

# Study & Evaluation Scheme

of

## Master of Computer Applications

[Applicable w.e.f. Academic Session - 2020-21 till revised]

[As per CBCS guidelines given by UGC]



**COLLEGE OF COMPUTING SCIENCES AND  
INFORMATION TECHNOLOGY**

**TEERTHANKER MAHAVEER UNIVERSITY**

**N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001**

**Website: [www.tmu.ac.in](http://www.tmu.ac.in)**



## TEERTHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U.P. Act No. 30, 2008)

Delhi Road, Bagarpur, Moradabad (U.P.)

<u>Study &amp; Evaluation Scheme</u>	
<u>SUMMARY</u>	
<b>Institute Name</b>	College of Computing Sciences and Information Technology, Delhi Road, Moradabad
<b>Programme</b>	MCA
<b>Duration</b>	Two Years full time(Four Semesters)
<b>Medium</b>	English
<b>Minimum Required Attendance</b>	75%
<u>Credits</u>	
<b>Maximum Credits</b>	105
<b>Minimum Credits Required for Degree</b>	99

<b>Assessment:</b>					
<b>Evaluation</b>			<b>Internal</b>	<b>External</b>	<b>Total</b>
<b>Theory</b>			40	60	100
<b>Practical/ Dissertations/ Project Reports/ Viva-Voce</b>			50	50	100
<b>Class Test-1</b>	<b>Class Test-2</b>	<b>Class Test-3</b>	<b>Assignment(s)</b>	<b>Attendance &amp; Participation</b>	<b>Total</b>
<b>Best two out of three</b>					
10	10	10	10	10	40
<b>Duration of Examination</b>			<b>External</b>	<b>Internal</b>	
			3 Hours	1.5 Hours	
<p><i>To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester end examination and teachers continuous evaluation.(i.e. both internal and external).A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have at least 45% marks in aggregate to clear the semester.</i></p>					

<b>Question Paper Structure</b>	
<b>1</b>	The question paper shall consist of six questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question no. 2 to 6 (from Unit-I to V) shall have explanatory answers (approximately 350 to 400 words) along with having an internal choice within each unit.
<b>2</b>	Question No. 1 shall contain 8 parts from all units of the syllabus with at least one question from each unit and students shall have to answer any five, each part will carry 2 marks.
<b>3</b>	The remaining five questions shall have internal choice within each unit; each question will carry

	10 marks.
<b>IMPORTANT NOTES:</b>	
1	<i>The purpose of examination should be to assess the Course Learning Outcomes (CLO) that will ultimately lead to of attainment of Programme Specific Outcomes (PSOs). A question paper must assess the following aspects of learning: Remember, Understand, Apply, Analyze, Evaluate &amp; Create (reference to Bloom's Taxonomy).</i>
2	<i>Assignment/ Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.</i>
3	<i>There shall be continuous evaluation of the student and there will be a provision of fortnight progress report.</i>

### Program Structure-MCA

#### A. Introduction:

**Master of Computer Applications (MCA)** is a two year long professional post-graduate programme for candidates wanting to explore deeper into the world of computer application development with the help of knowledge of modern programming language(s). The programme is bring together of both theoretical and practical knowledge. Employability, innovation, theory to practice connectedness is the central focus of MCA curriculum. MCA programme is designed to meet the shortage of qualified professionals in the IT (Information Technology) industry.

Students pursuing an MCA programme would have the option to choose from the following specialisations:

1. Software Development
2. Machine Learning
3. Network Technologies
4. Data Science and Analytics
5. Advanced Technologies

The institute emphasis on the following courses ***balanced with core and elective courses***:The curriculum of MCA program emphasizes an intensive, flexible computer science education with 56credits of core/skill-enhancement/ ability-enhancement compulsory courses, 16 credits of discipline specific elective courses and 33 credits of laboratory courses/ projects. Total 105 credits are allotted for the MCA degree.

The programme structure and credits for MCA are finalized based on the Information Technology industry requirements. Minimum number of classroom contact teaching credits for the MCA program will be 72credits (one credit equals 10 hours) and 33 credits for lab/ project work. However, the minimum number of the credits for award of MCA degree will be 99 credits.



## Syllabus of MCA -College of Computing Sciences &IT, TMU Moradabad

Course handouts for students will be provided in every course. A course handout is a thorough teaching plan of a faculty taking up a course. It is a blueprint which will guide the students about the pedagogical tools being used at different stages of the syllabus coverage and more specifically the topic-wise complete plan of discourse, that is, how the faculty members treat each and every topic from the syllabus and what they want the student to do, as an extra effort, for creating an effective learning. It may be a case study, a role-play, a classroom exercise, an assignment, or anything else which is relevant and which can enhance their learning about that particular concept or topic. Due to limited availability of time, most relevant topics will have this kind of method in course handout.

<b>MCA : Two-Year (4-Semester) CBCS Programme</b>			
<b>Basic Structure: Distribution of Courses</b>			
<b>S.No.</b>	<b>Type of Course</b>	<b>Credit Hours</b>	<b>Total Credits</b>
1	Core Course (CC)	10 Courses of 4 Credits each (Total Credits 10X4) 01 Course of 3 Credits each (Total Credits 1X3) 01 Course of 2 Credits each (Total Credits 1X2)	45
2.	Laboratory Course (LC)	06 Courses of 2 Credits each (Total Credits 6X2) 01 Course of 1 Credits each (Total Credits 1X1)	13
3	Ability-Enhancement Compulsory Course (AECC)	01 Course of 4 Credits each (Total Credits 1X4)	04
4	Skill-Enhancement Course (SEC)	01 Course of 4 Credits each (Total Credits 1X4) 01 Course of 2 Credits each (Total Credits 1X2) 01 Course of 1 Credits each (Total Credits 1X1)	07
5	Program/Discipline Specific Elective Course (DSEC)	04 Courses of 4 Credits each (Total Credits 4X4)	16
6	Project (PROJ)	01 Course of 6 Credits each (Total Credits 1X6) 01 Course of 14 Credits each (Total Credits 1X14)	20
7	Value Added Course (VAC)	04 Courses of 0 Credits each (Total Credits 6X0)	0
8	Bridge Course (BC)	03 Courses of 0 Credits each (Total Credits 3X0)	0
<b>Total Credits</b>			<b>105</b>

Contact hours include work related to Lecture, Tutorial and Practical (LTP), where our institution will have flexibility to decide course wise requirements.

### **B. Choice Based Credit System (CBCS)**

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his target number of credits as specified by the UGC and adopted by our University.

The following is the course module designed for the MCA program:



## Syllabus of MCA -College of Computing Sciences &IT, TMU Moradabad

**Core Course (CC):**Core courses will provide a holistic approach to computer science/ applications education, giving students an overview of the IT industries, a basis to build and specialize upon.

**Laboratory Course (LC):** Laboratory courses will provide more practical-based knowledge. Laboratory courses will also provide knowledge to develop application as well as system software’s.

**Ability Enhancement Compulsory Course (AECC):**As per the guidelines of Choice Based Credit System (CBCS) for all Universities, including the private Universities, the Ability Enhancement Compulsory Course (AECC) is a course designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. We offer one AECC in Semester I and will be of 4 credits.

**Skill Enhancement Course:**This course may be chosen from a pool of courses designed to provide skill-based knowledge. We offer SEC in III and IV Semester with credit 2 and 5 respectively.

**Value Added Course (VAC):**A value added audit course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the IT world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in IT world. There shall be one/ two course(s) each in Semester I, Semester II & Semester III and will carry no credit, however, it will be compulsory for every student to pass these courses with minimum 45% marks.

**Program/Discipline Specific Elective Course (DSEC):** The discipline specific elective courses are chosen to make students specialist or having specialized knowledge of a specific domain like Software Development, Machine Learning, etc. It will be covered in two semesters (III & IV) of second year of the programme. The student will have to choose any one specialization out of the five specializations offered. Each DSEC will carry 4 credits.

**Bridge Course (BC):** Bridge course will be applicable to students who do not have their graduation degree in computer stream or who do not have Human Value & Ethics as a course in their graduation degree. The bridge course will make them ready to take up MCA degree programme of two years duration. The students will also be required to appear for qualifying exam (pass with 45% marks) of bridge course.

### C. Programme Specific Outcomes (PSOs)

The learning and abilities or skills that a student would have developed by the end of two-year MCA Programme:

PSO – 1	Understanding of the fundamentals of computer applications to establish
---------	---

	themselves as computer and IT professionals in the IT and IT Enabled Service industry.
<b>PSO – 2</b>	Applying analytical and technical skills for a continued life-long learning, teaching and research. and will be prepared to be accepted to complete advanced degree programs such as M. Tech/M.S./M.Phil./Ph.D.
<b>PSO – 3</b>	Analyzing developed industry software projects for various technical or application areas and production & maintenance of computer systems.
<b>PSO – 4</b>	Developing software projects for industries and physical systems. In addition, Developing communication & soft skills to deal with IT/ corporate environment.

**D. Pedagogy & Unique practices adopted:** “Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept”. In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning.

**1. Case/ Assignment Based Learning:** Case/assignment based learning enhances student skills, helps in applying concepts, principles and analytical skills to solve the technical delineated problems. Case/ assignment method of teaching is used as a critical learning tool for effective learning and we encourage it to the fullest. We make it compulsory to teach at least one case study/ assignment in each unit of every course in MCA program.

**2. Role Play & Simulation:** Role-play and simulation are forms of experiential learning. Learners take on different roles, assuming a profile of a character or personality, and interact and participate in diverse and complex learning settings. Role-play and simulation function as learning tools for teams and groups or individuals as they "play" online or face-to-face. They alter the power ratios in teaching and learning relationships between students and educators, as students learn through their explorations and the viewpoints of the character or personality they are articulating in the environment. This student-centered space can enable learner-oriented assessment, where the design of the task is created for active student learning. Therefore, role-play& simulation exercises are being promoted for the practical-based experiential learning of our students.

**3. Video Based Learning (VBL)&Learning through Movies (LTM):**These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through movies. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through VBL & LTM is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting VBL & LTM, wherever possible.

**4. Field/Live Projects:**The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other their regular classes.

**5. Industrial Visits:** Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students’ exposure





## Syllabus of MCA -College of Computing Sciences &IT, TMU Moradabad

to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

**6. MOOCS:** Students may earn credits by passing MOOCS as decided by the college from time to time.

**7. Special Guest Lectures (SGL)&Extra Mural Lectures (EML):** Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

**8. Student Development Programs (SDP):** Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced software training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program.

**9. Industry Focused programs:** Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses are to be delivered by industry experts to provide practice based insight to the students.

**10. Special assistance program for slow learners & fast learners:**The College gets a diverse group of students every year. They differ in terms of their intelligence, efforts and interest. We make efforts to identify them as Slow and fast learners within first three months of their joining. Slow learners are given extra time and sessions to bridge the learning gap under the guidance of faculty coordinator and fast learners are provided challenging assignments/projects/readings and learning opportunity.

**11. Orientation Programme:** The Orientation Program is designed keeping in mind the guidelines of UGC & the Council. This Programme is for 03 Weeks duration. The Programme designed by the College is approved by the office of the Vice Chancellor. The purpose is to make the fresh students comfortable and provide awareness about the college and the university. The Topics covered are multi -faceted encompassing: Academic rules & regulation, Examination rules & regulation, Learning resources, participation in Extra -curricular & extra Mural Activities, Discipline, Conduct, Motivational talks, Industry talks, & Bridge Courses/content etc

**12.Mentoring Scheme:** Every Student shall be provided with a faculty Mentor to help him /her in their personal & Academic Issues. The mentor maintains a register of all his/her mentees with complete personal & parents 'details. It is essential to have at least to meet once in a month. The mentor enters the discussions held, advice given and efforts & improvements made by the mentee. This register of the mentor must be counter signed by the HOD once a month and by the Principal once in a semester.

**13.Career & personal counseling:**Counseling on a college and university campus inevitably involves issues encompassing career and personal exploration. Within this domain, counseling assists individuals in selecting an area of study, choosing a career, or clarifying attributes that facilitate or detract from their present work. Exploration of personal values, goals, and characteristics, combined with assessments of career interests, enhance the student's successful transition through higher education. Facilitating student–faculty interactions represents another essential facet of career counseling. Such significant relationships



## Syllabus of MCA -College of Computing Sciences &IT, TMU Moradabad

are positively associated with changes in students' occupational values.

**14. Competitive exam preparation:** Institute provides the foundation for the preparation of competitive exams. For this, special classes are conducted by the faculty members and students study value added courses from II semester onwards.

**15. Extra-curricular Activities:** Organizing & participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

**16. Participation in Workshops, Seminars & writing & Presenting Papers:** The purpose of Workshops, Seminars, and conference are important for the overall development of the students. Here the students go through the discussion of a research area/ academic subject with the expert(s). College conducts at least one Workshop and at least one Seminar in every semester. In addition, College also conducts on national and one international conference every year. Students actively participated in Workshops, Seminars & writing & Presenting Papers.

**17. Formation of Student Clubs, Membership & Organizing & Participating events:** Clubs and organizations are a big part of college life! A club is “a group of students organized with a similar interest for a social, literary, athletic, political, or other common purpose; while an organization is a group of students organized for and acting toward a particular cause”. Students have the opportunity and choose to join these groups for many reasons including: pursuit of individual interests; career networking opportunities; social camaraderie. Teerthanker Mahaveer University has a very active student club and organizational system that can be accessed by visiting on-campus offices and individual websites. All students should be strongly encouraged to pursue club and organizational membership opportunities to help them enrich their college experience.

**18. Capability Enhancement & Development Schemes:** These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets.

**19. Library Visit & Utilization of E-Learning Resources:** libraries have supported education efforts by providing teaching resources, information and referral services. A more active approach has been taken by libraries offering educational classes or one-to-one tutoring programs. Libraries have outreach programs designed to meet the needs of specific groups of people with limited educational skills.



**PROPOSED STUDY & EVALUATION SCHEME (2020-21)**  
**Programme: MCA ( 2 YEARS)**

**Semester – I**

S. No.	Course Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC - I	MCA116	Operating System	4	0	0	4	40	60	100
2	CC - II	MCA117	Data Structures & Algorithms	4	0	0	4	40	60	100
3	CC – III	MCA118	Database Management System	4	0	0	4	40	60	100
4	CC – IV	MCA119	Computer Organization and Architecture	4	0	0	4	40	60	100
5	AECC –I	MCA120	Business Communication	4	0	0	4	40	60	100
6	LC – I	MCA155	Data Structures & Algorithms Lab	0	0	4	2	50	50	100
7	LC – II	MCA156	Database Management System Lab	0	0	4	2	50	50	100
<b>Total</b>				<b>20</b>	<b>0</b>	<b>8</b>	<b>24</b>	<b>300</b>	<b>400</b>	<b>700</b>

**Semester - I (Value Added Courses)**

S. No.	Course Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	VAC – I	TMUPS101 <sup>#</sup>	Managing Self	2	1	0	0	50	50	100

# VAC is an audit course which will be compulsory to pass with 45% marks. However it will not be added towards overall result.

**Semester - I (Bridge Course)**

S. No.	Course Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	BC – I	MCA121*	Computer Fundamentals	2	0	0	0	70	30	100
2	BC – II	MCA122*	Basics of programming using C & C++	2	0	0	0	70	30	100
3	BC – III	MCA123**	Human Values & Ethics	2	0	0	0	70	30	100



## Syllabus of MCA -College of Computing Sciences &IT, TMU Moradabad

\* This course will be applicable to students who do not have their graduation degree in computer stream. The bridge course will make them ready to take up MCA degree programme of two years duration. The students will also be required to appear for qualifying exam (pass with 45% marks) of bridge course.

\*\* This course will be applicable to students who do not have Human Value & Ethics as a course in their graduation degree. The bridge course will make them ready to take up MCA degree programme of two years duration. The students will also be required to appear for qualifying exam (pass with 45% marks) of bridge course.

**Semester – II**

S. No.	Course Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC – V	MCA224	Software Engineering	4	0	0	4	40	60	100
2	CC – VI	MCA225	Computer Networks	3	0	0	3	40	60	100
3	CC – VII	MCA226	Theory of Computation	4	0	0	4	40	60	100
4	CC – VIII	MCA227	Object Oriented Programming using Java	4	0	0	4	40	60	100
5	CC – IX	MCA228	Web Technologies	4	0	0	4	40	60	100
6	LC – III	MCA257	Object Oriented Programming using Java Lab	0	0	4	2	50	50	100
7	LC – IV	MCA258	Computer Networks Lab	0	0	2	1	50	50	100
8	LC – V	MCA259	Web Technologies Lab	0	0	4	2	50	50	100
<b>Total</b>				<b>19</b>	<b>0</b>	<b>10</b>	<b>24</b>	<b>350</b>	<b>450</b>	<b>800</b>

**Semester - II (Value Added Courses)**

S. No.	Course Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	VAC – II	TMUPA202 <sup>#</sup>	Numerical Ability	2	1	0	0	40	60	100
2	VAC– III	TMUPS201 <sup>#</sup>	Managing Work and Others	2	1	0	0	50	50	100

#VAC is an audit course which will be compulsory to pass with 45% marks. However it will not be added towards overall result.

**Semester – III**

S. No.	Course Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	CC – X	MCA332	Python Programming	4	0	0	4	40	60	100
2	CC – XI	MCA333	Dot Net using C#	4	0	0	4	40	60	100
3	CC –XII	MCA334	Internet of Things	2	0	0	2	40	60	100
4	LC – VI	MCA361	Python Programming Lab	0	0	4	2	50	50	100
5	LC –VII	MCA362	Dot Net using C# Lab	0	0	4	2	50	50	100
6	PROJ –I	MCA363	Mini Project*	0	0	0	6	50	50	100
7	SEC – I	MCA364	Summer Internship	0	0	0	2	50	50	100
<b>Specialization Group A1 - Software Development</b>										
8	DSEC -I	MCA371	Android Programming	0	2	4	4	50	50	100
9	DSEC-II	MCA372	R – Programming	0	2	4	4	50	50	100
<b>Specialization Group B1 - Machine Learning</b>										
10	DSEC-I	MCA337	Soft Computing	3	1	0	4	40	60	100
11	DSEC-II	MCA338	Digital Image Processing	3	1	0	4	40	60	100
<b>Specialization Group C1 - Network Technologies</b>										
12	DSEC- I	MCA339	Mobile Computing	3	1	0	4	40	60	100
13	DSEC-II	MCA340	Cryptography and Network Security	3	1	0	4	40	60	100
<b>Specialization Group D1 - Data Science and Analytics</b>										
14	DSEC-I	MCA341	Data Science	3	1	0	4	40	60	100
15	DSEC-II	MCA342	Data Warehouse and Mining	3	1	0	4	40	60	100
<b>Specialization Group E1 - Advanced Technologies</b>										
16	DSEC-I	MCA343	Quantum Computing	3	1	0	4	40	60	100
17	DSEC-II	MCA344	Natural Language Processing	3	1	0	4	40	60	100
<b>Total</b>				<b>16/10*</b>	<b>2/4*</b>	<b>8/16*</b>	<b>30</b>	<b>400/420*</b>	<b>500/480*</b>	<b>900</b>

\*Total theory lectures, tutorials, practical lectures, internal marks, and external marks only for specialization group A1.

**Semester - III (Value Added Courses)**

S. No.	Course Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	VAC –IV	TMUPA302#	Arithmetic and Logical Ability	2	1	0	0	40	60	100

#VAC is an audit course which will be compulsory to pass with 45% marks. However it will not be added towards overall result.

