course focuses on the role of satellite radar systems and their application to monitoring aspects of the Earth's surface, including snow and ice, oceanic wind fields, agriculture and forestry.

Learning objectives:

1. To prepare the students for successful careers in Geospatial Industries and Information Technology that meet the needs of India and other Countries.
2. To develop the professional ability among the students to collect various Geospatial relates from various platform, data, analysis and synthesis that create user oriented real world applications.
3. To provide an opportunity for students to work as part of teams on multidisciplinary projects
4.To provide students with a sound foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze engineering and multidisciplinary problems and to prepare them for graduate studies.
5. To promote students awareness of the life-long learning and to introduce them to professional ethics and codes of professional practice**.**

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

1. Will acquire basic knowledge in B.E (Geoinformatics) and engineering.
2. Will acquire the ability to model and development of application in Geospatial arena interprets and analyze data, and report results.
3. Will acquire the ability to develop Geospatial system that meets desired specifications and requirements.
4. Will acquire the ability to function on engineering and science laboratory teams, as well as on multidisciplinary problem solving teams.
5. Will acquire the ability to identify, formulate and solve Geometrics related problems.
6. Will acquire an understanding of their professional and ethical responsibilities.
7. Will be able to communicate effectively in both verbal and written forms.

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9. Unit wise detailed content

Unit-1	**Number of lectures = 9**	**Title of the unit: Photogrammetric Survey**

basic principles, elevation of a point, determination of focal length of lens, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, scale of a tilted photograph, tilt distortion, relief displacement of a tilted photograph,

combined effects of tilt and relief, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope parallax, parallax in aerial stereoscopic views, parallax equations. Photogrammetry – analog, analytical and digital photogrammetry.		
Unit – 2	**Number of lectures = 09**	**Title of the unit: Remote Sensing**
Introduction, concepts and physical basis of Remote Sensing, Electromagnetic spectrum, radiation laws, atmospheric effects, image characteristics. Remote sensing systems; sources of remote sensing information, spectral quantities spectral signatures and characteristics spectral reflectance curves for rocks, soil, vegetation and water. Introduction to Aerial and space borne platforms. Optical, thermal and microwave sensors and their resolution, salient features of some of operating Remote Sensing satellites		
Unit – 3	**Number of lectures = 09**	**Title of the unit: Digital image processing**
Introduction, image rectification and restoration, image enhancement, image transformation, manipulation, image classification, fusion. Applications of remote sensing to civil engineering.		
Unit - 4	**Number of lectures = 9**	**Title of the unit: GIS system**
Definition terminology and data types, basic components of GIS software, data models, data acquisition, both raster based and vector based data input and data processing and management including topology, overlaying and integration and finally data product and report generation. GIS applications in civil engineering.		
10. Brief Description of self learning / E-learning component		
11. Books Recommended		

Text Books + Reference Books

1. Sateesh Gopi, R Sathkumar & N Madhu "Advanced Surveying GIS & Remote Sensing" Pearson Education.
2. Kang Tshung Chang "Introduction of Geographic Information Systems" TMH.
3. Campbell, "Introduction to Remote Sensing" 3/e, CRC Press Taylor & Francis Group.
4. Chen, "Signal and Image Processing for Remote Sensing" CRC Press Taylor & Francis Group.
5. A M Chandra: Higher Surveying Narosa Pub

1Name of the Department		**CIVIL ENGINEERING**				
2Course Name	**Engineering Geology**	**L**	**T**		**P**	
3Course Code	13470107	3	0		0	
4Type of Course (use tick mark)		**Core ()**	**PE()**		**OE(✓)**	
5Pre-requisite (if any)	Nil	**1. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (✓)	Every Sem ()
6Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials =00**	**Practical =0**			

Brief Syllabus:

Engineering Geology is the application of the geological sciences to Civil Engineering practice for the purpose of recognizing the location, design, construction, operation and maintenance of engineering projects such as Dams, Barrages, Bridges, High rise buildings and other such important projects. Students will be able to know the details of rock formation and study of rock cycle. Students will be able to identify different minerals and find their properties. They will understand the various geological features e.g. folds and faults. They will be able to select geologically suitable sites for massive Civil Constructions work.