Semester – IV

S. N o.	Course Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	SEC -II#	MCA438	ASP Dot Net	4	0	0	4	40	60	100
		MCA439	Advance Java	4	0	0	4	40	60	100
2	SEC-III##	MCA463	ASP Dot Net Lab	0	0	2	1	50	50	100
		MCA464	Advance Java Lab	0	0	2	1	50	50	100
3	PROJ-II	MCA465	Major Project	2	8	8	14	50	50	100
<b>Specialization Group A2 - Software Development</b>										
4	DSEC-III	MCA471	Julia	0	2	4	4	50	50	100
5	DSEC-IV	MCA472	Ruby	0	2	4	4	50	50	100
<b>Specialization Group B2 - Machine Learning</b>										
6	DSEC-III	MCA442	Pattern Recognition	3	1	0	4	40	60	100
7	DSEC-IV	MCA443	Deep Learning	3	1	0	4	40	60	100
<b>Specialization Group C2 - Network Technologies</b>										
8	DSEC-III	MCA444	Introduction to Wireless Networks	3	1	0	4	40	60	100
9	DSEC-IV	MCA445	Cloud and Fog Computing	3	1	0	4	40	60	100
<b>Specialization Group D2 – Data Science and Analytics</b>										
10	DSEC-III	MCA446	Oracle DBA	3	1	0	4	40	60	100
11	DSEC-IV	MCA447	Big Data Analytics	3	1	0	4	40	60	100
<b>Specialization Group E2 - Advanced Technologies</b>										
12	DSEC-III	MCA448	Blockchain Technology	3	1	0	4	40	60	100
13	DSEC-IV	MCA449	Spark	3	1	0	4	40	60	100
<b>Total</b>				<b>12/6*</b>	<b>10/12*</b>	<b>10/18*</b>	<b>27</b>	<b>220/240*</b>	<b>280/260*</b>	<b>500</b>

\*Total theory lectures, tutorials, practical lectures, internal marks, and external marks only for specialization group A2.

# Select any one theory course## Select corresponding laboratory course



<b>Course Code:</b> MCA 116	<b>MCA- Semester-I</b> <b>(Core Course - I)</b> <b>Operating System</b>	<b>L-4</b> <b>T-0</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding about various operating systems and the functions and services provided by the operating system.	
<b>CO2.</b>	Understanding the process management, process concepts and how process synchronized.	
<b>CO3.</b>	Understanding the detailed operation deadlock and deadlock characterization.	
<b>CO4.</b>	Understand different memory management techniques like paging segmentation etc.	
<b>CO5.</b>	Analyzing the working and functions various operating systems.	
<b>Course Content:</b>		
<b>Unit-1:</b>	Introduction to the Operating System, Types of Operating System: Batch System, Time Sharing System, Real Time System. Multi Programming, Distributed System, Functions of Operating System and its services.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Process Management:</b> Process Concept, Process State, Process Control Block, Process Scheduling, CPU Scheduling - CPU Scheduling, Scheduling Criteria, Scheduling Algorithms, Preemptive & Non Preemptive Scheduling.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Process Synchronization:</b> Critical Section Problem, Race Condition, Synchronization Hardware, Semaphores, Classical Problems of Synchronization. Dead Locks: Characterization, Methods for Handling Deadlock, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Memory Management:</b> Contiguous Allocation, External and Internal Fragmentation, Paging & Segmentation. Virtual Memory: Concept of Virtual Memory, Concept of Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Directory Structure, Allocation Methods:</b> Contiguous Allocation Linked Allocation, Indexed Allocation Free Space Management. Disk Structure, Disk Scheduling Algorithms, Disk Management.	<b>8 Hours</b>
<b>Text Books:</b>	1. Silbershatz and Galvin," Operating System Concept", Addison Weseley Eighth Edition	
<b>Reference Books:</b>	1. Flynn, Mchoes, "Understanding Operating System", Thomson Press, Sixth Edition 2. Tannenbaum,"Modern Operating System Concept", PHI Learning, Third Edition,	





	3. Joshi, R. C. and Tapaswi, S., “Operating Systems”, Wiley Dreamtech. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdf">https://www.tutorialspoint.com/operating_system/operating_system_tutorial.pdf</a> 2. <a href="https://www.studytonight.com/operating-system/">https://www.studytonight.com/operating-system/</a>	



<u>Course Code:</u> MCA 117	<b>MCA- Semester-I (Core Course - II) Data Structures &amp; Algorithms</b>	<b>L-4 T-0 P-0 C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concept of algorithm analysis, complexity, growth function, and sorting in polynomial time&in linear time.	
<b>CO2.</b>	Understanding the concept of graph algorithms as well as shortest path computation.	
<b>CO3.</b>	Understanding the concept of advanced design and analysis techniques like dynamic programming, matrix chain multiplication etc.	
<b>CO4.</b>	Understanding the concept of advanced data structure like RB tree, Fibonacci heap etc.	
<b>CO5.</b>	Understanding randomized string matching algorithms like Naïve algorithm, string matching with finite automata, and NP hard & NP complete problems.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> Algorithms, Analysis of Algorithms, Design of Algorithms, Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences and their solution methods. <b>Sorting in polynomial Time:</b> Insertion sort, Merge sort, Heap sort, and Quick sort. <b>Sorting in Linear Time:</b> Counting sort, Radix Sort, Bucket Sort.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Graph Algorithms:</b> Elementary Graph Algorithms, Breadth First Search, Depth First Search, Topological Sort, Strongly Connected Components, Minimum Spanning Tree, Kruskal's Algorithms, Prim's Algorithms, Single Source Shortest Path, All pair Shortest Path, Traveling Salesman Problem.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Advanced Design and Analysis Techniques:</b> Dynamic programming: Assembly Line Scheduling, Matrix Chain Multiplication, Longest Common Sequence, Greedy Algorithm: Activity Selection Problem, Knapsack problem. Backtracking, Branch and Bound.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Advanced Data Structure:</b> Red Black Trees, Augmenting Data Structure, Binomial Heap, BTree and Fibonacci Heap.	<b>8 Hours</b>
<b>Unit-5:</b>	Randomized Algorithms, String Matching: Naïve String Matching, Rabin-Karp, String matching with finite automata, KMP string matching algorithm, NP-Hard and NP-Complete problems.	<b>8 Hours</b>
<b>Text Books:</b>	1. Introduction to Algorithms, Coreman 3rd Edition.	
<b>Reference Books:</b>	1. Fundamentals of Computer Algorithms by Horowitz and Sahani, Galgotia, 2nd Edition.	

	<p>2. Computer Algorithms: Introduction to Design and Analysis by Sara Baase and Allen VanGelder, Pearson Education.</p> <p>3. Algorithm Design by Jon Kleinberg and Eva Tardos, Pearson Education.</p> <p>4. Fundamental of Algorithms by Brassard Bratley, PHI.</p> <p><b>* Latest editions of all the suggested books are recommended.</b></p>	
<b><u>Additional Electronic Reference:</u></b>	<p>1. <a href="https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm">https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm</a></p> <p>2. <a href="https://www.geektonight.com/design-and-analysis-of-algorithm-notes/">https://www.geektonight.com/design-and-analysis-of-algorithm-notes/</a></p>	

<b>Course Code:</b> MCA 118	<b>MCA- Semester-I</b> <b>(Core Course - III)</b> <b>Database Management System</b>	<b>L-4</b> <b>T-0</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
CO1.	Understanding the basics of data base systems, structure and architecture.	
CO2.	Understanding the relational data model and its different important terms like integrity and constraints.	
CO3.	Understanding the anomalies of database and removal of these anomalies using different normalization techniques.	
CO4.	Understanding different transaction processing concepts and serialization techniques.	
CO5.	Understanding different database recovery like shadow paging, deferred/ immediate updates and concurrency control techniques.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<p><b>Basic Concepts:</b> An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models and its type with comparative study, schema and instances, data independence and data base language and interfaces, DDL, DML, Database Structure.</p> <p><b>Entity-Relationship Models:</b> ER model concepts, notation for ER diagram, mapping constraints, weak entities, keys, extended ER model, relationships of higher degree.</p>	<b>8 Hours</b>
<b>Unit-2:</b>	<p><b>Introduction to Relational data Model and Language:</b> Relational data model concepts, integrity constraints, referential integrity, Key constraints, Domain constraints. <b>Relational Algebra:</b> Introduction, selection, projection, aggregate functions, joins, Relational calculus-Tuple and Domain calculus. <b>Introduction to SQL:</b> Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus. <b>Introduction to PL/SQL:</b> Basic concepts, programming constructs, cursor, triggers, function, procedure.</p>	<b>8 Hours</b>
<b>Unit-3:</b>	<p><b>Data Base Design &amp; Normalization:</b> Functional dependencies, trivial and non-trivial dependencies, normal forms, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, dependencies preservations, loss less join decompositions, concepts of MVD, and JDs.</p>	<b>8 Hours</b>
<b>Unit-4:</b>	<p><b>Transaction Processing Concepts:</b> Transaction system, Testing of serializability, Serializability of schedules, conflict &amp; view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling, Introduction to Distributed Database.</p>	<b>8 Hours</b>

<p><b>Unit-5:</b></p>	<p><b>Database Recovery &amp; Concurrency Control Techniques:</b> Database recovery techniques based on deferred or immediate updates, shadow paging, Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Recovery with concurrent transaction, data fragmentation. Overview of concurrency control and recovery in distributed database.</p>	<p><b>8 Hours</b></p>
<p><b><u>Text Books:</u></b></p>	<p>1. Date C J, “An Introduction to Database System”, Addison Wesley</p>	
<p><b><u>Reference Books:</u></b></p>	<p>1. Korth, Silbertz, Sudarshan, “Database Concepts”, McGraw Hil 2. Bipin C. Desai, “An introduction to Database Systems”, Galgotia Publication 3. Majumdar &amp; Bhattacharya, “Database Management System”, TMH <b>* Latest editions of all the suggested books are recommended.</b></p>	
<p><b><u>Additional Electronic Reference:</u></b></p>	<p>1. <a href="https://www.tutorialspoint.com/dbms/index.htm">https://www.tutorialspoint.com/dbms/index.htm</a> 2. <a href="https://www.guru99.com/dbms-tutorial.html">https://www.guru99.com/dbms-tutorial.html</a></p>	

<b>Course Code:</b> MCA 119	<b>MCA- Semester-I</b> <b>(Core Course - IV)</b> <b>Computer Organization and Architecture</b>	<b>L-4</b> <b>T-0</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding of the basic structure and operation of a digital computer	
<b>CO2.</b>	Understanding the basics of hardwired and micro-programmed control of the CPU.	
<b>CO3.</b>	Understanding the concepts of processor organization, various I/O devices and the I/O interface.	
<b>CO4.</b>	Applying binary arithmetic to perform various arithmetic operations using complement methods.	
<b>CO5.</b>	Applying concepts of memory control and I/O functions in the design of microprocessor chip.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Combinational and Sequential Circuit:</b> Logic Gates, Karnaugh Map, SOPs & POSs Boolean Expressions, Demorgan's theorem <b>Combinational Circuits:</b> Implementing Combinational Logic, <b>Arithmetic Circuits:</b> Basic Building Blocks, half adder, full adder, half subtractor, full subtractor, De-multiplexers and Decoders, Encoders, R-S Flip Flop, Level Triggered and Edge Triggered Flip Flops, J-K Flip Flop, Master-slave Flip Flops, T-flip Flop, D-flip Flop.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Register Transfer and Micro operations:</b> Register Transfer Language, Bus and Memory Transfer, Three State Bus Buffers, Memory Transfer, Arithmetic Micro operation (Binary Adder, Binary Adder-Subtractor, Binary Increment, Arithmetic Circuit), Logic Micro operations(List of logic operation), Shift Micro operations, Arithmetic Logic Shift Unit.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Processor Organization:</b> General register organization, Stack organization, Addressing mode, Instruction format, Instruction Cycle, Data transfer & manipulations, Program Control, Introduction to RISC and CISC.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Input-Output Organization:</b> I/O Interface, I/O bus and interface modules, Asynchronous data transfer: Strobe control, Hand Shaking, Modes of transfer: Programmed I/O, Interrupt initiated I/O, DMA, Interrupts & Interrupt handling, and Direct Memory access: DMA Controller and DMA Transfer.	<b>8 Hours</b>
<b>Unit-5:</b>	Evolution of Intel processor architecture- 4 bit to 64 bit, Control unit Hardwired and microprogrammed, concept of pipelining , Study of microprocessor 8085, Functional pins and Register organization, Memory mapped I/O and I/O mapped I/O schemes.	<b>8 Hours</b>
<b>Text Books:</b>	1. Mano M., <i>Computer System Architecture</i> , Prentice Hall of India.	
<b>Reference Books:</b>	1. Vravice, Zaky & Hamacher, <i>Computer Organization</i> , Tata Mc Graw Hill	





	2. Tannenbaum, <i>Structured Computer Organization</i> , Prentice Hall of India. 3. Hayes John P., <i>Computer Organization</i> , McGraw Hill. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials">https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials</a> 2. <a href="https://examupdates.in/digital-logic-design-books/">https://examupdates.in/digital-logic-design-books/</a>	

<b>Course Code:</b> MCA120	<b>MCA- Semester-I</b> <b>(Ability-Enhancement Compulsory Course - I)</b> <b>Business Communication</b>	<b>L-4</b> <b>T-0</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basics of English language, grammar and communication.	
<b>CO2.</b>	Understanding comprehension skills, business correspondence and presentation strategies.	
<b>CO3.</b>	Applying non-verbal means of communication in presentation.	
<b>CO4.</b>	Analyzing the different types of communication, report writing and interviews.	
<b>CO5.</b>	Analyzing the different types of sentence construction and the different modes of speech delivery.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Fundamentals of English Language:</b> English Language: Importance of English Language, Rules of Spelling and Pronunciation, Phonetics, Classification of Consonant and Vowel Sounds (IPA), Syllable, Stress and Intonation. English Grammar: Parts of Speech, Basic Sentence Patterns, Subject-Verb Agreement, Tense (Present, Past & Future), Voice (Active & Passive), Narration (Direct & Indirect), Modals, Phrases & Clauses, Simple, Compound & Complex Sentences, Conditional Sentences, Transformation & Synthesis of Sentences. English Vocabulary: Word Formation, Prefixes, Suffixes, Homophones, Synonyms, Antonyms, One Word Substitutions, Idioms & Phrases.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Fundamentals of Communication:</b> Meaning, Definition, Objectives, Kinds, Process and Importance of Communication, Language as a Tool of Communication, 7 Cs of Communication, Levels & Flows of Communication, Barriers to Communication, Principles of Effective Oral Communication, Passive, Aggressive & Assertive Communication, Vitals of Communication, Persuasive Communication, Difference between Technical Writing and General Writing, Features of Technical Written Communication.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Comprehension Skills (LSRW):</b> Listening Skills: Difference between Listening & Hearing, Process of Listening, Types of Listening, Importance of Listening, Barriers to Listening, Essentials of Effective Listening. Speaking Skills: Introducing Self & Others, Conversation, Types of Conversation, Essentials of Conversation, Dialogue, Debate & Story Telling, Describing a Scene, a Picture and a Situation, Short Speeches for JAM (Just a Minute) Session on Various Topics, Role Plays. Reading Skills: Four S's of Reading	<b>8 Hours</b>

	Comprehension, Strategies of Reading Comprehension, Reading Comprehension of Short Passages. Writing Skills: Essentials of a Paragraph, Structure & Methods of Paragraph, Writing Paragraph on Various Topics, Précis Writing, Application Writing, Essay Writing, and Writing Short Stories on Various Topics.	
<b>Unit-4:</b>	<b>Business Correspondence:</b> Principles of Business Correspondence, Structure of Business Letter, Writing Sales Letter, Claim or Complaint Letter, Credit Letter, Letters of Enquiry, Circular, Memos, Press Note, E-mail, Notice, Agenda, Minutes of Meeting, Bio-Data, Resume, Curriculum Vitae, Job Application, Joining Letter and Resignation Letter. Report Writing: Types of Report, Structure of Report, Essentials of Report Writing, Reporting Events, Writing Project, Thesis and Dissertation. Proposal Writing: Types of Proposal, Structure of Proposal, Essentials of Proposal Writing. Structure & Essentials of Technical/Research Paper Writing.	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Presentation Strategies:</b> Presentation: 5 W's of Presentation, Defining Purpose, Audience & Locale, Audio-Visual Aids, Organizing Content, Voice Dynamics, Five P's- Pace, Power, Pronunciation, Pause and Pitch, Body Language, Modes of Speech Delivery, Strategies for Effective Power Point Presentation. Group Discussion: Dos and Don'ts of Group Discussion, Techniques of Group Discussion. Interview: Types of Interview, Strategies for Successful Interviews, Mock Interview. Corporate Expectations: Office Etiquettes, Time Management, Service Mindset, Goal Setting, Team Building, Team Talk Dynamics, Traits of Leadership, Negotiation, Types of Negotiation, Techniques of Negotiation, Tele-Conferencing, Video-Conferencing, Internet, Intranet, Professional Ethics.	<b>8 Hours</b>
<b><u>Text Books:</u></b>	1. Balasubramanian T., <i>A Textbook of English Phonetics for Indian Students</i> , Macmillan India Ltd., Madras. 1995.	
<b><u>Reference Books:</u></b>	1. Sethi J & Dhamija P.V., <i>A Course in Phonetics and Spoken English</i> , Prentice Hall of India, New Delhi. 1989. 2. Taylor Grant, <i>English Conversation Practice</i> , Tata McGraw Hill New Delhi. 3. Bansal, R.K. and J.B. Harrison, <i>Spoken English</i> , Orient Longman, New Delhi. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.geektonight.com/business-communication-pdf-notes/">https://www.geektonight.com/business-communication-pdf-notes/</a> 2. <a href="https://www.tutorialspoint.com/business_communication_strategies">https://www.tutorialspoint.com/business_communication_strategies</a>	

<b>Course Code:</b> MCA155	<b>MCA- Semester-I</b> <b>(Laboratory Course - I)</b> <b>Data Structures &amp; Algorithms Lab</b>	<b>L-0</b> <b>T-0</b> <b>P-4</b> <b>C-2</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Applying linear and polynomial time sorting algorithm to sort the elements.	
<b>CO2.</b>	Applying graph algorithms to find the shortest path in the graph.	
<b>CO3.</b>	Applying advanced design and analysis techniques like dynamic programming, matrix chain multiplication, greedy algorithm etc. to solve the real life problems.	
<b>CO4.</b>	Developing algorithms for real life problems.	
<b>CO5.</b>	Developing randomized string matching algorithms like Naïve algorithm, Rabin Karp algorithm etc.	
<b>Course Content:</b>		
	<ol style="list-style-type: none"> <li>1. Programs to implement Array and Dynamic Array.</li> <li>2. Implement various sorting techniques.</li> <li>3. Program to implement recursion in C.</li> <li>4. Program to implement Stack and Queue Operation.</li> <li>5. Implement Recursive algorithms – Tower of Hanoi, recursive maximum &amp; minimum etc</li> <li>6. Program to implement Linked List Operation.</li> <li>7. Program to implement Stack and Queue Operation using Linked List.</li> <li>8. Program to implement Binary tree and Binary Search tree.</li> <li>9. Program to implement <i>Breadth First Search</i> and <i>Depth First Search</i>.</li> <li>10. Creation of a binary search tree and insertion &amp; deletion into it.</li> <li>11. Creation of a Red Black tree and all the associated operations on it.</li> <li>12. Implementing an AVL tree and all the associated operations on it.</li> <li>13. Multiplication of two matrices using Strassen’s Matrix Multiplication method.</li> <li>14. Solving Knapsack problem.</li> <li>15. Implementing shortest path algorithms (Dijkstra’s and Bellman Ford Algorithm).</li> <li>16. Finding the minimum cost Spanning Tree in a connected graph.</li> <li>17. Solving 8 Queen’s problem.</li> <li>18. Finding the number of connected components in a Graph</li> </ol>	<b>40</b> <b>Hours</b>