7Learning objectives:

1. The overall objective of lecture portion of engineering geology is to demonstrate the importance of Geology in making engineering decisions specially site selection of engineering projects.

2. Introduce the fundamentals of engineering properties of earth materials for their use in civil engineering constructions.

3. Develop quantitative skills and frame work for solving basic engineering geology problems related to geological features and geological hazards and remedial measures thereof.

8Course Outcomes:

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

1. Characterize and classify various minerals and rocks on the basis of their engineering properties.

2. Assess geological hazards and develop mitigation frameworks.

3. Use seismic and electrical methods to investigate subsurface and develop a native construction plan incorporating all relevant aspects of geology**.**

9Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** **Minerals and Rocks**
Relevance and importance of Engineering Geology in Civil Engineering. Minerals - their physical properties, rock forming minerals, Physical and engineering properties of igneous, metaphoric and sedimentary rocks.		
Unit - 2	**Number of lectures = 10**	**Title of the unit:** **Interior Structure of earth**
Earth's interior is based on seismic models, Earth's geomagnetic field, Plate tectonics and continental drift theory, study of earth's geological structures – fold, faults and joints, Geological factors affecting Civil Engineering constructions, Geological maps- their uses and interpretation.		
Unit – 3	**Number of lectures = 9**	**Title of the unit: Weathering and Soils**
The atmosphere, Weather and climate, Ocean structure and composition, Rock decay and weathering. Soil origin and formation, classification and its engineering importance, Slope stability, rock and soil slope stability analysis.		
Unit – 4	**Number of lectures = 07**	**Title of the unit:** **Ground Water**
Characteristic of ground water, Global distribution of water, Hydro Geological Cycle, Darcy's Law, laboratory permeability tests, Types of aquifers, Water level fluctuations, Surface and subsurface geophysical methods, Groundwater contamination, Artificial recharge of groundwater, Seawater intrusion and harvesting of rainwater.		

10Brief Description of self learning / E-learning component

1Name of the Department		**CIVIL ENGINEERING**				
2Course Name	**Natural Disaster Mitigation and Management**	**L**	**T**		**P**	
3Course Code	13470106	3	0		0	
4Type of Course (use tick mark)		**Core ()**	**PE()**		**OE(✓)**	
5Pre-requisite (if any)	Nil	**2. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (✓)	Every Sem ()
6Total Number of Lectures, Tutorials, Practical (assuming 12weeks of one semester)						
Lectures = 36		**Tutorials =**	**Practical**			

Brief Syllabus:

With the increases in the numbers of interventions by the human beings with the natural processes and by the implication on load on the environment, natural disasters are common in the today's world. Students learn natural disasters around the world and risk assessment, disaster mitigation, preparedness, response and recovery, earthquake, geological, geo-morphological aspects, landslides, severe weather & tornadoes, cyclones, floods and droughts. Upon completion, students should be able to Map, conduct modeling, risk analysis and loss estimation, natural disaster risk analysis and apply prevention and mitigation measures to reduce the impacts.

7Learning objectives:

1. To understand the aspects of atmospheric pollution and its flow.

2. To know about the issues such as atmospheric composition, monitoring, acidic deposition, urban air quality

3. To understand the use and application of air quality models for the identification of plume flow.

8Course Outcomes:

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

1. The types of natural and environmental disasters and its causes.

2. About organizational and Administrative strategies for managing disasters.

3. About the early warning systems, monitoring of disasters effect and necessity of rehabilitation.

4. About the engineering and non-engineering controls of mitigating various natural disasters.

5. Learn methodologies for disaster risk assessment with the help of latest tools like GPS, GIS, Remote sensing, information technologies, etc.

9Unit wise detailed content

Unit-1	**Number of lectures = 10**	**Title of the unit:** **Natural Disasters – Overview**

Introduction- Natural Disasters around the world- Natural Disaster Risk Assessment- Earth and its characteristics – Environmental Change and Degradation - Climate Change - Global warming – Human Dimensions of Global environment Change – Disaster mitigation, preparedness, response and recovery- comprehensive emergency management Early warning systems and Disaster Preparedness– Rehabilitation, Vulnerable Populations - Logistics and Services, Food, Nutrition and Shelter -Role of UN Red cross and NGOs

Unit – 2	**Number of lectures = 11**	**Title of the unit:** **Plate Tectonics& Earthquakes**

Introduction and Review - Natural Disasters -Principles, Elements, and Systems - Geological- Geo-morphological aspects, - Earthquake- Geology, Seismology, Characteristics and dimensions– Landslides- Human impact on the mountainous terrain and its relationship with Rainfall, liquefaction etc- Tsunami - Nature and characteristics

Unit – 3	**Number of lectures = 10**	**Title of the unit: Critical climate system aspects and Processes**

Oceanic, Atmospheric and Hydrologic cycles - Severe Weather & Tornadoes , Cyclones, Floods and Droughts - Global Patterns -Mitigation & Preparation – Drought – Famine- nature & dimensions – Drought Assessment & Monitoring.

Unit – 4	**Number of lectures = 06**	**Title of the unit:** **Natural hazards Assessment and Communication**

Mapping - Modeling, risk analysis and loss estimation – Natural disaster risk analysis - prevention and mitigation - Applications of

Space Technology (Satellite Communications, GPS, GIS and Remote Sensing and Information / Communication Technologies (ICT) in Early warning Systems - Disaster Monitoring and Support Centre– Information Dissemination – Mobile Communications etc.

10Brief Description of self learning / E-learning component

11Books Recommended

Text Books

1. Edward A Keller, Robert H Blodgett (2007), Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes,

Pearson Prentice Hall, 2nd Edition.

2. Didax (2007), Natural Disasters, Didax Educational Resources: ISBN: 9781583242728

Reference books

1. Edward Bryant (2005), Natural Hazards, Cambridge University Press, New York. ISBN: 978-0521537438

2. Robert L Kovach Earth's Fury (1995), An Introduction to Natural Hazards and Disasters, Prentice Hall.

3. Davi Alexander (1993), Natural Disasters, Routledge. ISBN: 9781857280937

1Name of the Department		**CIVIL ENGINEERING**				
2Course Name	**Solid Waste management**	**L**	**T**		**P**	
3Course Code	13470108	3	0		0	
4Type of Course (use tick mark)		**Core ()**	**PE()**		**OE(✓)**	
5Pre-requisite (if any)	Nil	**3. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (✓)	Every Sem ()
6Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		**Tutorials =**	**Practical**			

Brief Syllabus:

Solid waste management, the collecting, treating and disposing of solid material that is discarded because it has served its purpose or is no longer useful. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector borne disease, that is, disease spread by rodents and insects. The tasks of solid waste management present complex technical challenges. They also pose a wide variety of administrative, economic and social problems that must be managed and solved.

7Learning objectives:

1.To gain insight into collection, transfer and transport of municipal solid waste

2.Understand the design and operation of municipal solid waste landfill

3. Understand the design and operation of resource recovery facility.

8Course Outcomes:

At the end of the course ,the student will be able to:-

1.Understand solid waste and its composition

2. Understand various processes involved in solid waste collection, segregation and transportation.

3.Design solid waste disposal facility

9Unit wise detailed content		
Unit-1	**Number of lectures = 10**	**Title of the unit:** **Municipal Solid Waste Management**
Definition of solid waste–waste generation–major, sources and types of solid waste – sampling and characterization – Determination of composition of MSW–storage and handling of solid waste – Future changes in waste composition.		
Unit – 2	**Number of lectures = 11**	**Title of the unit:** **Collection of Solid Waste**
Waste collection systems, analysis of collection system–alternative techniques for collection system. Need for transfer operation, transport means and methods, transfer station types and design requirements		
Unit – 3	**Number of lectures = 11**	**Title of the unit:Transportation of Solid Waste**
Need for transfer operation, transport means and methods, transfer station types and design requirements		
Unit – 4	**Number of lectures = 10**	**Title of the unit: Process of Solid Waste and Energy recovery**
Unit operations for separation and processing, Materials Recovery facilities, Waste transformation through combustion and aerobic composting, anaerobic methods for materials recovery and treatment – Energy recovery – Incinerators		
10 Brief Description of self learning / E-learning component		
11 Books Recommended **Text Books** George Techobanoglous et al," Integrated Solid Waste Management ", McGraw-Hill Publication, 1993 **References** 1. Handbook of Solid Waste Management by Frank Kreith, George Tchobanoglous, McGraw Hill Publication 2. Bagchi, A., Design, Construction, and Monitoring of Landfills,(2ndEd). Wiley Interscience, 3. 1994. ISBN: 0-471-30681-9. 4. Sharma, H.D., and Lewis, S.P., Waste Containment Systems, Waste Stabilization, and		

Landfills: Design and Evaluation. Wiley Interscience, 1994.ISBN: 0471575364.
5. George Techobanoglous et al," Integrated Solid Waste Management ", McGraw-Hill Publication, 1993.
6. Charles A. Wentz; "Hazardous Waste Management ", McGraw-Hill Publication, 1995.

1. Name of the Department – ELECTRONICS and COMMUNICATION ENGINEERING						
2. Subject Name	**Signal & Systems**	**L** – 3	**T – 0**		**P -0**	
3.Course Code	13470312					
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE(√)**	
5. Pre-requisite (if any)	**Engineering Mathematics-II**	**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem **(√)**	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 36		**Tutorials =0**	**Practical =0**			

8. Course Description

This subject is about the mathematical representation of signals and systems. The most important representations we introduce involve the frequency domain – a different way of looking at signals and systems, and a complement to the time-domain viewpoint. Indeed engineers and scientists often think of signals in terms of frequency content, and systems in terms of their effect on the frequency content of the input signal.

9. Course objectives: The students will learn and understand

1. Determination of system response for a signal.
2. Fourier and Z transform techniques as tool for signal analysis

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. Demonstrate an understanding of the relation among the transfer function, convolution, and the impulse response, by explaining the relationship, and using the relationship to solve forced response problems.
2. Demonstrate an understanding of the relationship between the stability and causality of systems and the region of convergence of their Laplace transforms, by correctly explaining the relationship, and using the relationship to determine the stability and causality of systems.

11. Unit wise detailed content

Unit-1	**Number of lectures = 9**	**Introduction to Signals & Systems**

Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one dimensional/ multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their inter-relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables)

Unit – 2	**Number of lectures = 9**	**Laplace-Transform (LT) and Z-transform**

One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC), One sided and Bilateral Z-

transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping

Unit – 3	**Number of lectures = 9**	**Fourier Transforms (FT)**

Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT, Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT.

Unit – 4	**Number of lectures = 9**	**Linear Time Invariant**

Continuous Time Systems: Linear Time invariant Systems and their properties. Differential equation & Block diagram representation, Impulse response, Convolution integral, Frequency response (Transfer Function), Fourier transforms analysis. Discrete Time System: Difference equations, Block diagram representation, Impulse response, Convolution sum, MATLAB tutorials.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books:

1. P. Ramakrishna Rao, `Signal and Systems' 2008 Ed., Tata McGraw Hill, New DelhIi.

1. Name of the Department – Electronics And Communication Engineering						
2. Subject Name	**Digital Electronics & Computer Organization**	**L –** 3	**T – 0**		**P -0**	
3.Course Code	13470313					
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE(√)**	
5. Pre-requisite (if any)	**Knowledge of Basic Algebra, Basic Electronics**	**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (√)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 36		**Tutorials =0**	**Practical =0**			

8. Course Description

The course covers basic of logic expression, Reduction techniques of Boolean expression. Knowledge of digital systems design based on combinational and sequential logic is also imparted. This course further teaches about PLD, Memories and Logic Families.