<b>Course Code:</b> MCA156	<b>MCA- Semester-I</b> <b>(Laboratory Course - II)</b> <b>Database Management System Lab</b>	<b>L-0</b> <b>T-0</b> <b>P-4</b> <b>C-2</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Applying the concepts of DML operation to database table to complete different queries on database.	
<b>CO2.</b>	Applying the concepts of PL/SQL for creating functions and procedure.	
<b>CO3.</b>	Applying the concepts of PL/SQL for creating different triggers.	
<b>CO4.</b>	Developing the database for application software.	
<b>CO5.</b>	Developing the queries to access and update the database	
<b>Course Content:</b>		
	<ol style="list-style-type: none"> <li>1. Introduction to SQL Basics</li> <li>2. Introduction DBMS environment – Oracle 10g, i-sqlplus Environment</li> <li>3. Description of Data Types</li> <li>4. Implementing DML operations in SQL.</li> <li>5. Create a sample Relational Database</li> <li>6. Using DDL to create Tables, Alter Tables, Drop Tables</li> <li>7. Implementations and updation of data in tables.</li> <li>8. Use constraints to define Primary Keys, Foreign Keys, Cascade Operations and check Constraints.</li> <li>9. Using DCL to grant &amp; revoke permissions to users.</li> <li>10. Taking backup on Hard Drive.</li> <li>11. Design a Complete Database for a Bank with at least 2-NF conformity.</li> <li>12. Implementation of PL/SQL blocks and other database objects</li> </ol>	<b>40</b> <b>Hours</b>

<b>Course Code:</b> MCA121	<b>MCA- Semester-I (Bridge Course - I) Computer Fundamentals</b>	<b>L-2 T-0 P-0 C-0</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
CO1.	Understanding types of computers and generations of computers.	
CO2.	Understanding the basic components of a computer system	
CO3.	Understanding the importance of input /output devices and memory.	
CO4.	Understanding the basics of application and system software.	
CO5.	Understanding the basics of number system.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Computer fundamentals:</b> Brief history of development of computers, Computer system concepts, Computer system characteristics, Types of computers, Generations of computers, Basic components of a computer system - Control unit, ALU, Input/Output functions and characteristics	<b>4 Hours</b>
<b>Unit-2:</b>	<b>Devices and memory:</b> Input /Output devices, Primary and Secondary memories.	<b>4 Hours</b>
<b>Unit-3:</b>	<b>Computer software:</b> Software and its Need, Types of Software - System software, Application software, System Software: Operating System, Utility Program, Assemblers, Compilers and Interpreter.	<b>4 Hours</b>
<b>Unit-4:</b>	<b>Number System:</b> Binary, Octal, Decimal, and Hexadecimal number system, Subtraction using 1's and 2's complements.	<b>4 Hours</b>
<b>Unit-5:</b>	<b>Programming Fundamentals:</b> Algorithm development, Techniques of problem solving. Flowchart Structured programming concepts.	<b>4 Hours</b>
<b>Text Books:</b>	1. Computer Fundamentals, P.K. Sinha, BPB Publication, November, 2004. 2. Computer Fundamental and Concepts, V. Raja Raman, PHI, 4 <sup>th</sup> Edition, January 2010.	
<b>Reference Books:</b>	1. Computers Today, S.K. Basandra, Galgotia Publications, 2005. * <b>Latest editions of all the suggested books are recommended.</b>	
<b>Additional Electronic Reference:</b>	1. <a href="https://www.tutorialspoint.com/computer_fundamentals/index.htm">https://www.tutorialspoint.com/computer_fundamentals/index.htm</a> 2. <a href="https://www.javatpoint.com/computer-fundamentals-tutorial">https://www.javatpoint.com/computer-fundamentals-tutorial</a>	



<b>Course Code:</b> MCA122	<b>MCA- Semester-I (Bridge Course - II) Basics of programming using C &amp; C++</b>	<b>L-2 T-0 P-0 C-0</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the concept of C/ C++ programming.	
<b>CO2.</b>	Understanding the importance of data types and tokens used in C/ C++.	
<b>CO3.</b>	Understanding the importance of object oriented features.	
<b>CO4.</b>	Understanding the use of object and class in C++.	
<b>CO5.</b>	Understanding the use of constructor and destructor in C++.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction to C Programming Language :</b> History, Structure of C programming, Language Fundamental- Data Types- integer, character, float, constant and variable, keywords, identifiers, C tokens, comments, Operators,	<b>4 Hours</b>
<b>Unit-2:</b>	<b>Features of object oriented programming:</b> object, class, encapsulation, inheritance, polymorphism, static and dynamic binding.	<b>4 Hours</b>
<b>Unit-3:</b>	<b>Introduction to Control Structures –</b> Decision making structure- if , if –else , if- elseif, Switch, Loop Control Structure - for, While, do-while, Other Statements- goto, break, continue, exit.	<b>4 Hours</b>
<b>Unit-4:</b>	<b>C++ Programming Basics:</b> Variables, data type, array, Functions, Call by Reference, Call by Address, Call by Value, Function Overloading, Inline Function, Enumerations.	<b>4 Hours</b>
<b>Unit-5:</b>	<b>Object &amp; Classes:</b> Access Specifiers, Constructors. Default, Copy Constructor, destructor, Friend Functions, memory allocation in C++.	<b>4 Hours</b>
<b>Text Books:</b>	1. Programming in C, E. Balguruswamy, McGraw Hill, 2 <sup>nd</sup> Edition.	
<b>Reference Books:</b>	1. Let Us C/ c++, Yashvant Kanetkar, BPB Publication, 2006. 2. Programming in C++, E. Balguruswamy, McGraw Hill, 2 <sup>nd</sup> Edition. <b>* Latest editions of all the suggested books are recommended.</b>	
<b>Additional Electronic Reference:</b>	1. <a href="https://www.tutorialspoint.com/cplusplus/cpp_tutorial.pdf">https://www.tutorialspoint.com/cplusplus/cpp_tutorial.pdf</a> 2. <a href="https://www.cprogramming.com/tutorial.html">https://www.cprogramming.com/tutorial.html</a>	

<u>Course Code:</u> MCA123	<b>MCA- Semester-I (Bridge Course - III) Human Values &amp; Ethics</b>	<b>L-2 T-0 P-0 C-0</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concept of human value and ethics.	
<b>CO2.</b>	Understanding the basics of relationship and physical facilities.	
<b>CO3.</b>	Understanding the importance of human value and ethics.	
<b>CO4.</b>	Understanding the needs of Self ('I') and 'Body'.	
<b>CO5.</b>	Understanding harmony in the Family.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> Understanding the need, basic guidelines, content and process for Value Education. Self Exploration – what is it? – its content and process; 'Natural Acceptance' and Experiential Validation – as the mechanism of self exploration. Continuous Happiness and Prosperity – A look at basic Human Aspirations. Right Understanding, Relationship and Physical Facilities	<b>4 Hours</b>
<b>Unit-2:</b>	<b>Understanding Harmony in the Human Being – Harmony in Myself:</b> Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' – <i>Sukh</i> and <i>Suvidha</i> . Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'.	<b>4 Hours</b>
<b>Unit-3:</b>	<b>Understanding Harmony in the Family and Society – Harmony in Human-Human Relationship:</b> Understanding harmony in the Family – the basic unit of human interaction. Understanding values in human-human relationship; meaning of <i>Nyaya</i> and program for its fulfillment to ensure <i>Ubhay-tripti</i> ; Trust ( <i>Vishwas</i> ) and Respect ( <i>Samman</i> ) as the foundational values of relationship. Understanding the meaning of <i>Vishwas</i> ; Difference between intention and competence. Understanding meaning of <i>Samman</i> ;	<b>4 Hours</b>
<b>Unit-4:</b>	Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): <i>Samadhan</i> , <i>Samridhi</i> , <i>Abhay</i> , <i>Sah-astitva</i> as comprehensive Human Goals. Visualizing a universal harmonious order in society – Undivided Society ( <i>Akhand Samaj</i> ), Universal Order ( <i>Sarvabhaum Vyavastha</i> ) – from family to world family!	<b>4 Hours</b>

<b>Unit-5:</b>	<b>Understanding Harmony in the Nature and Existence:</b> Understanding the harmony in the nature. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature.	<b>4 Hours</b>
<b><u>Text Books:</u></b>	1. R R Gaur, R Sangal, G P Bagaria, 2009, <i>A Foundation Course in Value Education</i> .	
<b><u>Reference Books:</u></b>	1. Ivan Illich, 2000, <i>Energy and Equity</i> , The Trinity Press. 2. A Nagraj, <i>Jeevan Vidya Ek Parichay</i> , Divya Path Sansthan. 3. Sussan George, <i>How the Other Half Dies</i> , Penguin Press. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.academia.edu/8844628/Professional_Ethics_and_Human_Values_Notes">https://www.academia.edu/8844628/Professional_Ethics_and_Human_Values_Notes</a> 2. <a href="https://lecturenotes.in/subject/576/professional-ethics-and-human-values">https://lecturenotes.in/subject/576/professional-ethics-and-human-values</a>	

<b>Course Code:</b> <b>TMUPS-101</b>	<b>MCA- Semester-I</b> <b>(Value Added Course - I)</b> <b>Managing Self</b>	<b>L-2</b> <b>T-0</b> <b>P-0</b> <b>C-0</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
<b>CO2.</b>	Understanding and analyzing self and devising a strategy for self-growth and development.	
<b>CO3.</b>	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
<b>CO4.</b>	Utilizing time in the most effective manner and avoiding procrastination.	
<b>CO5.</b>	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
<b>CO6.</b>	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Personal Development:</b> Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	<b>10 Hours</b>
<b>Unit-2:</b>	<b>Professional Development:</b> Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Career Development:</b> Resume Building Occupational Research Group discussion (GD) and Personal Interviews	<b>12 Hours</b>
<b>Reference Books:</b>	<ol style="list-style-type: none"> <li>1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18<sup>th</sup> ed., Pearson Education</li> <li>2. Tracy, Brian, Time Management (2018), Manjul Publishing House</li> <li>3. Hill, Napoleon, Think and grow rich (2014), Amazing Reads</li> <li>4. Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub</li> </ol>	

	<ol style="list-style-type: none"><li>5. <a href="https://www.hloom.com/resumes/creative-templates/">https://www.hloom.com/resumes/creative-templates/</a></li><li>6. <a href="https://www.mbauniverse.com/group-discussion/topic.php">https://www.mbauniverse.com/group-discussion/topic.php</a></li><li>7. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan</li><li>8. Burne, Eric, Games People Play (2010), Penguin UK</li><li>9. <a href="https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression">https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression</a></li></ol> <p><b>* Latest editions of all the suggested books are recommended.</b></p>	
--	--	--

<b>Course Code:</b> MCA224	<b>MCA- Semester-II</b> <b>(Core Course - V)</b> <b>Software Engineering</b>	<b>L-4</b> <b>T-0</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
CO1.	Understanding the basic concepts of software development life cycle and various process models of software development.	
CO2.	Understanding the concepts of agile software development and the basics of requirements engineering using case study.	
CO3.	Understanding the concepts of software design and to apply software design techniques with the help of flow charts, ERD and DFD.	
CO4.	Understanding the concepts of coding approach, software testing, and software maintenance & software reliability.	
CO5.	Analyzing various tools and techniques of coding approach, software testing, and software maintenance & software reliability.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> Introduction to Software Engineering, Software Development Life Cycle (SDLC) & its phases. <b>Software Process Models:</b> Water Fall, Evolutionary Process Model - Prototype & Spiral Model, Incremental Process Model – Iterative Approach, RAD. Overview of ETVX Concept (Entry, Task, Verification & Validation, Exit)	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Agile Methodology:</b> Agile Manifesto- Values & Principles. Agile Methods: Extreme Programming, Scrum. Challenges in Adopting Agile Methods. <b>Requirement Engineering:</b> Functional and Non Functional Requirements, User Requirements, System Requirements, Interface Specifications, Context Diagram, Software Requirement Specifications (SRS) Case Study: SRS following IEEE Standards.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Software-Design:</b> Design principles, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies-Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Data Flow Diagrams (DFD), Data Dictionary, Entity Relationship Diagrams (ERD), Concept of User Interface	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Coding:</b> Top-down and bottom-up approach, Coding Standards, Code Review, Code Walkthrough, Code Inspections. <b>Software Testing:</b> Overview of Testing, Verification & Validation. <b>Software Reliability:</b> Overview of Software Reliability, Reliability Metrics	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Software Maintenance:</b> Need for Software Maintenance, Categories of Maintenance: Preventive, Corrective, Adaptive and Perfective Maintenance, Cost of Maintenance <b>Trends in Software Engineering:</b> Reverse Engineering & Re-engineering, CASE Tools	<b>8 Hours</b>

<b><u>Text Books:</u></b>	1. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.	
<b><u>Reference Books:</u></b>	1. Pankaj Jalote, Software Engineering, Wiley 2. Ian Sommerville, Software Engineering, Addison Wesley. 3. Pressman, Roger S., “Software Engineering: A Practitioner’s Approach”, McGraw Hill <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf">https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf</a> 2. <a href="https://www.tutorialspoint.com/software_engineering/software_engineering_pdf_version.htm">https://www.tutorialspoint.com/software_engineering/software_engineering_pdf_version.htm</a>	

<b>Course Code:</b> MCA225	<b>MCA- Semester-II (Core Course - VI) Computer Networks</b>	<b>L-3 T-0 P-0 C-3</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the concepts of network fundamentals and terminology.	
<b>CO2.</b>	Understanding the principles of LAN design such as topology and configuration depending on types of users accessing the network.	
<b>CO3.</b>	Understanding different type of network interfaces and their uses by identifying and using basic Network components, choosing appropriate network type and media.	
<b>CO4.</b>	Understanding network industry standards such as the OSI model.,	
<b>CO5.</b>	Analyzing routing Protocols and reverse address resolution protocols.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Congestion and Quality of Service (QoS):</b> Data traffic, Congestion, Congestion Control, Open loop and Closed Loop Congestion Control in TCP and Frame Relay, Quality of Service, Flow Characterization, Flow Classes, Need for QoS, Techniques to Improve QoS.	<b>6 Hours</b>
<b>Unit-2:</b>	<b>ATM Protocol Reference Model:</b> Introduction, Transmission Convergence (TC) Sub-layer, Physical Medium Dependent (PMD) Sub-layer, Physical Layer Standards for ATM.	<b>6 Hours</b>
<b>Unit-3:</b>	<b>Virtual Private Network (VPN):</b> Types of VPN, VPN General Architecture, VPN Security Issues, VPN Standards. <b>IP Addressing:</b> IPv4 header format, Classless Addressing of IP, Calculating network and host, calculating subnetting, IPv6 addressing, Header format of IPv6, Advantage of IPv6	<b>6 Hours</b>
<b>Unit-4:</b>	<b>Wireless Local Area Networks:</b> Introduction, Wireless LAN Topologies, Wireless LAN Requirements, the Physical Layer, the Medium Access Control (MAC) Layer, Latest Developments, Wireless LAN standards	<b>6 Hours</b>
<b>Unit-5:</b>	<b>Interconnection Networks:</b> Introduction, Banyan Networks- Properties, Crossbar Switch, Three Stage Class Networks, Rearrangeable Networks, Folding Algorithm, Benes Networks.	<b>6 Hours</b>
<b>Text Books:</b>	1. Data Communication and Networking - B. A.Forouzan, 4th updating, 2004, TMH	
<b>Reference Books:</b>	1. Introduction to Broadband Communication Systems- Sadiku, Mathew N.O., Akujuobi, Cajetan.M, PHI 2. Wireless Networks- P. Nicopolitidis, A. S. Pomportsis, G. I. Papadimitriou, M. S. Obaidat, 2003, JohnWiley & Sons 3. High Performance TCP / IP Networking – Mahaboob Hassan, Jain Raj, PHI.	





	<b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.university.youth4work.com/study-material/computer-networking-lecture">https://www.university.youth4work.com/study-material/computer-networking-lecture</a> 2. <a href="https://www.geeksforgeeks.org/computer-network-tutorials/">https://www.geeksforgeeks.org/computer-network-tutorials/</a>	



<b>Course Code:</b> MCA226	<b>MCA- Semester II (Core Course - VII) Theory of Computation</b>	<b>L-4 T-0 P-0 C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the fundamentals of Computational theory and basic terminology used.	
<b>CO2.</b>	Understanding basics of various machines used for computations like FSM, PDA, TM.	
<b>CO3.</b>	Understanding the grammar, language, formation of regular expression in FA, minimization of FA and CFG.	
<b>CO4.</b>	Applying the concepts to design various machines like FSM, PDA etc.	
<b>CO5.</b>	Analyzing the efficiency of various machines based upon their functionality and limitations.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Fundamentals:</b> Strings, Alphabet, Language, Operations, Finite state machine, Definitions, Finite automaton model, acceptance of strings and languages, Deterministic finite automaton and non deterministic finite automaton, Transition diagrams and language recognizers, Chomsky hierarchy of languages.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Finite Automata:</b> NFA with $\epsilon$ transitions-Significance, Acceptance of languages. Conversions and Equivalence, Equivalence between NFA with and without null transitions, NFA to DFA conversion, Minimization of FSM, Equivalence between two FSM's, Finite Automata with output-Moore and Mealy machines.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Regular Languages:</b> Regular sets, Regular expressions, Identify rules, Constructing finite Automata for a given regular expressions, Conversion of finite automata to regular expressions, Pumping lemma of regular sets. <b>Grammar Formalism:</b> Regular grammars-right linear and left linear grammars, Equivalence between regular linear grammar and FA, Context free grammar, Derivation trees, Sentential forms, Rightmost and leftmost derivation of strings.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Context Free Grammars:</b> Ambiguity in context free grammars. Minimization of context free grammars, Chomsky normal form, Greiback normal form, Pumping lemma for context free languages.	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Push Down Automata:</b> Push down automata, Definition, Model, Acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, Introduction to Turing Machine, TM Definition, TM Model, Design of TM.	<b>8 Hours</b>

<b><u>Text Books:</u></b>	1. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science (Automata, Languages and Computation)”, PHI	
<b><u>Reference Books:</u></b>	1. Martin J. C., “Introduction to Languages and Theory of Computations”, TMH 2. Papadimitrou, C. and Lewis, C.L., “Elements of theory of Computations”, PHI 3. Hopcroft, Ullman, “Introduction to Automata Theory, Language and Computation”, Nerosa Publishing House <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1 <a href="https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/">https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/</a> 2. <a href="https://www.tutorialspoint.com/automata_theory/index.htm">https://www.tutorialspoint.com/automata_theory/index.htm</a>	