9. Course objectives:

1. Understanding the different number systems used in computerized system and codes used to represent the digits and arithmetic operation using each number system and codes.
2. Enabling students to take up application specific sequential circuit to specify the finite state machine and designing the logic circuit.

10. Course Outcomes (COs):

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

1. Verify and analyze the input/output data of each logic gate and circuits such as adders, counters.
2. Apply the digital circuit design concept in developing basic component of computer organization, projects or experiments.

11. Unit wise detailed content

Unit-1	**Number of lectures = 8**	**Number System and Boolean algebra**

Review of number system, Boolean algebra: De-Morgan's theorem, PI & EPI, Expression minimization using K-maps & Quine McCluskey method, Introduction to Logic Gates and their combinations.

Unit – 2	**Number of lectures = 9**	**Combinational & Sequential Circuits**

Combinational Circuits: Design of adder/subtractors, Comparators, code converters, encoders/decoders, multiplexers/de-multiplexers, Function realization.

Sequential Circuits: Latches and Flip flops - SR, D, JK and T. Design of Counters and shift registers.

Unit – 3	Number of lectures = 9	Synchronous & Asynchronous Sequential Circuits
Finite State Machine, Mealy/Moore Machines. Analysis & design of Synchronous sequential circuits, Analysis & design of Asynchronous sequential machines.		
Unit – 4	**Number of lectures = 9**	**Programmable Devices & Logic Families**
Memories: ROM, RAM, PROM, EPROM, Cache Memories, And PLA, PLD, And FPGA, digital logic families: TTL, ECL, CMOS.		

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1. Mano, Morris. "Digital logic." Computer Design. Englewood Cliffs Prentice-Hall (1979).

Reference Books

1. Floyd, Thomas L. Digital Fundamentals, 10/e. Pearson Education India, 1986.
2. Malvino, Albert Paul and Donald P. Leach. Digital principles and applications. McGraw-Hill, 1986.
3. Jain, Rajendra Prasad. Modern Digital Electronics 3. Tata McGraw-Hill Education, 2003.

1. Name of the Department – ELECTRONICS and COMMUNICATION ENGINEERING						
2. Subject Name	**Real time Embedded System**	**L** – 3	**T – 0**		**P -0**	
3.Course Code	13470314					
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE(√)**	
5. Pre-requisite (if any)	**Embedded System**	**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (√)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical						
Lectures = 36		**Tutorials =0**	**Practical =0**			

8. Course Description

Introduces microcontrollers and embedded processors. Gives knowledge of embedded system programming. Students can independently design and develop a hardware platform encompassing a microcontroller and peripherals.

9. Course objectives: The students will learn and understand

1. The basic concepts of Embedded Systems
2. The applications of embedded systems involving real-time programming of microcontrollers.

10. Course Outcomes (COs): On completion of this course, the students will be able to

1. To learn the basic concepts of Embedded Systems
2. To gain an understanding of applications of embedded systems involving real-time programming of microcontrollers.

11. Unit wise detailed content

Unit-1	**Number of lectures = 9**	**PIC Microcontroller**

Architecture - Features – Resets –Memory Organizations: Program Memory, Data Memory – Instruction Set – simple programs. Interrupts –I/O Ports –Timers- CCP Modules- Master Synchronous serial Port (MSSP)- USART –ADC- I2C

Unit – 2	**Number of lectures = 9**	**Embedded Processors**

ARM processor- processor and memory organization, Data operations, Flow of Control, CPU Bus configuration, ARM Bus, Memory devices, Input/output devices, Component interfacing, designing with microprocessor development and debugging, Design Example: Alarm Clock.

Unit – 3	**Number of lectures = 9**	**Embedded Programming**

Programming in Assembly Language (ALP) Vs. High level language – C program elements, Macros and

Functions – Use of pointers – NULL pointers – use of function calls – multiple function calls in a cyclic order in the main function pointers – Function queues and interrupt service Routines queues pointers – Concepts of Embedded programming in C++ - Object oriented programming – Embedded programming in C++, C program compilers – Cross compiler – optimization of memory codes.