<b>Course Code:</b> MCA227	<b>MCA- Semester-II</b> <b>(Core Course - VIII)</b> <b>Object Oriented Programming using Java</b>	<b>L-4</b> <b>T-0</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concept of object oriented programming.	
<b>CO2.</b>	Understanding the detail concept of java in real life.	
<b>CO3.</b>	Understanding the concept of data types and conditional statement used in java.	
<b>CO4.</b>	Understanding application of java and its modules.	
<b>CO5.</b>	Analyzing the relationship between java and Data Analysis.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Fundamental Programming Structures:</b> Introduction to Java, Data Types, Variables, Operators, Control Flow, Arrays, Big Numbers. <b>Objects and Classes:</b> Introduction to Object Oriented Programming, Classes, Inner classes, Access Specifiers, Methods, Argument Passing Mechanism, Constructors, Overloading, finalize, static, Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Object Wrappers and Autoboxing, Packages and Interfaces.	<b>8 Hours</b>
<b>Unit-2:</b>	String Handling, Exception Handling, Input/Output, Networking. <b>Graphics Programming:</b> Applet Fundamentals, Introducing AWT, Graphics, Colors, Fonts, Displaying Image. <b>Event Handling:</b> Delegation Event Model, Event Classes, Event Listener Interfaces. <b>AWT Controls:</b> Button, Label, Checkbox, Checkbox Group, Choice, List, Scrollbar, Text Field, Text Area, Menu. <b>Layout Managers:</b> Flow Layout, Border Layout, Grid Layout, Card Layout, Removing Layout Management and Using Insets.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Swings:</b> Swings Overview, Creating a Swing Applet and Application. <b>Swing Components:</b> Image Icon, JLabel, JTextField, JTextArea, JButton, JCheckBox, JRadioButton, JComboBox, JList, JProgressBar, Using Menu & Toolbar, Different Panes, JPanel, JTable, JSlider, JInternalFrame, Dialog Boxes. <b>Multithreading:</b> Thread States, Thread Priorities, Synchronization, multithreading applications with Applets and Swings	<b>8 Hours</b>
<b>Unit-4:</b>	<b>JDBC:</b> Introduction to JDBC, Types of JDBC Drivers, java.sql package, Using stored procedures and Metadata. <b>Utilities:</b> Using JAR and JAVADOC utilities. <b>Introduction to Beans:</b> Java Bean API, Beans properties, Simple Bean Example, Enterprise Java Bean-Entity Beans, Session Beans, Message Driven Beans.	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Java Servlets:</b> Servlet Basics, Servlet API, Life Cycle of Servlet, Running Servlet, HTTP Redirects, Session Management <b>Java Server Pages (JSP):</b> JSP Elements, Implicit Objects, Using	<b>8 Hours</b>



	Bean, Introduction to JSTL.	
<b><u>Text Books:</u></b>	1. Patrick Naughton & Herbert Schildt, <i>The Complete Reference JAVA2</i> , Tata Mc Graw Hill	
<b><u>Reference Books:</u></b>	1. Balagurusamy E., <i>Programming in JAVA</i> , Tata McGraw Hill 2. Steven Holzner, <i>Java2 Black Book</i> , Dreamtech 3. Herbert Schildt, <i>The Complete Reference JAVA2</i> , Tata McGraw Hill <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.tutorialspoint.com/discrete_mathematics/index.htm">https://www.tutorialspoint.com/discrete_mathematics/index.htm</a> 2. <a href="https://www.javatpoint.com/discrete-mathematics-tutorial">https://www.javatpoint.com/discrete-mathematics-tutorial</a>	

<b>Course Code:</b> MCA228	<b>MCA- Semester-II</b> <b>(Core Course - IX)</b> <b>Web Technologies</b>	<b>L-4</b> <b>T-0</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the concept of server-side web-based programming and the CGI environment.	
<b>CO2.</b>	Understanding the basics of web-based scripting languages, their advantages and problems.	
<b>CO3.</b>	Understanding the concept of searching and pattern matching using regular expressions.	
<b>CO4.</b>	Understanding the concept of implementation of a small web-based server-side application.	
<b>CO5.</b>	Understanding the some current technical and research issues in this field.	
<b>Course Content:</b>		
<b>Unit-1:</b>	Introduction to HTML, HTML fonts Styles, Links, Images Tables Static V/S Dynamic Websites HTML, attributes, Headings Paragraphs, Formatting Lists, Colors Forms Links on a same page, Tags DHTML Introduction Marquee Tag Effects. CSS Introduction, CSS Id & Class Styling Backgrounds, Fonts, Links, CSS Border, Margin, Cell padding. HTML5 Intro HTML5 Elements , Style , Media ,Video Audio Plug-ins HTML.	<b>8 Hours</b>
<b>Unit-2:</b>	Introduction to JavaScript – Control Structures, DOM, Client Validations (Null and Password Validations), Javascript events. JQUERY library, Scrolling effects, Images and Forms Integration ,Fading practical, Animation effect practical.	<b>8 Hours</b>
<b>Unit-3:</b>	PHP installation and Introduction, Loops, String Functions in PHP,PHP Email Function ,PHP Basics, Variables, Arrays in PHP with Attributes Date & Time, Image Uploading, File handling in PHP ,Functions in PHP, Errors handling in PHP.	<b>8 Hours</b>
<b>Unit-4:</b>	Introduction to MySQL database, Create tables, fields, Alter table, Insert, Update and where condition, Delete, Select, Limits, Distinct, Joins, Order by, Group by, Union, Import and Export Database. Introduction to Ajax, XML HTTP Request, XHR Object, XHR Response, XHR Ready State, Fetching text from source, Ajax polls, AJAX PHP, Ajax Database.	<b>8 Hours</b>
<b>Unit-5:</b>	Advance PHP-Sending Emails using Classes, Class, Object, Inheritance, Inheritance types, Object cloning, Constructor and Destructor, Access specifiers, Scope resolution operator, Class constant, This operator, Abstract class and interface.	<b>8 Hours</b>

<p><b><u>Text Books:</u></b></p>	<p>1. Kogent Learning Solutions Inc ,“Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, Javascript, PHP, Java, Jsp, XML and Ajax, Black Book ”, Dreamtech Press ,2009 Edition.          2. Robin Nixon ,“Learning PHP, MySQL &amp; JavaScript with j Query, CSS &amp; HTML5”, Shroff Publishers &amp; Distributers Private Limited - Mumbai; Fourth edition,2015.          3. Vikram Vaswani,“PHP- A Beginners Guide”, McGraw Hill Education ,2008 Edition.</p>	
<p><b><u>Reference Books:</u></b></p>	<p>1. Ivan Bayross, “Web Technologies Part II”, BPB Publications.          2. Larry Ullman ,“Php and MYSQL for Dynamic Web Sites”, Pearson Education, 4 edition ,2014.          * <b>Latest editions of all the suggested books are recommended.</b></p>	
<p><b><u>Additional Electronic Reference:</u></b></p>	<p>1.<a href="https://www.geektonight.com/web-technologies-notes-pdf/">https://www.geektonight.com/web-technologies-notes-pdf/</a>          2.<a href="https://tutorial.techaltum.com/webdesigning.html">https://tutorial.techaltum.com/webdesigning.html</a></p>	

<b>Course Code:</b> MCA257	<b>MCA- Semester-II</b> <b>(Laboratory Course - III)</b> <b>Object Oriented Programming using Java Lab</b>	<b>L-0</b> <b>T-0</b> <b>P-4</b> <b>C-2</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the execution of java in real life.	
<b>CO2.</b>	Analyzing the data from different datasets with different modules.	
<b>CO3.</b>	Developing different functions to search pattern in the files.	
<b>CO4.</b>	Developing the different modules to predict data.	
<b>CO5.</b>	Developing console application in Java	
<b>Course Content:</b>	<ol style="list-style-type: none"> <li>1. Programs based on console application.</li> <li>2. Programs based on loops, arrays, operators and big numbers.</li> <li>3. Programs based on Classes and Objects.</li> <li>4. Programs based on Method Overloading, Constructors.</li> <li>5. Simple application based on static keyword.</li> <li>6. Programs based on Inheritance.</li> <li>7. Programs based on Method Overriding, Dynamic Method Dispatch, Abstract Classes.</li> <li>8. Programs based on Object Wrappers and Autoboxing.</li> <li>9. Programs based on String Handling.</li> <li>10. Programs based on Networking.</li> <li>11. Simple application to demonstrate the working of Packages.</li> <li>12. Developing a Simple Applet.</li> <li>13. An applet to demonstrate the working of Mouse Events.</li> <li>14. Programs based on the usage of all AWT controls.</li> <li>15. A simple application to demonstrate the working of Frames.</li> <li>16. A simple swing application.</li> <li>17. Programs to demonstrate event handling on various swing components.</li> <li>18. Programs based on applets and multithreading.</li> <li>19. A simple application to retrieve and insert records in MS-Access database.</li> <li>20. A simple application to retrieve and insert records in My-SQL database.</li> <li>21. Use of JAR and JAVADOC utilities.</li> <li>22. A simple client-server application using RMI.</li> <li>23. Programs based on Servlets.</li> <li>24. A simple application using JSP.</li> <li>25. A web based application that could search a record from the database.</li> </ol>	<b>40</b> <b>Hours</b>





<b>Course Code:</b> MCA258	<b>MCA- Semester-II</b> <b>(Laboratory Course - IV)</b> <b>Computer Networks Lab</b>	<b>L-0</b> <b>T-0</b> <b>P-2</b> <b>C-1</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the structure and organization of computer networks; as well as relationships between the layers.	
<b>CO2.</b>	Analyzing various models of client/server and peer to peer models.	
<b>CO3.</b>	Analyzing transport layer protocols to design the network.	
<b>CO4.</b>	Developing data link frame to transfer data from one node to another node.	
<b>CO5.</b>	Developing error detection methods to detect the error during transmission of data from one node to another node	
<b>Course Content:</b>		
	<ol style="list-style-type: none"> <li>1. Study of Network devices in detail</li> <li>2. Connect the computers in Local Area Network</li> <li>3. Implementation of Data Link Framing method - Character Count.</li> <li>4. Implementation of Data link framing method - Bit stuffing and De stuffing.</li> <li>5. Implementation of Error detection method - even and odd parity.</li> <li>6. Implementation of Error detection method - CRC Polynomials.</li> <li>7. Implementation of Data Link protocols - Unrestricted simplex protocol</li> <li>8. Implementation of data link protocols - Stop and Wait protocol</li> <li>9. Implementation of routing algorithms - Dijkstra's algorithm</li> <li>10. Study of Network IP Addressing</li> <li>11. Study of sockets in detail</li> </ol>	<b>20</b> <b>Hours</b>



<b>Course Code:</b> MCA259	<b>MCA- Semester-II (Laboratory Course - V) Web Technologies Lab</b>	<b>L-0 T-0 P-4 C-2</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Developing server-side web-based program modules.	
<b>CO2.</b>	Developing program modules to solve the real life problems using web-based scripting languages.	
<b>CO3.</b>	Developing searching and pattern matching programming problems using regular expressions.	
<b>CO4.</b>	Developing a small web-based server-side application programming problems.	
<b>CO5.</b>	Developing the websites using HTML and java script.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<ol style="list-style-type: none"> <li>1. Using various HTML Tags</li> <li>2. Rendering tags in different browsers.</li> <li>3. Combining JavaScript with HTML – Form Validation, User Input, Form Submission etc</li> <li>4. Creating CSS to combine with javascripts</li> <li>5. Creating rounded table corners using div tags &amp; css.</li> <li>6. Using AJAX</li> <li>7. Using XMLHttpRequest objects within a Javascript code</li> <li>8. AJAX based form validation</li> <li>9. Loading a html page within a div tag using AJAX</li> <li>10. Dynamic Data Loading using AJAX on a form</li> <li>11. Creating Auto-suggest Text field using AJAX</li> <li>12. Using XML, creating DTD's, combining XML with CSS, validating XML</li> <li>13. Creating a simple ASP Page to submit data to the server.</li> <li>14. Using JQuery plugins on a HTML page</li> <li>15. Programming on PHP control structures.</li> <li>16. Database connectivity of PHP page.</li> <li>17. Programming based upon Advanced PHP.</li> <li>18. Program based on AJAX in PHP.</li> </ol>	<b>40 Hours</b>



<b>Course Code:</b> TMUPA-202	<b>MCA- Semester-II</b> <b>(Value Added Course - II)</b> <b>Numerical Ability</b>	<b>L-2</b> <b>T-1</b> <b>P-0</b> <b>C-0</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.	
<b>CO2.</b>	Employing the techniques of Percentage; Ratios and Average in inter related concepts of Time and Work.	
<b>CO3.</b>	Applying the arithmetical concepts of Average, Mixture and Allegation.	
<b>CO4.</b>	Evaluating the different possibilities of various reasoning based problems in series, Blood relation, Direction and Puzzle Problems.	
<b>CO5.</b>	Correlating the various arithmetic concepts to check sufficiency of data.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Percentages</b> Basic calculation, ratio equivalent, base, change of base, multiplying factor, percentage change, increment, decrement, successive percentages, word problems	<b>4 Hours</b>
<b>Unit-2:</b>	<b>Profit Loss Discount</b> Basic definition, formula, concept of mark up, discount, relation with successive change, faulty weights	<b>3 Hours</b>
<b>Unit-3:</b>	<b>Data Sufficiency</b> Introduction of Data Sufficiency, different topics based DS	<b>3 Hours</b>
<b>Unit-4:</b>	<b>Ratio, proportions and variations</b> Concept of ratios, proportions, variations, properties and their applications	<b>3 Hours</b>
<b>Unit-5:</b>	<b>Mixtures and allegations</b> Mixtures of 2 components, mixtures of 3 components, Replacements	<b>3 Hours</b>
<b>Unit-6:</b>	<b>Time and Work</b> Same efficiency, different efficiency, alternate work, application in Pipes and Cisterns	<b>5 Hours</b>
<b>Unit-7:</b>	<b>Number and alphabet series</b> Number series, alphabet series	<b>2 Hours</b>
<b>Unit-8:</b>	<b>Blood relations</b> Indicating type, operator type, family tree type	<b>2 Hours</b>
<b>Unit-9:</b>	<b>Direction sense</b> Simple statements, shadow type	<b>1 Hours</b>
<b>Unit-10:</b>	<b>Problem solving</b> Arrangement type, Distribution type, Miscellaneous	<b>4 Hours</b>
<b>Reference Books:</b>	<ul style="list-style-type: none"> <li>R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude</li> <li>R2:-Quantitative Aptitude by R.S. Agrawal</li> </ul>	



	<ul style="list-style-type: none"><li>• R3:-M Tyra: Quicker Maths</li><li>• R4:-Nishith K Sinha:- Quantitative Aptitude for CAT</li><li>• R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com</li><li>• R6:-Logical Reasoning by Nishith K Sinha</li><li>• R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal</li></ul> <p><b>* Latest editions of all the suggested books are recommended.</b></p>	
--	--	--

<b>Course Code:</b> TMUPS-201	<b>Value Added Audit Course</b> MCA- Semester-II <b>Managing Work and Others</b>	<b>L-2</b> <b>T-1</b> <b>P-0</b> <b>C-0</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Communicating effectively in a variety of public and interpersonal settings.	
<b>CO2.</b>	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
<b>CO3.</b>	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
<b>CO4.</b>	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
<b>CO5.</b>	Handling difficult situations with grace, style, and professionalism.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Intrapersonal Skills:</b> Creativity and Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Interpersonal Skills:</b> Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	<b>12 Hours</b>
<b>Unit-3:</b>	<b>Interview Techniques:</b> Job Seeking Group discussion (GD) Personal Interview	<b>10 Hours</b>
<b>Reference Books:</b>	Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18 <sup>th</sup> ed., Pearson Education Burne, Eric, Games People Play (2010), Penguin UK Carnegie, Dale, How to win friends and influence people (2004), RHUK Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com 1. <a href="https://www.hloom.com/resumes/creative-templates/">https://www.hloom.com/resumes/creative-templates/</a> 2. <a href="https://www.mbauniverse.com/group-discussion/topic.php">https://www.mbauniverse.com/group-discussion/topic.php</a> 3. <a href="https://www.indeed.com/career-advice/interviewing/job-">https://www.indeed.com/career-advice/interviewing/job-</a>	



	<p><a href="#">interview-tips-how-to-make-a-great-impression</a></p> <p><b>* Latest editions of all the suggested books are recommended.</b></p>	
--	--	--



<b>Course Code:</b> <b>MCA332</b>	<b>MCA- Semester III (Core Course - X) Python Programming</b>	<b>L-4 T-0 P-0 C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concept of python programming language.	
<b>CO2.</b>	Understanding the object oriented programming concepts using Python	
<b>CO3.</b>	Understanding the important aspects related with string, lists and dictionary in python	
<b>CO4.</b>	Understanding various modules used in python	
<b>CO5.</b>	Applying the technical skill for designing user defined functions in python	
<b>Course Content:</b>		
<b>Unit-1:</b>	Introduction History, Features, Setting up path, Working with Python, Basic Syntax ,Variable and Data Types , Operator Conditional Statements If ,If- else ,Nested if-else Looping For, While ,Nested loops Control Statements Break, Continue ,Pass	<b>8 Hours</b>
<b>Unit-2:</b>	String Manipulation Accessing Strings ,Basic Operations ,String slices ,Function and Methods Lists Introduction ,Accessing list ,Operations ,Working with lists ,Function and Methods Tuple Introduction ,Accessing tuples ,Operations ,Working ,Functions and Methods	<b>8 Hours</b>
<b>Unit-3:</b>	Dictionaries Introduction, Accessing values in dictionaries ,Working with dictionaries ,Properties ,Functions Functions Defining a function , Calling a function, Types of functions ,Function Arguments ,Anonymous functions ,Global and local variables	<b>8 Hours</b>
<b>Unit-4:</b>	Modules Importing module ,Math module ,Random module ,Packages ,Composition Input-Output Printing on screen ,Reading data from keyboard ,Opening and closing file ,Reading and writing files ,Functions	<b>8 Hours</b>
<b>Unit-5:</b>	Exception Handling Exception ,Exception Handling ,Except clause , Try ? finally clause , User Defined Exceptions OOPs concept Class and object , Attributes , Inheritance , Overloading , Overriding , Data hiding	<b>8 Hours</b>
<b>Text Books:</b>	1. Learning Python by Mark Lutz, David Ascher Shop O'Reilly - O'Reilly Media	
<b>Reference Books:</b>	1. Learn Python the Hard Way, Zed A. Shaw , <u>Goodreads</u> 2. Python Essential Reference, David M. Beazley, Addison Wesley 3. Beginning Python Magnus Lie Hetland , <u>Goodreads</u>	

	<b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.python.org/about/gettingstarted/">https://www.python.org/about/gettingstarted/</a> 2. <a href="https://www.tutorialspoint.com/python/index.htm">https://www.tutorialspoint.com/python/index.htm</a>	

<b><u>Course Code:</u></b> MCA333	<b>MCA- Semester III (Core Course - XI) Dot Net using C#</b>	<b>L-4 T-0 P-0 C-4</b>
<b><u>Course Outcomes:</u></b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basics of Dot Net Framework with C#.	
<b>CO2.</b>	Understanding the meaning and basic components of a Dot Net Framework with C#.	
<b>CO3.</b>	Understanding the hands-on use of Dot Net Framework with C# applications in Web, Window and Console Application.	
<b>CO4.</b>	Understanding the categories of programs, Web, Window and Console Application.	
<b>CO5.</b>	Understanding the use of the Dot Net Framework with C# programs to create professional, academic, and business software projects.	
<b><u>Course Content:</u></b>		
<b>Unit-1:</b>	<b>Architecture of the .Net Framework Development Platform:</b> Compiling Source Code into Managed Code, Metadata, Intermediate Language (IL), Common Language Runtime Services, Common Type System, Common Language Specification The .Net Framework Class Library, Just-In-Time Compilation, Unified Classes. <b>C# Basics:</b> Data Types, Literals and Variables, Operator, Program Control Statements, Class and Object, Arrays and Strings, <b>A Closer Look at Methods and Classes:</b> C# Access Modifiers, Use ref and out parameter, Variable number of Arguments, Concept of Return Object and Array. Method Overloading, Overloading Constructors, Optional Arguments, Named Arguments, Recursion, Understanding Static.	<b>8 Hours</b>
<b>Unit-2:</b>	Operator Overloading, Indexers and Properties, <b>Inheritance</b> : Member Access using Protected Access, Calling Base Class Constructor, Name Hiding, Virtual Methods and Overriding, Abstract Classes, Using sealed to Prevent Inheritance, Boxing and Unboxing. Interfaces, Exception Handling. Using I/O.	<b>8 Hours</b>
<b>Unit-3:</b>	Delegates and Events, Namespaces and Assemblies, Reflection, Unsafe Code, Networking and Socket. <b>Multithreading</b> : Thread Class, Determining when a Thread Ends, Thread Priorities, Synchronization, Thread Communication using Wait(), Pulse() and PulseAll(), Using the Mutex and a Semaphore. Collections. Windows Forms (IDE Environment)	<b>8 Hours</b>





<b>Unit-4:</b>	<p><b>Advanced Features Using C#:</b> Windows Services, Web Services.  <b>Introduction to ADO.Net:</b> Connected v/s. Disconnected Data Access. ADO.Net Architecture, Connection Object, SQL Command Object, Data Adapter, Data Reader, DataSet.  <b>Asp.net Web Form Controls.</b> State Management, Grid View Control, Validation Controls. Concepts of Paging, Database connectivity with authentication and authorization.</p>	<b>8 Hours</b>
<b>Unit-5:</b>	<p><b>Advanced Features Using C#:</b> Distributed Application in C#, Graphical Device interface with C#, Enumeration.  <b>AJAX:</b> Introduction to AJAX, Using Asp.Net Ajax Controls, Implement Web forms by using Asp.Net Ajax, ASP.NET application using Ajax control toolkit.  <b>LINQ :</b>LINQ Fundamental, LINQ to Object, LINQ to XML, LINQ to SQL</p>	<b>8 Hours</b>
<b><u>Text Books:</u></b>	1. “.Net professional framework 4.0”, Wrox	
<b><u>Reference Books:</u></b>	<p>1.C#.Net Developers Guide- Greg Hack, Jason Werry, SaurabhNandu. (SyngRess)          2.Wrox Press Professional C# 4th Edition – Simon Robinson, Jay Glynn          3.“C# 4.0 Complete Reference”, by Herbert Schildt  <b>* Latest editions of all the suggested books are recommended.</b></p>	
<b><u>Additional Electronic Reference:</u></b>	<p>1.<a href="https://dotnet.microsoft.com/learn/csharp">https://dotnet.microsoft.com/learn/csharp</a>          2.<a href="https://dotnettutorials.net/course/csharp-dot-net-tutorials/">https://dotnettutorials.net/course/csharp-dot-net-tutorials/</a></p>	

<b>Course Code:</b> MCA334	<b>MCA- Semester-III (Core Course - XII) Internet of Things</b>	<b>L-2 T-0 P-0 C-2</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the concepts of Internet of Things.	
<b>CO2.</b>	Understanding the building blocks of Internet of Things and characteristics.	
<b>CO3.</b>	Understanding the application areas of IOT.	
<b>CO4.</b>	Understanding design, development, and security challenges of IoT.	
<b>CO5.</b>	Developing Internet of Things based applications in different domain.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, Functional blocks of IoT.	<b>4 Hours</b>
<b>Unit-2:</b>	<b>Domain Specific IOTs:</b> Home Automation, Cities, Environment, Agriculture, Industry, Health & Life Style.	<b>4 Hours</b>
<b>Unit-3:</b>	<b>IoT &amp; M2M:</b> Machine to Machine, Difference between IoT and M2M, Software define Network	<b>4 Hours</b>
<b>Unit-4:</b>	<b>Challenges in IoT:</b> Design challenges, Development challenges, Security challenges, Other challenges	<b>4 Hours</b>
<b>Unit-5:</b>	<b>IOT Physical Devices &amp; Endpoints:</b> What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming & IOT Devices.	<b>4 Hours</b>
<b>Text Books:</b>	1. Vijay Madiseti, Arshdeep Bahga, "Internet of Things A Hands-On- Approach", 2014.	
<b>Reference Books:</b>	1. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013 * <b>Latest editions of all the suggested books are recommended.</b>	
<b>Additional Electronic Reference:</b>	1. <a href="https://www.tutorialspoint.com/internet_of_things/index.htm">https://www.tutorialspoint.com/internet_of_things/index.htm</a> 2. <a href="https://www.guru99.com/iot-tutorial.html">https://www.guru99.com/iot-tutorial.html</a>	



<b>Course Code:</b> <b>MCA361</b>	<b>MCA- Semester III (Laboratory Course - VI) Python Programming Lab</b>	<b>L-0 T-0 P-4 C-2</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Applying the core python programming concepts like loop, if statement and other concept to create python program.	
<b>CO2.</b>	Applying the different collections such as list, tuple, dictionaries used in python to create python program.	
<b>CO3.</b>	Applying various functions used in python to create python program.	
<b>CO4.</b>	Developing the python programs by using the concept of class, inheritance and operator overloading	
<b>CO5.</b>	Developing the applications by using python programming concepts.	
<b>Course Content:</b>		
	<ol style="list-style-type: none"> <li>1. Write a Python program to calculate the length of a string.</li> <li>2. Write a Python program to count the number of characters (character frequency) in a string.</li> <li>3. Write a Python program to get a string made of the first 2 and the last 2 chars from a given a string. If the string length is less than 2, return instead of the empty string.</li> <li>4. Write a Python program to get a string from a given string where all occurrences of its first char have been changed to '\$', except the first char itself.</li> <li>5. Write a Python program to get a single string from two given strings, separated by a space and swap the first two characters of each string.</li> <li>6. Write a Python program to sum all the items in a list.</li> <li>7. Write a Python program to multiplies all the items in a list.</li> <li>8. Write a Python program to get the largest number from a list.</li> <li>9. Write a Python program to get the smallest number from a list.</li> <li>10. Write a Python script to sort (ascending and descending) a dictionary by value</li> <li>11. Write a Python script to add a key to a dictionary</li> <li>12. Write a Python program to create a tuple</li> <li>13. Write a Python program to create a tuple with different data types.</li> </ol>	<b>40 Hours</b>

	<p>14. Write a Python program to create a tuple with numbers and print one item.</p> <p>15. Write a Python program to unpack a tuple in several variables.</p> <p>16. Write a Python program to add an item in a tuple.</p>	
--	---	--

<b>Course Code: MCA362</b>	<b>MCA- Semester III (Laboratory Course - VII) Dot Net using C# Lab</b>	<b>L-0 T-0 P-4 C-2</b>
Course Outcomes:	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Applying the dot net framework with C# applications in web, window and console application.	
<b>CO2.</b>	Applying the dot net framework features to create personal, academic and business documents.	
<b>CO3.</b>	Developing the C# programs by using C# programming concept.	
<b>CO4.</b>	Developing the various business applications using dot net framework with C#	
<b>CO5.</b>	Developing the real life applications using dot net framework features.	
Course Content:		
	<ol style="list-style-type: none"> <li>1. The use of sequence, conditional and iteration construct.</li> <li>2. Various operators like logical, arithmetical, relational, etc.</li> <li>3. Overloading of various operators.</li> <li>4. Use of Static Member functions, optional arguments.</li> <li>5. Use of destructor and various types of constructor.</li> <li>6. Various forms of Inheritance.</li> <li>7. Use of Interface in multiple inheritance, virtual and override concept, delegates.</li> <li>8. File operation.</li> <li>9. Create windows based application with connected and disconnected architecture.</li> <li>10. Simple web application using ASP Net.</li> <li>11. Use of Active X controls.</li> <li>12. Create web application using ASP.Net with Ajax and Ajax Control Toolkits provided by Microsoft.</li> <li>13. Create Window application using ASP.Net with Ajax and Ajax Control Toolkits provided by Microsoft.</li> </ol>	<b>40 Hours</b>



<b>Course Code:</b> <b>MCA363</b>	<b>MCA- Semester III (Project - I) Mini Project</b>	<b>L-0 T-0 P-0 C-6</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the various stages of project development by Synopsis ,SRS and Project document.	
<b>CO2.</b>	Understanding the basic concept of project by ER diagrams and DFDs.	
<b>CO3.</b>	Applying the test cases in the various modules of the project.	
<b>CO4.</b>	Developing the real life small projects by using the technical skills.	
<b>CO5.</b>	Developingthe database design database queries for real life small projects.	
<b>Course Content:</b>		
	<p>The student will complete the mini project in summer vacations after II semester. Students will submit a synopsis in the mid of the II semester for approval from the departmental committee in a specified format.The student will have to submit at the starting of III semester. Mini project will be evaluated during examination of III semester by the panel of experts and external expert.</p> <p>Minor Project will be evaluated out of total 100 marks. In Internal Evaluation marks will be awarded out of 50 and in external evaluation also marks will be awarded out of 50 on the basis of viva-voce. Internal evaluation will be exercised by the Project Committee of college.</p>	



<b>Course Code:</b> <b>MCA364</b>	<b>MCA- Semester III</b> <b>(Skill-Enhancement Course - I)</b> <b>Summer Internship</b>	<b>L-0</b> <b>T-0</b> <b>P-0</b> <b>C-2</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1:</b>	Understanding the working environment of IT industries.	
<b>CO2:</b>	Understanding the various stages of project development .	
<b>CO3:</b>	Applying database queries for real life projects.	
<b>CO4:</b>	Developing technical skills for testing, maintaining, and deploying the software projects.	
<b>CO5:</b>	Developing real life projects for the industries.	
<b>Course Content:</b>	The student will undertake summer internship program of 6 to 8 weeks during summer vacations. For Internship program he/she can go for “an IT company or internship program organized by the college on various recent technologies. Student will submit a report during III semester. The report will be evaluated during examination of III semester by the panel of experts and external expert. The report will be evaluated out of total 100 marks. In Internal Evaluation marks will be awarded out of 50 and in external evaluation also marks will be awarded out of 50 on the basis of viva-voce. Internal evaluation will be exercised by the committee of college.	

<b>Course Code:</b> MCA371	<b>MCA- Semester-III</b> <b>(Program/Discipline Specific Elective Course - I)</b> <b>Android Programming</b>	<b>L-0</b> <b>T-2</b> <b>P-4</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concepts of Android programming	
<b>CO2.</b>	Understanding Android Framework for application development	
<b>CO3.</b>	Applying event handling in android programming	
<b>CO4.</b>	Applying basic android styles and themes in android based applications.	
<b>CO5.</b>	Developing the android based applications for mobile phones.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Overview:</b> What is Android, Features of Android, Setting up Android Environment, Android Architecture, Application Framework. Application components (activities, services, Broadcast receivers, content providers). First sample application, Anatomy of Android application, Main activity file, Manifest file, Strings file, R file, Layout file, Running the application.	<b>10 Hours</b>
<b>Unit-2:</b>	<b>Emulator</b> -Android Virtual Device, Organizing and accessing the resources, Fragments, Intents & Filters, Basic UI Design, Form widgets, Text Fields, UI Controls, UI Layouts.	<b>10 Hours</b>
<b>Unit-3:</b>	<b>Event Handling:</b> Event Listeners and Handlers, Event Listeners Registration. Preferences, Menus, Custom Components, Tabs and Tab Activity.	<b>10 Hours</b>
<b>Unit-4:</b>	Styles and Themes, Drag and Drop, Content Provider (SQLite Programming, SQLiteOpenHelper, SQLiteDatabase, Cursors).	<b>10 Hours</b>
<b>Unit-5:</b>	Location Based Services, Sending Emails, Sending SMS	<b>10 Hours</b>
<b>Text Books:</b>	1.Carmen Delessio., Sams Teach Yourself Android Application Development in 24 Hours, SAMS	
<b>Reference Books:</b>	1. Jonathan Simon, Head First Android Development, O'Reilly 2.Reto Meier, Wrox Professional Android Application Development, Paperback * <b>Latest editions of all the suggested books are recommended.</b>	
<b>Additional Electronic Reference:</b>	1. <a href="https://www.tutorialspoint.com/android/index.htm">https://www.tutorialspoint.com/android/index.htm</a> 2. <a href="https://tutorial.techaltum.com/android-tutorial.html">https://tutorial.techaltum.com/android-tutorial.html</a>	



<b>Course Code:</b> MCA372	<b>MCA- Semester-III</b> <b>(Program/Discipline Specific Elective Course - II)</b> <b>R – Programming</b>	<b>L-0</b> <b>T-2</b> <b>P-4</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basics of R programming in terms of constructs, control statements, string functions	
<b>CO2.</b>	Understanding the use of R for regression analysis.	
<b>CO3.</b>	Applying R programming for Text processing	
<b>CO4.</b>	Applying the R programming from a statistical perspective	
<b>CO5.</b>	Developing the R programming based applications.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> Introducing to R, R Data Structures, help functions in R, Vectors, Scalars, Declarations, recycling, Common Vector operations, Using all and any, Vectorized operations.	<b>10 Hours</b>
<b>Unit-2:</b>	<b>Matrices, Arrays And Lists:</b> Creating matrices, Matrix operations, Applying Functions to Matrix Rows and Columns, Adding and deleting rows and columns, lists, Creating lists, General list operations, applying functions to lists, recursive lists	<b>10 Hours</b>
<b>Unit-3:</b>	<b>Data Frames:</b> Creating Data Frames, Matrix-like operations in frames, Merging Data Frames, Applying functions to Data frames, Factors and Tables, factors and levels, Working with tables.	<b>10 Hours</b>
<b>Unit-4:</b>	Arithmetic and Boolean operators and values, Default values for arguments, Returning Boolean values, functions are objects, Environment and Scope issues, Writing Upstairs, Recursion, Replacement functions.	<b>10 Hours</b>
<b>Unit-5:</b>	Descriptive Statistics using R: Analysis of Variance (One way ANOVA, Two way ANOVA), Simple and Multiple Linear Regression Analysis, Logistic Regression, Time Series Analysis	<b>10 Hours</b>
<b>Text Books:</b>	1. Norman Matloff, “The Art of R Programming: A Tour of Statistical Software Design”, NoStarch Press, 2011.	
<b>Reference Books:</b>	1. Mark Gardener, “Beginning R – The Statistical Programming Language”, Wiley,2013. 2. Jared P. Lander,” R for Everyone: Advanced Analytics and Graphics”, Addison-Wesley Data,2013 <b>* Latest editions of all the suggested books are recommended.</b>	



<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.datamentor.io/r-programming/">https://www.datamentor.io/r-programming/</a> 2. <a href="https://www.guru99.com/r-tutorial.html">https://www.guru99.com/r-tutorial.html</a>	
--	--	--

<b><u>Course Code:</u></b> MCA337	<b>MCA- Semester-III</b> <b>(Program/Discipline Specific Elective Course - I)</b> <b>Soft Computing</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b><u>Course Outcomes:</u></b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concept of soft computing.	
<b>CO2.</b>	Understanding fuzzy set, fuzzy rules, and fuzzy relations	
<b>CO3.</b>	Understanding the basic concept of genetic algorithm.	
<b>CO4.</b>	Applying fuzzy rules and relations for fuzzy based applications	
<b>CO5.</b>	Analyzing different kinds of artificial neural networks and their learning techniques.	
<b><u>Course Content:</u></b>		
<b>Unit-1:</b>	<b>Introduction:</b> Introduction to soft computing. Intelligent systems, Knowledge-based systems, Knowledge representation and processing. Applications of computational intelligence.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Fuzzy Logic:</b> Crisp set and Fuzzy set, Basic concepts of fuzzy sets, membership functions. Basic operations on fuzzy sets, Properties of fuzzy sets, Fuzzy relations.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Fuzzy rules and models:</b> fuzzy If – Then rules, fuzzy mapping rules and fuzzy implication functions, Applications of Fuzzy Logic. Fuzzy Reasoning – Fuzzy Inference Systems, Mamdani Fuzzy Models, Sugeno Fuzzy Models, Tsukamoto Fuzzy Models	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Genetic Algorithms:</b> Basic concepts of genetic algorithms, how are genetic algorithms different from traditional algorithms, Comparative study of Genetic Algorithm and traditional algorithm, encoding, genetic modeling. Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of Genetic Algorithm,	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Neural Networks:</b> Introduction, Architecture, Back Propagation and Feed Forward Networks, Supervised Learning Neural Networks, Perceptrons, Adline, Backpropagation Mutilayer Perceptrons, Radical Basis Function Networks, Unsupervised Learning Neural Networks, Competitive Learning Networks, Kohonen Self-Organizing Networks, Learning Vector Quantization, Hebbian Learning.	<b>8 Hours</b>

<b><u>Text Books:</u></b>	1.“Neuro-Fuzzy and Soft Computing”, J.S.R.Jang, C.T.Sun and E.Mizutani, PHI - Pearson Education, 2004.	
<b><u>Reference Books:</u></b>	1.“Neural Networks, Fuzzy Logic and Genetic Algorithms”, S. Rajasekaran and G.A.V. Pai, PHI, 2003. 2.“Computational Intelligence - PC Tools”, R.Eberhart, P.Simpson and R.Dobbins, AP Professional, Boston, 1996. 3.“Genetic Algorithms: Search, Optimization and Machine Learning”, Davis E. Goldberg, Addison Wesley, N.Y., 1989. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://lecturenotes.in/subject/124/soft-computing-sc">https://lecturenotes.in/subject/124/soft-computing-sc</a> 2. <a href="http://www.myreaders.info/html/soft_computing.html">http://www.myreaders.info/html/soft_computing.html</a>	

<b>Course Code:</b> MCA338	<b>MCA- Semester-III</b> <b>(Program/Discipline Specific Elective Course - II)</b> <b>Digital Image Processing</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the fundamental concepts of a digital image processing system.	
<b>CO2.</b>	Understanding the basic concept of morphological operations, image segmentation, and representation techniques	
<b>CO3.</b>	Understanding the techniques for image enhancement and image restoration.	
<b>CO4.</b>	Applying various image enhancement techniques to improve the quality of images.	
<b>CO5.</b>	Analyzing images in the frequency domain using various transforms.	
<b>Course Content:</b>		
<b>Unit-1:</b>	Elements of Visual Perception, Image Sensing and Acquisition, Components of Image Processing system, Image sampling and Quantization.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Image Enhancement in Spatial Domain:</b> Basic Gray Level Transformation, Histogram Processing, Spatial Filtering, Smooth Spatial Filtering: Smoothing Linear Filters, Order-Statistics filters. Enhancement using arithmetic/Logic Operations: Image subtraction, Image Averaging, Use of Second Derivatives for Enhancement-The Laplacian.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Image Enhancement in Frequency Domain:</b> one dimensional Fourier frequency domain and its inverse, Two dimensional Fourier frequency domain and its inverse, Basic properties of frequency domain, Smoothing Frequency-Domain Filters- Ideal Lowpass Filters, Butterworth Lowpass Filters, Gaussian Lowpass Filters, Sharpening Frequency Domain Filters- Ideal Highpass Filters, Butterworth Highpass Filters, Gaussian Highpass Filters, Unsharp Masking, High-Boost Filtering.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Morphological Image Processing:</b> Basic Concepts from Set Theory, Logic Operations Involving Binary Images, Dilation and Erosion, Opening and Closing, Hit or Miss Transformation, Morphological Algorithms- Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening, Skeletons, Pruning, Extensions to Gray-Scale Images- Dilation, Erosion, Opening and Closing.	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Image Segmentation:</b> Detection of Discontinuities- Point Detection, Line Detection, Edge Detection, Edge Linking and Boundary Detection- Local Processing, Global Processing via the Hough Transform, Global Processing via Graph-Theoretic Techniques, Thresholding- Foundation, Basic Global Thresholding,	<b>8 Hours</b>