Unit – 4	**Number of lectures = 9**	**Real Time Operating Systems**

Operating system services –I/O subsystems – Network operating systems –Interrupt Routines in RTOS Environment – RTOS Task scheduling models, Interrupt – Performance Metric in Scheduling Models –IEEE standard POSIX functions for standardization of RTOS and inter-task communication functions–List of Basic functions in a Preemptive scheduler – Fifteen point strategy for synchronization between processors, ISRs, OS Functions and Tasks – OS security issues- Mobile OS.

12. Brief Description of self-learning / E-learning component

The students will be encouraged to learn using the SGT E-Learning portal and choose the relevant lectures delivered by subject experts of SGT University. The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

13. Books Recommended

Text Books

1. Raj Kamal , Embedded Systems Architecture, Programming and Design, Tata McGraw-Hill, New Delhi, 2003.*ISBN* 0-07-049470-3

Reference Books

1. Frank Vahid and Tony Givargi Embedded System Design: A Unified Hardware/Software Introduction's, John Wiley & Sons, 2000.

2. John B Peatman, Design with PIC Microcontrollers, Prentice Hall of India, 2007*ISBN=0130462136*

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING							
2. Course Name	**Sensor and Architecture interfacing**	**L**	**T**		**P**		
3. Course Code	13470315	3	0		0		
4. Type of Course (use tick mark)		**Core ()**	**PE()**		**OE(√)**		
5. Pre-requisite (if any)		**6. Frequency (use tick marks)**	Even ()	Odd ()	Either Sem (√)	Every Sem ()	

7. Total Number of Lectures, Tutorials, Practical (assuming 14 weeks of one semester)		
Lectures = 36	**Tutorials = 0**	**Practical =**

8. Brief Syllabus

This course deals with the different type of sensors, transducers and their interfacing with microcontrollers. This also describes their role to know the domain status. It also deals with the process to further processing of sensing elements.

9. Learning objectives:

1. Educate students to understand the functioning of different types of sensors & their role in order to sense various parameters.
2. To utilize the status of different signal parameters in the real time application to control the working.

10. Course Outcomes (COs):

At the end of the course, the students will be able to

1. Explain static and dynamic characteristics and operating principle of Inductive, capacitive, magnetic, piezo electric, radiation, electro chemical sensors.

2. Illustrate the importance of standard of calibration

3. Select suitable sensor for a given automobile, aeronautics, machine tools and manufacturing application

11. Unit wise detailed content

Unit-1	**Number of lectures = 9**	**Introduction**

Definition, Measurement Techniques, Classification of errors, Error analysis, Static and dynamic characteristics of transducers, Performance measures of sensors, Classification of sensors, calibration techniques.

Resistance, Inductance and Capacitance Transducers: Potentiometer, strain gauges, optical encoders, LVDT, RVDT, Synchro, Microsyn,

Applications: Pressure, position, angle and acceleration. Capacitance circuitry, Feedback type condenser microphone , frequency modulating oscillator circuit, Dynamic capacitance variation, A.C. Bridge for Amplitude Modulation, Applications: Proximity, microphone, pressure, displacement

Unit – 2	**Number of lectures =9**	**Piezoelectric & Magnetic Sensors**

Piezoelectric Materials and properties, Modes of deformation, Multi-morphs, Environmental effects, Applications:

Accelerometer, ultrasonic. Magnetic Sensors, types, principle, requirement and advantages: Magneto resistive, Hall Effect – Eddy current.

Radiation and Electro Chemical Sensors: Photo conductive cell, photo voltaic, Photo resistive, Fiber optic sensors, Ray and Nuclear radiation sensors, Electro chemical sensors: Electrochemical cell, Polarization, sensor Electrodes and electro-ceramics in Gas Media.

Unit – 3	**Number of lectures = 9**	**Modern Sensors**

Film sensors, micro-scale sensors, Particle measuring systems, Vibration Sensors, SMART sensors, Machine Vision, Multi-sensor systems

Applications of Sensors: Applications and case studies of Sensors in Automobile Engineering, Aeronautics, Machine tools and Manufacturing processes.