	Basic Adaptive Threshold, Region-Based Segmentation- Basic Formulation, Region Growing, Region Splitting and Merging.	
<b><u>Text Books:</u></b>	1. Fundamentals of Digital Image Processing, Anil K. Jain, Pearson, IInd, 2004.	
<b><u>Reference Books:</u></b>	1. Digital Image Processing using METLAB, Rafel, Richard & Steven, Pearson, IInd, 2007. 2. Digital Image Processing, Jayaraman S, Veerakumar T, Esakkirajan S, TMH, Ist, 2009. 3. Digital Image Processing, Rafel C. Gonzalez & Richard E. Woods, PHI, 10th, 2005. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.tutorialspoint.com/dip/index.htm">https://www.tutorialspoint.com/dip/index.htm</a> 2. <a href="https://www.geektonight.com/digital-image-processing-notes/">https://www.geektonight.com/digital-image-processing-notes/</a>	

<b>Course Code:</b> MCA339	<b>MCA- Semester-III</b> <b>(Program/Discipline Specific Elective Course - I)</b> <b>Mobile Computing</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic architecture and principles of operation of computer systems and networks.	
<b>CO2.</b>	Understanding the network protocols, routing algorithms, connectivity methods and characteristics.	
<b>CO3.</b>	Understanding the capabilities of next-generation networks and the role of wireless technologies in network design and operation.	
<b>CO4.</b>	Applying the wireless technologies in commercial and enterprise applications.	
<b>CO5.</b>	Analyzing various network protocols and routing algorithms	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> Issues in mobile computing, Study of Electromagnetic Spectrum: Radio wave, Microwave, Infrared, Overview of wireless communication, Cellular concept, sharing of wireless channels: FDMA, TDMA, CDMA, GSM: location management-HLR, VLR, handoffs, channel allocation, Differences among CDMA & GPRS, EDGE, 3G Technologies.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Mobile Data Communication:</b> WLANs (Wireless LANs); IEEE 802.11 standard; Mobile IP; Wireless Application Protocol (WAP); Mobile Internet Standards; WAP Gateway and Protocols; Wireless Markup Languages (WML).	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Third Generation (3G) Mobile Services:</b> International Mobile Telecommunications 2000 (IMT 2000) vision; Wideband Code Division Multiple Access (W-CDMA); and CDMA 2000; Quality of services in 3G.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Mobile Ad hoc networks,</b> Routing protocols, Route discovery & maintenance: Global State Routing (GSR), Destination Sequenced Distance Vector Routing (DSDV), Dynamic Source Routing (DSR), Ad- Hoc On demand Distance Vector Routing (AODV), Temporary Ordered Routing Algorithm (TORA)	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Mobile Internet &amp; wireless Web:</b> WAP, WAP Protocol stack, security issues in mobile computing, IEEE 802.11 security through WEP, Bluetooth security, WAP 2.0 security.	<b>8 Hours</b>
<b>Text Books:</b>	1. J.Schiller “Mobile communication, “Pearson “	
<b>Reference Books:</b>	1. Mobile Computing Technology, Applications & Service creation, “Ashoke K. Talikdar, 2. Mobile Computing Theory & Practice “Kumkumgarg – PEARSON”. 3. Lin, Y. B. and Chlamatac, I, <i>Wireless and mobile Networks Architecture</i> , John Wiley & Sons. <b>* Latest editions of all the suggested books are recommended.</b>	



<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.tutorialspoint.com/mobile_computing/index.htm">https://www.tutorialspoint.com/mobile_computing/index.htm</a> 2. <a href="https://examupdates.in/mobile-computing-pdf/">https://examupdates.in/mobile-computing-pdf/</a>	
--	--	--

<b>Course Code:</b> <b>MCA340</b>	<b>MCA- Semester III</b> <b>(Program/Discipline Specific Elective Course - II)</b> <b>Cryptography and Network Security</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Remembering vulnerability and the weaknesses of unsecured network.	
<b>CO2.</b>	Understanding information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of network security.	
<b>CO3.</b>	Applying different encryption and decryption techniques to solve problems related to confidentiality and authentication.	
<b>CO4.</b>	Analyzing and compare the performance of different encryption algorithms for verifying the integrity of varying message sizes.	
<b>CO5.</b>	Analyzing different digital signature algorithms to achieve authentication and create secure applications.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction to Security:</b> Attacks, Services & Mechanisms, Security. Conventional Encryption Model, Classical Encryption Techniques, Steganography, Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Conventional Encryption Algorithms:</b> Triples DES, Blowfish, International Data Encryption Algorithm, RC5, Placement of Encryption Function, Key Distribution, Random Number Generation.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Public Key Encryption:</b> Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm, Key Management, Fermat's & Euler's Theorem, Primality Test, The Chinese Remainder Theorem.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Message Authentication &amp; Hash Functions:</b> Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Function, Birthday Attacks, Security of Hash Function & MAC, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS).	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Network &amp; System Security:</b> Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime, Key Management, Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall Design Principles, Trusted Systems.	<b>8 Hours</b>



<b><u>Text Books:</u></b>	1. William Stallings, “Cryptography and Network Security: Principles and Practice”, Prentice Hall, New Jersey.	
<b><u>Reference Books:</u></b>	1. Johannes A. Buchmann, “Introduction to cryptography”, Springer- Verlag. 2. Atul Kahate, “Cryptography and Network Security”, TMH <b>*Latest editions of all the suggested books are recommended</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.btechguru.com/prepare--anna-university--computer-science-and-engineering--cryptography-and-network-security--pki--3--54">https://www.btechguru.com/prepare--anna-university--computer-science-and-engineering--cryptography-and-network-security--pki--3--54</a> 2. <a href="https://www.tutorialspoint.com/cryptography/index.htm">https://www.tutorialspoint.com/cryptography/index.htm</a>	



<b>Course Code:</b> MCA341	<b>MCA- Semester-III</b> <b>(Program/Discipline Specific Elective Course - I)</b> <b>Data Science</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concept Data Science and the skill sets needed to be a data scientist.	
<b>CO2.</b>	Understanding basic statistical modeling and analysis techniques.	
<b>CO3.</b>	Understanding the Data Science Process and its components.	
<b>CO4.</b>	Applying EDA and the Data Science process in a case study.	
<b>CO5.</b>	Applying basic machine learning algorithms like Linear Regression, k-Nearest Neighbors (k-NN), k-means, etc for predictive modeling.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction to Statistics:</b> Basic Terms, Variable and Types, Measures of Central Tendency, Measures of Dispersion, Population Vs Sample, Chebysheff's Theorem, PDF, Distributions- Binomial, Poisson, Normal, Standard Normal, Calculating Normal Probabilities –using z-table, normal table, Central Limit Theorem	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Sampling Distribution and Hypothesis Testing-</b> Sampling Distribution of the mean, Sampling Distribution of two Dice, Difference between two means, estimation- point and interval estimation, confidence levels, interval width, selecting sample size, sample size to estimate mean size, Hypothesis testing and errors, Sampling distributions (Chi-Square, t, F, z), fitting a model	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Data Science, Role and Process:</b> Data Science Role, Drivers and Application era of Data Science, Life cycle of Data Science(ETL Preprocessing)- EDA process, Data Extraction, Load, Imputation, Cleaning, Transformation, Visualization(lines, curves and 3D spaces), Analysis, Model selection and evaluation- Selecting a model, building model and optimization, Role of Data Scientist, Data Science and Ethical Issues	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Machine Learning Algorithms-I:</b> Linear Regression- Regression Analysis, simple one variable regression line, Estimating ("Learning") Model Coefficients, Gradient descent algorithm- cost function to find 'beta' values and concept, local and global minima, concept of learning rate, Logistic Regression- Logistic regression model, Sigmoid function and visualization, decision boundary (linear and non-linear), metrics for logistic regression (accuracy, sensitivity, specificity etcetera concepts), RoC curve- use of RoC curve to find out optimum decision boundary	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Machine Learning Algorithms-II:</b> Decision trees and random forests- model, parameter meaning and explanation, Naive Bayes-Retail basket analysis, Concept of boosting and bagging, Unsupervised learning methods/Clustering- K-means algorithm,	<b>8 Hours</b>



	optimization objective. Association Rules- Association rule mining, K-nearest neighbors algorithm.	
<b><u>Text Books:</u></b>	1. Joel Grus, “Data Science from Scratch”, O’Reilly. 2015.	
<b><u>Reference Books:</u></b>	1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. 2013. 2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. 2013. 3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. 2009. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://intellipaat.com/blog/tutorial/data-science-tutorial/">https://intellipaat.com/blog/tutorial/data-science-tutorial/</a> 2. <a href="https://elitedatascience.com/data-science-resources">https://elitedatascience.com/data-science-resources</a>	

<b>Course Code:</b> MCA342	<b>MCA- Semester III</b> <b>(Program/Discipline Specific Elective Course - II)</b> <b>Data Warehouse and Mining</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the functionality of the various data mining and data warehousing component.	
<b>CO2.</b>	Understanding the strengths and limitations of various data mining and data warehousing models.	
<b>CO3.</b>	Understanding the analyzing techniques of various data.	
<b>CO4.</b>	Analyzing different approaches and techniques used in data mining and data ware housing.	
<b>CO5.</b>	Analyzing different approaches of classification and predictions techniques.	
<b>Course Content:</b>		
<b>Unit-1:</b>	Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Aggregation, OLAP Servers: ROLAP, MOLAP, HOLAP, Process Architecture, 3 Tier Architecture, Data Mart.	<b>8 Hours</b>
<b>Unit-2:</b>	Introduction: Motivation (for Data Mining), Data Mining-Definition & Functionalities, Data Pre-processing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation.	<b>8 Hours</b>
<b>Unit-3:</b>	Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering. Concept Description: Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data.	<b>8 Hours</b>
<b>Unit-4:</b>	Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases	<b>8 Hours</b>
<b>Unit-5:</b>	Classification and Predictions: What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm. Cluster Analysis: Outlier Analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering, Density Based Clustering.	<b>8 Hours</b>
<b>Text Books:</b>	1. Paul R. P., Fundamentals Of Data Warehousing, John Wiley and Sons.	



<b><u>Reference Books:</u></b>	1. Anahony S., Data Warehousing In the Real World: A Practical Guide for Building DecisionSupport Systems, John Wiley and Sons. 2.Kamber and Han, “Data Mining Concepts and Techniques”, Hartcourt India P. Ltd., 3. R Programming for Data Science, by Roger D. PengUsing R for Introductory Statistics, by John Verzani, Chapman & Hall/CRC, 2004. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.tutorialspoint.com/data_mining/index.htm">https://www.tutorialspoint.com/data_mining/index.htm</a> 2. <a href="https://data-flair.training/blogs/data-mining-tutorial/">https://data-flair.training/blogs/data-mining-tutorial/</a>	

<b>Course Code:</b> MCA343	<b>MCA- Semester-III</b> <b>(Program/Discipline Specific Elective Course - I)</b> <b>Quantum Computing</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concept of quantum model of computation.	
<b>CO2.</b>	Understanding the concepts, theories, models & techniques	
<b>CO3.</b>	Applying the algorithms to improve the performance of quantum computing.	
<b>CO4.</b>	Analyzing various quantum computing techniques.	
<b>CO5.</b>	Analyzing computing complexity of various quantum computing techniques.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> Overview of traditional computing: Church-Turing thesis, circuit model of computation, reversible computation, quantum physics, quantum physics and computation, Dirac notation and Hilbert Spaces, dual vectors, operators, the spectral theorem, functions of operators, tensor products, Schmidt decomposition theorem	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Qubits And Quantum Model Of Computation:</b> State of a quantum system, time evolution of a closed system, composite systems, measurement, mixed states and general quantum operations, quantum circuit model, quantum gates, universal sets of quantum gates, unitary transformations, quantum circuits	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Quantum Algorithms - I:</b> Superdense coding, quantum teleportation, applications of teleportation, probabilistic versus quantum algorithms, phase kick-back, the Deutsch algorithm, the Deutsch-Jozsa algorithm, Simon's algorithm, Quantum phase estimation and quantum Fourier Transform, eigen value estimation	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Quantum Algorithms - II:</b> Order-finding problem, eigen value estimation approach to order finding, Shor's algorithm for order finding, finding discrete logarithms, hidden subgroups, Grover's quantum search algorithm, amplitude amplification, quantum amplitude estimation, quantum counting, searching without knowing the success probability	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Quantum Computational Complexity And Error Correction:</b> Computational complexity, black-box model, lower bounds for searching, general black-box lower bounds, polynomial method, block sensitivity, adversary methods, classical error correction, classical three-bit code – fault tolerance, quantum error correction, three- and nine-qubit quantum codes, fault-tolerant quantum	<b>8 Hours</b>



	computation	
<b><u>Text Books:</u></b>	1. P. Kaye, R. Laflamme, and M. Mosca, “An introduction to Quantum Computing”, Oxford University Press, 1999.	
<b><u>Reference Books:</u></b>	1. Sahni, “Quantum Computing”, Tata McGraw-Hill Publishing Company, 2007. 2. V. Sahni, V. Lakshminarayanan, D.P. Srivastava, “Quantum Information Systems” Mc-Graw Hill Education, 2011. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.edn.com/the-basics-of-quantum-computing-a-tutorial/">https://www.edn.com/the-basics-of-quantum-computing-a-tutorial/</a> 2. <a href="https://qosf.org/learn_quantum/">https://qosf.org/learn_quantum/</a>	

<b>Course Code: MCA344</b>	<b>MCA- Semester III (Program/Discipline Specific Elective Course - II) Natural Language Processing</b>	<b>L-3 T-1 P-0 C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the concepts of Natural Language, its architecture, algorithms and models.	
<b>CO2.</b>	Understanding the syntax of Natural Language.	
<b>CO3.</b>	Understanding the advanced features of natural language.	
<b>CO4.</b>	Applying natural language processing syntax and grammars in different types of applications.	
<b>CO5.</b>	Analysing semantics for creating grammar of the natural language.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Natural Language:</b> Generations; Architecture; Surface realization; Discourse planning; Issues: Knowledge in Speech and Language processing, Ambiguity; Models and Algorithms; Language thought and understanding; Morphology and Finite-State transducers: Survey of English morphology, Finite-State Morphological parsing.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Syntax:</b> Word classes and Part-of-speech tagging: English word classes, Tag sets for English, Part-of-speech tagging, Rule-based Part-of-speech tagging, Stochastic Part-of-speech tagging, Transformation-based tagging; Issues; Context-free grammars for English; Constituency; Context-free rules and trees; Sentence-level constructions: Noun phrases, Coordination, Agreement, Verb phrase and sub categorization, Auxiliaries, Spoken language syntax, Grammars equivalence and normal form; Finite-state and Context-free grammars; Grammars and Human processing	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Advanced Features:</b> Structures; Unification: Implementation, Parsing with Unification constraints, Types; Inheritance; Lexicalized and Probabilistic parsing.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Semantic:</b> Computational desiderata for representations; Meaning structure of Language; First order Predicate calculus; Linguistically relevant concepts: Related representational approaches, Alternative approaches to meaning; Semantic analysis: Syntax-driven Semantic analysis, Attachments for a fragment of English, Integrating semantic analysis into the early parser, Idioms and compositionality, Robust semantic analysis.	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Applications:</b> Word sense disambiguation and information retrieval: Selection restriction-based disambiguation, Robust word sense disambiguation, Information retrieval (IR), Other information retrieval tasks; Machine translation; Language similarities and differences; Transfer metaphor; Interlingua idea: Using meaning, Direct translation, Using statistical techniques, Usability and system	<b>8 Hours</b>



	development.	
<b><u>Text Books:</u></b>	1. Jurafsky, D. and Martin, J. H., Speech and Language Processing, Pearson Education.	
<b><u>Reference Books:</u></b>	1. James, A., Natural Language Understanding, Pearson Education. * <b>Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.tutorialspoint.com/natural_language_processing/index.htm">https://www.tutorialspoint.com/natural_language_processing/index.htm</a> 2. <a href="https://monkeylearn.com/blog/getting-started-in-natural-language-processing-nlp/">https://monkeylearn.com/blog/getting-started-in-natural-language-processing-nlp/</a>	



<b>Course Code:</b> TMUPA-302	<b>MCA- Semester-III</b> <b>(Value Added Course - IV)</b> <b>Arithmetic and Logical Ability</b>	<b>L-2</b> <b>T-1</b> <b>P-0</b> <b>C-0</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.	
<b>CO2.</b>	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.	
<b>CO3.</b>	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data.	
<b>CO4.</b>	Identifying different possibilities of reasoning based problems of Syllogisms and Coding-Decoding.	
<b>CO5.</b>	Employing the techniques of Percentage, Ratios and Average in inter related concepts of Time Speed and Distance.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Averages</b> Basic Averages, Concept of Distribution, Weighted Average, equations	<b>3 Hours</b>
<b>Unit-2:</b>	<b>Time Speed Distance</b> Average speed, proportionalities in Time, Distance, trains, boats, races, circular tracks	<b>5 Hours</b>
<b>Unit-3:</b>	<b>Permutations and combinations</b> Fundamental counting, and or, arrangements of digits, letters, people in row, identical objects, rank, geometrical arrangements, combination: - basic, handshakes, committee, selection of any number of objects, identical and distinct, grouping and distribution, de-arrangements	<b>4 Hours</b>
<b>Unit-4:</b>	<b>Probability</b> Introduction, Probability based on Dice and Coins, Conditional Probability, Bayes Theorem	<b>2 Hours</b>
<b>Unit-5:</b>	<b>Number theory</b> Classification of Numbers, Divisibility Rules, HCF and LCM, Factors, Cyclicity (Unit Digit and Last Two digit), Remainder Theorem, Highest Power of a Number in a Factorial, Number of trailing zeroes	<b>6 Hours</b>
<b>Unit-6:</b>	<b>Data interpretation</b> Data Interpretation Basics, Bar Chart, Line Chart, Tabular Chart, Pie Chart, DI tables with missing values	<b>5 Hours</b>
<b>Unit-7:</b>	<b>Coding and decoding</b> Sequential coding, reverse coding, abstract coding	<b>2 Hours</b>
<b>Unit-8:</b>	<b>Syllogisms</b> Two statements, three statements	<b>3 Hours</b>

<b><u>Reference Books:</u></b>	<ul style="list-style-type: none"><li>• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude</li><li>• R2:-Quantitative Aptitude by R.S. Agrawal</li><li>• R3:-M Tyra: Quicker Maths</li><li>• R4:-Nishith K Sinha:- Quantitative Aptitude for CAT</li><li>• R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com</li><li>• R6:-Logical Reasoning by Nishith K Sinha</li><li>• R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal</li></ul> <p><b>* Latest editions of all the suggested books are recommended.</b></p>	
--------------------------------	---	--

<b>Course Code:</b> MCA438	<b>MCA- Semester-IV</b> <b>(Skill-Enhancement Course - II)</b> <b>ASP Dot Net</b>	<b>L-4</b> <b>T-0</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concepts of ASP.NET programming and working of different controls statements available in ASP.NET	
<b>CO2.</b>	Understanding the web services and WCF, WF application	
<b>CO3.</b>	Understanding the ASP.NET web application using Database.	
<b>CO4.</b>	Applying different validation controls in ASP.NET web application.	
<b>CO5.</b>	Applying state management techniques in AP.NET web application.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>ASP.NET Introduction &amp; Controls:</b> ASP.NET Introduction, First ASP.NET Application, Life Cycle of ASP.NET, Page Auto Postback Property, Event Handler Parameters, Dynamically initializing Controls, IsPostBack property of Page class, ListControls, Comparison between HtmlControls and WebControls, Control Properties and Methods, FileUpload Control, How Control Manages its State, What is EnableViewState, How Control raises events, Event handling in Web Forms. WebConfiguration File and Global.asax.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Redirecting User to Another Page:</b> Redirecting Options, Response.Redirect, Server.Transfer, Cross Page Postback, Determine how the pages was invoked, Passing values between pages. <b>Master Pages</b> : Introduction to MasterPage, ContentPlaceHolder and Content tags, Accessing controls of MasterPage in ContentPage, URL's in MasterPages, UniqueID and ClientID. <b>Validation Controls:</b> Base Validator, Required Field Validator, Compare Validator, Range Validator, Regular Expression Validator, Custom Validator, Causes Validation Property, Grouping - Validation Group Property, Page.Validators and Page.IsValid.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>ASP.NET State Management:</b> Static Members, View State, Hidden Field in Form, Query String, HttpContext, Cookies-HttpCookie, Sessions-HttpSessionState, Application-HttpApplicationState, Summary of All Features. <b>Data Bound Controls:</b> Databinding traditional way, SqlDataSource, GridView, DetailsView, FormView, DataList, Repeater, ListView, DataPager.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>AJAX.NET:</b> What is AJAX, What is AJAX.NET, Script Manager, Update Panel, Update Progress, Timer, AJAX Control Toolkit. Understanding & Publishing Web Application. ASP.NET Security: Authentication, Authorization, Impersonation.	<b>8 Hours</b>
<b>Unit-5:</b>	Web Services, ASP.NET MVC, Windows Communication Foundation (WCF), Windows Workflow Foundation (WF).	<b>8 Hours</b>



<b><u>Text Books:</u></b>	1. “Professional ASP.NET MVC 5 (WROX)” by Jon Galloway and Brad Wilson	
<b><u>Reference Books:</u></b>	1. “ASP.NET 4.5 in Simple Steps” by Kogent Learning Solutions Inc 2. “ASP.NET 4.5, Covers C# and VB Codes, Black Book” by Kogent Learning Solutions Inc 3. “ASP.NET: The Complete Reference” by Matthew Macdonald <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://stackify.com/learn-asp-net-tutorials/">https://stackify.com/learn-asp-net-tutorials/</a> 2. <a href="https://www.tutorialspoint.com/asp.net/index.htm">https://www.tutorialspoint.com/asp.net/index.htm</a>	

<b>Course Code:</b> MCA439	<b>MCA- Semester-IV</b> <b>(Skill-Enhancement Course - II)</b> <b>Advance Java</b>	<b>L-4</b> <b>T-0</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the concept of Internet Programming, using Java Applets	
<b>CO2.</b>	Understanding the concept of creating the dynamic web pages using Servlets and JSP	
<b>CO3.</b>	Understanding the process of accessing database through Java programs, using java data base connectivity.	
<b>CO4.</b>	Understanding the multi-tier architecture of web-based enterprise applications using enterprise javabeans.	
<b>CO5.</b>	Applying Java Bean concepts to reuse software component.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Java Database Connectivity (JDBC):</b> JDBC Product, Types of Drivers, Two-Tier Client/Server Model, Three-Tier Client/Server Model, Basic Steps of JDBC, Creating and Executing SQL Statement, The Result Set Object, Working with Database MetaData Interface	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Java Servlets:</b> Servlet Interaction & Advanced Servlets, Life cycle of Servlet, Java Servlet Development Kit, Javax.servlet package, Reading Servlet Parameters, Reading Initialization Parameters, The javax.servlet.http Package, Handling HTTP.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Java Server Pages (JSP):</b> JSP Technologies, Understanding the Client-Server Model, Understanding Web server software, Configuring the JSP Server, Handling JSP Errors, JSP Translation Time Errors, JSP Request Time Errors, Creating a JSP Error Page	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Remote Method Invocation (RMI):</b> RMI Architecture, Designing RMI application, Executing RMI application	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Enterprise Java Beans (EJB):</b> Types of EnterpriseJava beans, Session Bean & Entity Bean, Features of Session Bean, Life-cycle of Stateful Seession Bean, Features of Entity Bean, Life-cycle of Entity Bean, Container-managed Transactions & Bean-managed Transactions, Implementing a container-managed Entity Bean	<b>8 Hours</b>
<b>Text Books:</b>	1. Java the Complete Reference, ninth edition by Herbert Schild, Publisher: McGraw Hills	
<b>Reference Books:</b>	1. Just Hibernate, A Lightweight Introduction to the Hibernate Framework by Madhusudhan Konda, Publisher: O'Reilly Media 2. Programming Jakarta Struts, 2nd Edition by Chuck Cavaness, Publisher: O'Reilly Media 3. Head First Servlets and JSP by Bryan Basham, Kathy Sierra & Bert Bates, Publisher: O'Reilly Media <b>* Latest editions of all the suggested books are recommended.</b>	
<b>Additional Electronic Reference:</b>	1. <a href="https://lecturenotes.in/subject/368/advanced-java-programming-ajp">https://lecturenotes.in/subject/368/advanced-java-programming-ajp</a> 2. <a href="https://www.edureka.co/blog/advanced-java-tutorial">https://www.edureka.co/blog/advanced-java-tutorial</a>	

<b>Course Code:</b> MCA463	<b>MCA- Semester-IV</b> <b>(Skill-Enhancement Course - III)</b> <b>ASP Dot Net Lab</b>	<b>L-0</b> <b>T-0</b> <b>P-2</b> <b>C-1</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Applying different validation controls in ASP.NET web application.	
<b>CO2.</b>	Applying state management techniques in AP.NET web application.	
<b>CO3.</b>	Developing Web application through ASP.NET.	
<b>CO4.</b>	Developing ASP.NET web based business applications.	
<b>CO5.</b>	Developing ASP.NET application by using AJAX.	
<b>Course Content:</b>		
	<ol style="list-style-type: none"> <li>1. Simple web application using ASP Net</li> <li>2. Use of IsPostBack property.</li> <li>3. Create web application to login.</li> <li>4. Use different controls of ASP.Net in web application.</li> <li>5. Use of Web Configuration and Global.asax file.</li> <li>6. Create a simple application with atleast two web pages to implement Server.transfer and Response.Redirect.</li> <li>7. Create a web application using master page.</li> <li>8. Use different validation controls in a web application.</li> <li>9. Use of state management controls in web application.</li> <li>10. Use of Database in a web application.</li> <li>11. Implement different database tools available in ASP.NET.</li> <li>12. Create a web application using AJAX.</li> <li>13. Create a web Service and use it in an application.</li> <li>14. Create simple application using WCF</li> </ol>	<b>20</b> <b>Hours</b>



<b>Course Code:</b> MCA464	<b>MCA- Semester-IV</b> <b>(Skill-Enhancement Course - III)</b> <b>Advance Java Lab</b>	<b>L-0</b> <b>T-0</b> <b>P-2</b> <b>C-1</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding Stateful, Stateless and Entity Beans.	
<b>CO2.</b>	Applying event handling on AWT and Swing components.	
<b>CO3.</b>	Developing dynamic web pages using Servlets and JSP	
<b>CO4.</b>	Developing the business applications using Java Applets	
<b>CO5.</b>	Developing the applications using menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, etc.	
<b>Course Content:</b>		
	<ol style="list-style-type: none"> <li>1. Write a Program in Java to implement Calculator using Swing technology</li> <li>2. Write a Program that displays two textboxes for entering a students' Roll-no and Name with appropriate labels and buttons</li> <li>3. Write a Java program that makes a connection with database using JDBC and prints metadata of this connection</li> <li>4. Write a java program for one way TCP communication for server and client, where server will response to client with current data and time.</li> <li>5. Write a java program for two way TCP communication for server and client. It should look like a simple chat application</li> <li>6. Create a simple calculator application that demonstrates the use of RMI. You are not required to create GUI.</li> <li>7. Create Servlet That Prints Hello World.</li> <li>8. Create Servlet That Prints Today's Date</li> <li>9. Create Servlet for login page, if the username and password is correct then prints message "Hello username" else a message"login failed".</li> <li>10. Create Servlet that uses cookies to store the number of times a user has visited the servlet.</li> </ol>	<b>20</b> <b>Hours</b>

<b>Course Code: MCA465</b>	<b>MCA- Semester IV (Project - II) Major Project</b>	<b>L-2 T-8 P-8 C-14</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Applying the test cases in the various modules of the project.	
<b>CO2.</b>	Developing the real life projects by using the technical skills.	
<b>CO3.</b>	Developing the database design database queries for real life projects.	
<b>CO4.</b>	Developing technical skills for testing, maintaining, and deploying the software projects.	
<b>CO5.</b>	Developing real life projects for the industries.	
<b>Course Content:</b>		
	<p>The student will undertake a major project in IV semester. They will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.</p> <p>Major Project will be evaluated out of total 100 marks. In Internal Evaluation marks will be awarded out of 50 and in external evaluation also marks will be awarded out of 50 on the basis of viva-voce. Internal evaluation will be exercised by the Project Committee of college.</p>	



<b>Course Code:</b> MCA471	<b>MCA- Semester-IV</b> <b>(Program/Discipline Specific Elective Course - III)</b> <b>Julia</b>	<b>L-0</b> <b>T-2</b> <b>P-4</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding programming skills in core Julia	
<b>CO2.</b>	Understanding Object Oriented Skills in Julia	
<b>CO3.</b>	Understanding the important aspects related with files, structure and objects, dictionary in Julia	
<b>CO4.</b>	Developing the ability to work on string and tuples in Julia.	
<b>CO5.</b>	Developing user defined functions and applications using Julia	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> Running Julia, The First Program, Arithmetic Operators, Values and Types, Formal and Natural Languages, Assignment Statements, Variable Names, Expressions and Statements, Script Mode, Operator Precedence, String Operations, Floor Division and Modulus, Boolean Expressions, Logical Operators, Conditional Execution, Alternative Execution, Chained Conditionals, Nested Conditionals	<b>10 Hours</b>
<b>Unit-2:</b>	<b>Iteration:</b> Reassignment, Updating Variables, The while Statement break, continue  <b>Functions:</b> Function Calls, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution  Parameters and Arguments, Variables and Parameters Are Local Stack Diagrams, Fruitful Functions and Void Functions, Recursion	<b>10 Hours</b>
<b>Unit-3:</b>	<b>Strings:</b> Characters, A String Is a Sequence, length, Traversal, String Slices, Strings Are Immutable, String Interpolation, Searching, Looping and Counting, String Library, The εOperator, String Comparison  <b>Arrays:</b> An Array is a Sequence, Arrays Are Mutable, Traversing an Array, Array Slices, Array Library, Map, Filter and Reduce, Dot Syntax, Deleting (Inserting) Elements, Arrays and Strings, Objects and Values, Aliasing, Array Arguments	<b>10 Hours</b>
<b>Unit-4:</b>	<b>Dictionaries:</b> A Dictionary Is a Mapping, Dictionary as a Collection of Counters, Looping and Dictionaries, Reverse Lookup, Dictionaries and Arrays, Memos, Global Variables  <b>Tuples:</b> Tuple Assignment, Tuples as Return Values, Variable-length Argument Tuples, Arrays and Tuples, Dictionaries and Tuples, Sequences of Sequences	<b>10 Hours</b>
<b>Unit-5:</b>	<b>Files:</b> Reading and Writing, Formatting, Filenames and Paths, Catching Exceptions, Databases, Serialization, Command Objects, Modules  <b>Structs and Objects:</b> Composite Types, Structs are Immutable, Mutable Structs, Rectangles, Instances as Arguments, Instances as Return Values, Structs and Functions	<b>10 Hours</b>



<b><u>Text Books:</u></b>	1. Ben lauwers and Allen B. Downey., <i>Think Julia: How to Think Like a Computer Scientist</i> , Orelly	
<b><u>Reference Books:</u></b>	1. A. Salceanu, “ <i>Julia Programming Projects</i> ”, Packet 2. Ivo Balbeart, “Julia 1.0 Programming”, packet * <b>Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://julialang.org/learning/">https://julialang.org/learning/</a> 2. <a href="https://mindmajix.com/julia-tutorial">https://mindmajix.com/julia-tutorial</a>	

<b>Course Code:</b> MCA472	<b>MCA- Semester-IV</b> <b>(Program/Discipline Specific Elective Course - IV)</b> <b>Ruby</b>	<b>L-0</b> <b>T-2</b> <b>P-4</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding programming skills in core ruby	
<b>CO2.</b>	Understanding Object Oriented Skills in ruby	
<b>CO3.</b>	Understanding the ruby's built in methods for manipulating strings, files, and hashes.	
<b>CO4.</b>	Developing methods and classes in Ruby.	
<b>CO5.</b>	Developing useful standalone applications in ruby.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> History of Ruby, Dynamic Web Applications, Ruby Installation, Web Servers and Server-Side Programming, Ruby and Databases, UNIX/Linux Environment	<b>10</b> <b>Hours</b>
<b>Unit-2:</b>	<b>Data and Operations:</b> Data and Types, Variables, Constants, Operators, Expressions, Operator Precedence, Operator Precedence. <b>Conditional Statements and Control Structures:</b> If Else, Case, While, Do, Foreach, For, Redo.	<b>10</b> <b>Hours</b>
<b>Unit-3:</b>	<b>Methods:</b> Methods Definition, Methods and Blocks, Calling a Method, Method Parameters, Method Return Values, Exception Handling <b>Arrays and Hashes:</b> Indexing Arrays, Initializing Arrays, Array Class, Hashes, Blocks and Iterators	<b>10</b> <b>Hours</b>
<b>Unit-4:</b>	<b>Classes and Objects:</b> Defining a Class, Objects and Attributes, Access Control, Inheritance and Messages, Class Variables and Class Methods, Modules and Namespaces, Mixins	<b>10</b> <b>Hours</b>
<b>Unit-5:</b>	<b>Web Interaction and File Access:</b> Ruby HTML Code Generation, CGI Code Generation, Templating Systems, Form Input, Validation and Regular Expressions, Cookies, Sessions, Reading/Writing Files	<b>10</b> <b>Hours</b>
<b>Text Books:</b>	1. Peter Cooper , “Beginning Ruby”, 3rd edition	
<b>Reference Books:</b>	1. Dave Thomas , “Programming Ruby”, 1st Edition <b>* Latest editions of all the suggested books are recommended.</b>	
<b>Additional Electronic Reference:</b>	1. <a href="http://rubylearning.com/satishtalim/tutorial.html">http://rubylearning.com/satishtalim/tutorial.html</a> 2. <a href="https://www.tutorialspoint.com/ruby/index.htm">https://www.tutorialspoint.com/ruby/index.htm</a>	

<b>Course Code:</b> MCA442	<b>MCA- Semester-IV</b> <b>(Program/Discipline Specific Elective Course - III)</b> <b>Pattern Recognition</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the concepts of Pattern Recognition, its principles and various approaches.	
<b>CO2.</b>	Understanding various methods of parameter estimation like Maximum Likelihood, Bayesian parameter and also methods of dimension reduction.	
<b>CO3.</b>	Understanding various techniques for unsupervised learning and dimension reduction.	
<b>CO4.</b>	Applying parametric and nonparametric techniques for pattern recognition.	
<b>CO5.</b>	Analyzing various learning and pattern recognition techniques.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, approaches, independence of events, conditional and joint probability, Bayes' theorem; Mathematical foundations – Linear algebra, Probability Theory, inverses, eigen values, eigen vectors.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Bayes Decision Theory:</b> Minimum-error-rate classification, Classifiers, discrete features, Bayesian Decision Theory <b>Parameter Estimation Methods:</b> Maximum-Likelihood estimation; Maximum a Posteriori estimation.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Unsupervised learning and clustering:</b> Criterion functions; Algorithms for clustering: K-Means, Hierarchical and other methods; Cluster validation; Maximum entropy estimation <b>Dimension reduction methods</b> - Principal Component Analysis (PCA), Fisher Linear discriminate analysis, Hidden Markov Models (HMM), Gaussian mixture models.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Linear discriminant functions:</b> Gradient descent; Support vector machines <b>Nonparametric Techniques:</b> Density Estimation, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy rules and classification.	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Decision trees:</b> Concept of construction, splitting of nodes, choosing of attributes, overfitting, pruning <b>Non-metric methods for pattern classification:</b> Non-numeric data or nominal data, decision tree, CART	<b>8 Hours</b>
<b>Text Books:</b>	1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification",	
<b>Reference Books:</b>	1.S. Theodoridis and K. Koutroubas, "Pattern Recognition", 4th	

	Edition, Academic Press, 2009. 2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://cse.buffalo.edu/~jcorso/t/CSE555/files/lecture_introduction.pdf">https://cse.buffalo.edu/~jcorso/t/CSE555/files/lecture_introduction.pdf</a> 2. <a href="https://cedar.buffalo.edu/~srihari/CSE555/">https://cedar.buffalo.edu/~srihari/CSE555/</a>	

<b>Course Code:</b> MCA443	<b>MCA- Semester-IV</b> <b>(Program/Discipline Specific Elective Course - IV)</b> <b>Deep Learning</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concepts of deep learning	
<b>CO2.</b>	Understanding the main techniques in deep learning and the main research in this field.	
<b>CO3.</b>	Understanding the basic concepts of tensor flow and convolution network.	
<b>CO4.</b>	Applying various training methods for deep learning.	
<b>CO5.</b>	Analyzing various deep learning and deep neural network techniques.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> History, Advantages, disadvantages, limitations; ML Vs AI Vs DL; Applications and examples of DL, Cycle of Deep Learning. <b>Architectures:</b> Deep Neural Network, Deep Belief Network and RNN. Basics of Machine Learning in Python.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Foundations of Neural N/W and Deep Learning:</b> Neural N/Ws: Biological Neurons, Perceptron, Multilayer Feed forward N/Ws. <b>Training NNs:</b> Backpropagation Learning. <b>Activation Functions:</b> Linear, Sigmoid, Tanh, Hard Tanh, Softmax, Rectified Linear. <b>Loss Functions:</b> Loss Function Notation, Loss Functions for Regressions, Loss Functions for Classifications, Loss Functions for reconstructions. <b>Hyper-Parameters:</b> Learning Rate, Regularization, Momentum, Sparsity.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Implementing Neural N/Ws in TensorFlow:</b> Introduction; TensorFlow Operations; Placeholder Tensors; Sessions in TensorFlow; Logistic Regression Model ; Logging and Training Logistic Regression Model; <b>Beyond Gradient Descent:</b> Challenges with Gradient Descent, Model Identifiability, Momentum Based Optimization, Gradient Points in the wrong direction.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Optimization for Training Deep Models:</b> Learning and pure Optimization, Challenges in NN Optimization, Basic Algorithms of Optimization, Parameters Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-order Methods, Optimization Strategies and Meta-Algorithms	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Convolution Networks:</b> Neurons in Human Vision, Convolutional Operation, Features Selection, Filters and Feature Maps, Convolutional Layer, Max Pooling, Architecture of Convolutional Networks, Variants of the Basic Convolution Function ,Structured Output, Data Types, Efficient Convolutional Algorithms, Random	<b>8 Hours</b>

	and Unsupervised Features, Neuroscientific Basis for Convolutional N/W, Visualizing Learning in CNN.	
<b><u>Text Books:</u></b>	1. Charu C Aggarwal, "Neural Network and Deep Learning", Springer.	
<b><u>Reference Books:</u></b>	1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009. 2. Skansi , Sandro , "Introduction to Deep Learning", Springer. 3. Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016 <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="http://deeplearning.net/reading-list/tutorials/">http://deeplearning.net/reading-list/tutorials/</a> 2. <a href="https://www.digitalvidya.com/blog/deep-learning-tutorial/">https://www.digitalvidya.com/blog/deep-learning-tutorial/</a>	

<b>Course Code:</b> MCA444	<b>MCA- Semester-IV</b> <b>(Program/Discipline Specific Elective Course - III)</b> <b>Introduction to Wireless Networks</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding fundamentals of wireless communications.	
<b>CO2.</b>	Understanding the various routing protocols	
<b>CO3.</b>	Understanding the different issues in MAC and routing issues in multi hop wireless and ad-hoc networks	
<b>CO4.</b>	Applying knowledge of TCP/IP extensions for mobile and wireless networking.	
<b>CO5.</b>	Analyzing security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction of networks:</b> Review of LAN, MAN, WAN, Intranet, Internet, and interconnectivity devices: bridges, Routers etc. Review of TCP/IP Protocol Architecture: ARP/RARP, IP addressing, IP Datagram format and its Delivery, Routing table format, ICMP Messages, Subnetting, Supernetting and CIDR, DNS. NAT: Private addressing and NAT, SNAT, DNAT, NAT and firewall.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Routing and transport:</b> Routing Protocols: BGP- Concept of hidden network and autonomous system, An Exterior gateway protocol, Different messages of BGP. Interior Gateway protocol: RIP, OSPF. Multiplexing and ports, TCP: Segment format, Sockets, Synchronization, Three Way Hand Shaking, Variable window size and Flow control.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Multiple Division Techniques:</b> FDMA, TDMA, CDMA, OFDM, SDMA. Comparison of Multiple Division Techniques, Modulation Techniques –AM, FM, FSK, PSK,QPSK, QAM .Mobile Data Networks: Introduction, Data Oriented CDPD Network, GPRS, EDGE and High Data Rates, SMS in GSM, Mobile Application Protocols.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Introduction to Wireless LAN:</b> Evolution of WLAN, Wireless Home Networking, Technologies for Home Area Network (HAN), Overview of IEEE 802.11, Reference Architecture, PHY and MAC Layer, Wireless ATM, HIPERLAN.	<b>8 Hours</b>
<b>Unit-5:</b>	IEEE 802.15 WPAN, Home RF, Bluetooth, Interference between Bluetooth and 802.11, Adhoc Networks, Introduction to 2.5 G and 3 G Networks.	<b>8 Hours</b>
<b>Text Books:</b>	1. Comer, “Internetworking with TCP/ IP Vol-I”, 5th edition, Addison Wesley, 2006.	



<b><u>Reference Books:</u></b>	1. W. Richard Stevens, “TCP/IP Illustrated Vol-I”, Addison-Wesley. 2. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education. 3. Uwe Hansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.geektonight.com/wireless-networks-notes-pdf/">https://www.geektonight.com/wireless-networks-notes-pdf/</a> 2. <a href="https://www.tutorialspoint.com/Wireless-Networks">https://www.tutorialspoint.com/Wireless-Networks</a>	

<b>Course Code:</b> MCA445	<b>MCA- Semester-IV</b> <b>(Program/Discipline Specific Elective Course - IV)</b> <b>Cloud and Fog Computing</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the current cloud and fog computing technologies, including technologies for different cloud and fog services.	
<b>CO2.</b>	Understanding the large data processing in the cloud and fog computing	
<b>CO3.</b>	Understanding the resource management in the cloud and fog in management	
<b>CO4.</b>	Analyzing the components of cloud and fog computing showing how business agility in an organization can be created.	
<b>CO5.</b>	Analyzing case studies to derive the best practice model to apply when developing and deploying cloud and fog based applications and security parameters.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Cloud Computing:</b> Existing usage of cloud computing; New paradigm in the cloud; Applications. Cloud Computing Architectural Framework: Cloud: Benefits, Vocabulary, Business scenarios, Essential characteristics, Deployment models, Service models, Multi-tenancy, Approaches to create a barrier between the tenants.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Vendor Lock-in and Efforts at Standardization:</b> Need of migration; Preventing vendor lockin; Comparison chart. Data Center Operations: The anatomy of cloud infrastructure, Data Center Operations Security challenge, implements “Five Principal Characteristics of Cloud Computing, Data center Security Recommendations. Introducing Identity Services, Enterprise Architecture with IDaaS, IDaaS Security Recommendations, data Security in Cloud, technologies for data security.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Governance and Enterprise Risk Management:</b> Information security governance processes, Governance and enterprise risk management in Cloud Computing, Governance Recommendations, Enterprise Risk Management Recommendations, Information Risk Management Recommendations and Third Party Management Recommendations.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Cloud Reliability, Fault Tolerance and Response Time:</b> Business continuity management: System reliability, Case studies on designing for reliability; Concept of fault tolerance; Response time. Internet Cloud Security: Introduction; Potential threats; Security as a service by cloud providers; Fraud theory and Intellectual property. Information Lifecycle Management: Key challenges regarding data lifecycle security, Data Security Recommendations by Cloud Computing	<b>8 Hours</b>

<b>Unit-5:</b>	<b>Fog and Edge Computing:</b> Fog Computing: Concepts, Principles and Related Paradigms, Fog Computing Issues, Fog Computing in the IoT Environment: Principles, Features, and Models, Cloud Versus Fog Computing Comparison, Fog Computing Versus Edge Computing, Fog Computing Reference Architecture, Benefits of Fog Computing.	<b>8 Hours</b>
<b><u>Text Books:</u></b>	1. David, E.Y. Sarna, Implementing and Developing Cloud Computing Applications, CRC Press.	
<b><u>Reference Books:</u></b>	1 Mather, T., Cloud Security and Privacy: An Enterprise Perspective On Risks And Compliance, O'Reilly 2 Mahmood Zaigham, Fog Computing and Technologies, Kindle Edition 3. Rajkumar Buyya, James Broberg, Andrzej M. Goscinsk, Cloud Computing: Principles and Paradigms, Wiley Publications <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1.guru99.com/cloud-computing-for-beginners.html 2. <a href="https://www.geektonight.com/cloud-computing-notes/">https://www.geektonight.com/cloud-computing-notes/</a>	

<p><b>Course Code:</b> MCA446</p>	<p>MCA- Semester-IV <b>(Program/Discipline Specific Elective Course - III)</b> <b>Oracle DBA</b></p>	<p>L-3 T-1 P-0 C-4</p>
<p><b>Course Outcomes:</b></p>	<p><b>On completion of the course, the students will be :</b></p>	
<p><b>CO1.</b></p>	<p>Understanding the basic concept of oracle database administration.</p>	
<p><b>CO2.</b></p>	<p>Understanding oracle database storage structures.</p>	
<p><b>CO3.</b></p>	<p>Understanding the backup and recovery in database</p>	
<p><b>CO4.</b></p>	<p>Analyzing various database storage structures and the techniques of managing oracle database.</p>	
<p><b>CO5.</b></p>	<p>Developing oracle database security features and skills for managing oracle database.</p>	
<p><b>Course Content:</b></p>		
<p><b>Unit-1:</b></p>	<p><b>Introduction of Oracle Database 10g and Database Configuration Assistant Introduction:</b> Oracle Database 10g : Overview of Grid Computing, Oracle Database Architecture, Database Structures, Oracle Memory Structures, Process Structures, Oracle Instance Management, Server Process and Database Buffer Cache, Physical Database Structure, Tablespaces and Data Files, SYSTEM and SYSAUX tablespaces, Segments, Extents and Blocks, Logical and Physical Database Structures. <b>Creating an Oracle Database:</b> Objectives, Planning the Database, Database Configuration Assistant (DBCA), Using DBCA to create a database, Password Management, Creating a Database Design Template, Using the DBCA to Delete a Database.</p>	<p><b>8 Hours</b></p>
<p><b>Unit-2:</b></p>	<p><b>Managing Oracle Instance &amp; Database Storage Structures:</b> Managing the Oracle Instance: Objectives, Management Framework, Starting and Stopping Database Control, Oracle Enterprise Manager, Accessing Oracle Enterprise Manager, Using SQL*Plus and iSQL*Plus to Access Your Database ,Setting Up iSQL*Plus for SYSDBA and SYSOPER Access, Calling SQL*Plus from a Shell Script, Calling a SQL Script from SQL*Plus, Initialization Parameter Files, Simplified Initialization Parameters, Viewing and Modifying Initialization Parameters , Database Startup and Shutdown, Viewing the Alert Log, Viewing the Alert History, Dynamic Performance Views. <b>Managing Database Storage Structures:</b> Objectives, Storage Structures, How Table Data Is Stored, Anatomy of a Database Block, Tablespaces and Data Files, Oracle Managed Files (OMF), Space Management in Tablespaces, Exploring the Storage Structure, Creating a New Tablespace, Storage for Locally Managed Tablespaces, Tablespaces in the Preconfigured Database, Altering a Tablespace, Actions with Tablespaces, Dropping Tablespaces, Viewing Tablespace Information, Gathering Storage Information, Viewing Tablespace Contents, Enlarging the Database, What Is Automatic Storage Management?, ASM: Key Features and Benefits, ASM: Concepts</p>	<p><b>8 Hours</b></p>

<b>Unit-3:</b>	<p><b>Managing Undo Data, Security in Database:</b>Managing Undo Data: Objectives, Data Manipulation, Undo Data , Transactions and Undo Data, Storing Undo Information, Undo Data Versus Redo Data, Monitoring Undo, Administering Undo, Configuring Undo Retention, Guaranteeing Undo Retention, Sizing the Undo Tablespace, Using the Undo Advisor</p> <p><b>Implementing Oracle Database Security:</b> Objectives, Industry Security Requirements, Separation of Responsibilities, Database Security, Principle of Least Privilege, Applying the Principle of Least Privilege, Monitoring for Suspicious Activity, Standard Database Auditing, Enabling Auditing, Uniform Audit Trails, Enterprise Manager Audit Page, Using and Maintaining Audit Information, Value- Based Auditing, Fine-Grained Auditing, FGA Policy, Audited DML Statement: Considerations, FGA Guidelines, DBA Auditing, Maintaining the Audit Trail, Security Updates, Applying Security Patches</p>	<b>8 Hours</b>
<b>Unit-4:</b>	<p><b>Performance Management:</b>Objectives, Performance Monitoring, Performance Monitoring: Top Sessions, Performance Monitoring: Top Services, SQL Tuning Advisor: Overview ,SQL Tuning Advisor : Options and Recommendations, SQL Statistics, Identifying Duplicate SQL, Using the SQL Access Advisor, Managing Memory Components, Enabling Automatic Shared Memory Management (ASMM), Manually Setting Shared Memory Management, Using the Memory Advisor, Dynamic Performance Statistics, Troubleshooting and Tuning Views, Invalid and Unusable Objects</p>	<b>8 Hours</b>
<b>Unit-5:</b>	<p><b>Backup and Recovery in Database:</b> Performing Database Backups: Objectives, Backup Solutions: Overview, Oracle Secure Backup, User- Managed Backup, Terminology, Recovery Manager (RMAN), Configuring Backup Settings, Scheduling Backups: Strategy, Options, Settings, Schedule, Review Backing Up the Control File to a Trace File, Managing Backups, Flash Recovery Area</p>	<b>8 Hours</b>
<b><u>Text Books:</u></b>	1. Oracle Database 10G, The Complete reference by kevinloney-Tata Mcgraw Hill Education Pvt. Ltd Publication	
<b><u>Reference Books:</u></b>	1. Oracle DBA Bible, by JanathanGennick, Carol McCullough-Dieter and Gerrit- Jan Linker, WILEY-Dreamtech Publication. 2. Using Oracle, by William G. Page - PHI Publication <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://oracle-base.com/articles/misc/learning-to-be-an-oracle-database-administrator-dba">https://oracle-base.com/articles/misc/learning-to-be-an-oracle-database-administrator-dba</a> 2. <a href="https://intellipaat.com/blog/tutorial/oracle-dba-tutorial/">https://intellipaat.com/blog/tutorial/oracle-dba-tutorial/</a>	

<b>Course Code:</b> <b>MCA447</b>	<b>MCA- Semester IV</b> <b>(Program/Discipline Specific Elective Course - IV)</b> <b>Big Data Analytics</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the requirement of Big data with respect to 5 V's.	
<b>CO2.</b>	Understanding the basic storage structure used in Big data with respect to clusters.	
<b>CO3.</b>	Understanding the Hadoop Ecosystem and its components.	
<b>CO4.</b>	Analyzing the data processing in Big data with HIVE , PIG and HBASE.	
<b>CO5.</b>	Analyzing the functionality and working of Zookeeper for monitoring Servers in Cluster.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>INTRODUCTION TO BIG DATA:</b> Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>INTRODUCTION HADOOP:</b> Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>HADOOP ARCHITECTURE:</b> Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>HIVE AND HIVEQL, HBASE:</b> Hive Architecture and Installation, Comparison with Traditional Database, HiveQL – Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase conceptsAdvanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Big Data Analytics:</b> Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists - Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.	<b>8 Hours</b>
<b>Text Books:</b>	1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”,Wiley, ISBN: 9788126551071, 2015.	



<b><u>Reference Books:</u></b>	1. Tom White, “HADOOP: The definitive Guide” , O Reilly 2012. 2. Vignesh Prajapati, “Big Data Analytics with R and Haoop”, Packet Publishing 2013. 3. Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press, 2014 <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.tutorialspoint.com/big_data_analytics/index.htm">https://www.tutorialspoint.com/big_data_analytics/index.htm</a> 2. <a href="https://www.businessprocessincubator.com/content/big-data-analytics-tutorial-materials-syllabus/">https://www.businessprocessincubator.com/content/big-data-analytics-tutorial-materials-syllabus/</a>	



<b>Course Code:</b> MCA448	<b>MCA- Semester-IV</b> <b>(Program/Discipline Specific Elective Course - III)</b> <b>Blockchain Technology</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concept of blockchain and types of blockchain	
<b>CO2.</b>	Understanding basic building blocks of cryptography used in blockchain and how to use them in blockchains.	
<b>CO3.</b>	Understanding the applications of blockchain technology like bitcoin and its key features, characteristics including limitations and advantages.	
<b>CO4.</b>	Applying the ethereum platform and its working architecture to build blockchain applications	
<b>CO5.</b>	Analyzing various kind of blockchains and techniques to create the hyperledger.	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction:</b> Peer to Peer, Distributed Networks, Cryptographically Secure Consensus Mechanism, Byzantine fault tolerance in consensus Algorithms, tiers of blockchain technology, features of blockchain. Types of Blockchain: Distributed Ledger, Public Blockchains, Private Blockchains, Sidechains, Permissioned Ledger, Shared Ledger, Fully Private and Proprietary Blockchains, Tokenized Blockchains, Token less Blockchains.	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Cryptography and Blockchain:</b> Hashes-Hash Cryptography, Types of hashes used in Blockchain, Hashes Vs Encryption, Recording Transactions, Digital Signatures, Verifying and Confirming transactions, Collision resistant hash, Consensus Building, Consensus Technique-PoW, PoS, PoA, Zero Knowledge Proof.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Bitcoin (Blockchain 1.0):</b> Bitcoin blockchain, the challenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use.	<b>8 Hours</b>
<b>Unit-4:</b>	<b>Ethereum (2.0):</b> Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts	<b>8 Hours</b>
<b>Unit-5:</b>	<b>Hyperledger (Blockchain 3.0):</b> Hyperledger fabric, the plug and play platform and mechanisms in permissioned blockchain. Implementing 6t Blockchain using Java Script on Visual Basic.	<b>8 Hours</b>
<b>Text Books:</b>	1. Draft version of "S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.	
<b>Reference Books:</b>	1. Mastering Bitcoin, 2nd Edition. by Andreas M. Antonopoulos. Released June 2017. Publisher(s): O'Reilly Media. 2. Mastering Ethereum. by Andreas M. Antonopoulos, Gavin Wood.	



	Released November 2018. Publisher(s): O'Reilly Media 3.Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016. <b>* Latest editions of all the suggested books are recommended.</b>	
<b><u>Additional Electronic Reference:</u></b>	1. <a href="https://www.tutorialspoint.com/blockchain/index.htm">https://www.tutorialspoint.com/blockchain/index.htm</a> 2. <a href="https://www.guru99.com/blockchain-tutorial.html">https://www.guru99.com/blockchain-tutorial.html</a>	

<b>Course Code:</b> MCA449	<b>MCA- Semester-IV</b> <b>(Program/Discipline Specific Elective Course - IV)</b> <b>Spark</b>	<b>L-3</b> <b>T-1</b> <b>P-0</b> <b>C-4</b>
<b>Course Outcomes:</b>	<b>On completion of the course, the students will be :</b>	
<b>CO1.</b>	Understanding the basic concept of big data analysis using spark	
<b>CO2.</b>	Understanding basics of spark framework	
<b>CO3.</b>	Understanding the Data Analysis with Spark Shell	
<b>CO4.</b>	Applying various classification and clustering techniques in Spark	
<b>CO5.</b>	Analyzing various methods of data analysis and the sentiment analysis in spark	
<b>Course Content:</b>		
<b>Unit-1:</b>	<b>Introduction to Spark:</b> Spark vs. MapReduce, Key-Value Pairs in Spark, Spark Programming Basics, Saving data for future use by Spark	<b>8 Hours</b>
<b>Unit-2:</b>	<b>Spark Framework:</b> Introduction to GPU Computing, CUDA Programming Model, CUDA API, Simple Matrix, Multiplication in CUDA, CUDA Memory Model, Shared Memory Matrix Multiplication, Additional CUDA API Features.	<b>8 Hours</b>
<b>Unit-3:</b>	<b>Data Analysis with Spark Shell:</b> Writing Spark Application - Spark Programming in Scala, Python, R, Java - Application Execution.	<b>8 Hours</b>
<b>Unit-4:</b>	Introduction to MLlib Regression with MLlib, Classification algorithms, clustering algorithms	<b>8 Hours</b>
<b>Unit-5:</b>	Introduction to NLP Tokenization Bag-of-Words Model TF-IDF Sentiment Analysis Basics Topic Modelling Latent Dirichlet Allocation Word2Vec Recurrent Neural Networks(RNNs)	<b>8 Hours</b>
<b>Text Books:</b>	1. Mike Frampton, “Mastering Apache Spark”, Packt Publishing, 2015.	
<b>Reference Books:</b>	1. Mohammed Guller, Big Data Analytics with Spark, Apress,2015 2. Donald Miner, Adam Shook, “Map Reduce Design Pattern”, O’Reilly, 2012 3. NickPentreath, MachineLearningwithSpark, PacktPublishing, 2015 <b>* Latest editions of all the suggested books are recommended.</b>	
<b>Additional Electronic Reference:</b>	1. <a href="https://www.tutorialspoint.com/apache_spark/index.htm">https://www.tutorialspoint.com/apache_spark/index.htm</a> 2. <a href="https://www.edureka.co/blog/spark-tutorial/">https://www.edureka.co/blog/spark-tutorial/</a>	