Unit – 4	**Number of lectures = 9**	**Applications and architecture interfacing**

Interfacing of LEDs, 7 Segment display device, LCD display, DIP Switches, Push Button switches, Key denounce techniques, Keyboard connections load per key and matrix form, Interfacing A/D converter, D/A converter, Relay, opto isolator stepper motor and DC motor.

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

1. Patranabis D.," Sensor and Actuators", Prentice Hall of India (Pvt) Ltd., 2005.

Reference Book:

2. Renganathan S.," Transducer Engineering", Allied Publishers (P) Ltd., 2003.

1. Name of the Department- ELECTRONICS & COMMUNICATION ENGINEERING						
2. Course Name	Electrical Measurements and Instrumentation	L	T		P	
3. Course Code	13470316	3	0		0	
4. Type of Course (use tick mark)		Core ()	PE()		OE(√)	
5. Pre-requisite (if any)	Basic Electrical and Electronics Engineering	**6.** Frequency (use tick marks)	Even ()	Odd ()	Either Sem (√)	Every Sem ()
7. Total Number of Lectures, Tutorials, Practical (assuming 12 weeks of one semester)						
Lectures = 36		Tutorials = 00	Practical =			

8. Brief Syllabus

This course deals with the basics of Electrical and Electronic measuring instruments used in laboratory and industry. In the process they learn different type of instruments like PMMC, Moving Iron, Electrodynamometer which includes voltmeter, ammeter, wattmeter, energy meter, power factor meter, frequency meter, Q meter, etc. Students will also learn about different AC and DC bridges to obtain various electrical parameters. Display devices which include DVM, CRO, and DSO etc are also learnt to analyze electrical signals in the course.

9. Learning objectives:

1. To know the necessity of different measuring instruments and their design principle.
2. To understand the working principle of different measuring instruments and technical solutions to handle different errors.
3. To learn the architecture and working principle of advanced measuring instrument and their applications.

10. Course Outcomes:

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

1. Learn units, dimensions, standards and errors and basics of different types of measuring instruments to measure different electrical quantities
2. Apply their knowledge to measure electrical quantities using standard analog and digital measuring instruments.

11. Unit wise detailed content

Unit-1	Number of lectures = 9	Philosophy of Measurement & Analog Measurement of Electrical Quantities

Unit & dimensions, standards, Errors, Characteristics of Instruments and measurement system, basics of statistical analysis. PMMC instrument, DC ammeter, DC voltmeter, Ohm meter, Moving Iron instrument, Electrodynamics Wattmeter, errors and remedies, Three Phase Wattmeter, Power in three phase system, Energy meter.

Unit - 2	Number of lectures = 9	Measurement: Instrument Transformer

Instrument Transformer and their applications in the extension of instrument range, Introduction to measurement of speed, frequency and power factor.

Unit - 3	Number of lectures = 9	Measurement of Parameters

Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the

help of AC Bridges- Wheatstone, Kelvin, Maxwell, Hay's, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges, Wagner Earthling device, Q Meter.

Unit - 4	Number of lectures = 9	AC Potentiometer & Magnetic Measurement

Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement. Ballistic Galvanometer, Flux meter. Digital Measurement: Concept of digital measurement, Digital voltmeter, Frequency meter, Power Analyzer and Harmonics Analyzer, Electronic, Multimeter. DSO and its applications.

12. Brief Description of self learning / E-learning component

The students will be encouraged to learn using the SGT ELearning portal and choose the relevant lectures delivered by subject experts of SGT University.

The link to the E-Learning portal.

https://elearning.sgtuniversity.ac.in/course-category/

Journal papers; Patents in the respective field.

13. Books Recommended

Text Book:

1. E.W. Golding & F.C. Widdis, "Electrical Measurement &Measuring Instrument", A.W. Wheeler & Co. Pvt. Ltd. India.

Reference Books

1. Forest K. Harries, "Electrical Measurement", Willey Eastern Pvt. Ltd. India.
2. A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons.