School of CSA

Master of Computer Applications (MCA)

HANDBOOK
2020-2021

REVA UNIVERSITY
Bengaluru, India

10 YEARS OF UNIVERSITY RECOGNITION
20 YEARS OF ACADEMIC EXCELLENCE

SCHOOL OF COMPUTER SCIENCE AND APPLICATIONS

Master of Computer Applications (MCA)

HANDBOOK

2020

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Chancellor's Message

"Education is the most powerful weapon which you can use to change the world."
- Nelson Mandela.

There was a time when survival depended on just the realization of physiological needs. We are indeed privileged to exist in a time when 'intellectual gratification' has become indispensable. Information is easily attainable for the soul that is curious enough to go look for it. Technological boons enable information availability anywhere anytime. The difference, however, lies between those who look for information and those who look for knowledge.

It is deemed virtuous to serve seekers of knowledge and as educators it is in the ethos at REVA University to empower every learner who chooses to enter our portals. Driven by our founding philosophy of 'Knowledge is power', we believe in building a community of perpetual learners by enabling them to look beyond their abilities and achieve what they assumed impossible.

India has always been beheld as a brewing pot of unbelievable talent, acute intellect and immense potential. All it takes to turn those qualities into power is a spark of opportunity. Being at a University is an exciting and rewarding experience with opportunities to nurture abilities, challenge cognizance and gain competence.

For any University, the structure of excellence lies in the transitional abilities of its faculty and its facility. I'm always in awe of the efforts that our academic board puts in to develop the team of subject matter experts at REVA. My faculty colleagues understand our core vision of empowering our future generation to be ethically, morally and intellectually elite. They practice the art of teaching with a student-centered and transformational approach. The excellent infrastructure at the University, both educational and extra-curricular, magnificently demonstrates the importance of ambience in facilitating focused learning for our students.

A famous British politician and author from the 19th century - Benjamin Disraeli, once said 'A University should be a place of light, of liberty and of learning'. Centuries later this dictum still inspires me and I believe, it takes team-work to build successful institutions. I welcome you to REVA University to join hands in laying the foundation of your future with values, wisdom and knowledge.

Dr. P. Shyama Raju
The Founder and Hon'ble Chancellor, REVA University

Vice-Chancellor's Message

The last two decades have seen a remarkable growth in higher education in India and across the globe. The move towards inter-disciplinary studies and interactive learning have opened up several options as well as created multiple challenges. India is at a juncture where a huge population of young crowd is opting for higher education. With the tremendous growth of privatization of education in India, the major focus is on creating a platform for quality in knowledge enhancement and bridging the gap between academia and industry.

A strong believer and practitioner of the dictum "Knowledge is Power", REVA University has been on the path of delivering quality education by developing the young human resources on the foundation of ethical and moral values, while boosting their leadership qualities, research culture and innovative skills. Built on a sprawling 45 acres of green campus, this 'temple of learning' has excellent and state-of-the-art infrastructure facilities conducive to higher teaching-learning environment and research. The main objective of the University is to provide higher education of global standards and hence, all the programs are designed to meet international standards. Highly experienced and qualified faculty members, continuously engaged in the maintenance and enhancement of student-centric learning environment through innovative pedagogy, form the backbone of the University.

All the programs offered by REVA University follow the Choice Based Credit System (CBCS) with Outcome Based Approach. The flexibility in the curriculum has been designed with industry-specific goals in mind and the educator enjoys complete freedom to appropriate the syllabus by incorporating the latest knowledge and stimulating the creative minds of the students. Bench marked with the course of studies of various institutions of repute, our curriculum is extremely contemporary and is a culmination of efforts of great think-tanks - a large number of faculty members, experts from industries and research level organizations. The evaluation mechanism employs continuous assessment with grade point averages. We believe sincerely that it will meet the aspirations of all stakeholders – students, parents and the employers of the graduates and postgraduates of Reva University.

At REVA University, research, consultancy and innovation are regarded as our pillars of success. Most of the faculty members of the University are involved in research by attracting funded projects from various research level organizations like DST, VGST, DBT, DRDO, AICTE and industries. The outcome of the research is passed on to students through live projects from industries. The entrepreneurial zeal of the students is encouraged and nurtured through EDPs and EACs.

REVA University has entered into collaboration with many prominent industries to bridge the gap between industry and University. Regular visits to industries and mandatory internship with industries have helped our students become skilled with relevant to industry requirements. Structured training programs on soft-skills and preparatory training for competitive exams are offered here to make students more employable. 100% placement of eligible students speaks the effectiveness of these programs. The entrepreneurship development activities and establishment of "Technology Incubation Centers" in the University extend full support to the budding entrepreneurs to nurture their ideas and establish an enterprise.

With firm faith in the saying, "Intelligence plus character –that is the goal of education" (Martin Luther King, Jr.), I strongly believe REVA University is marching ahead in the right direction, providing a holistic education to the future generation and playing a positive role in nation building. We reiterate our endeavor to provide premium quality education accessible to all and an environment for the growth of over-all personality development leading to generating "GLOBAL PROFESSIONALS".

 Welcome to the portals of REVA University!

Dr. K. Mallikharjuna Babu
Vice-Chancellor, REVA University

Director –Message

Welcome note to students

It's my pleasure to welcome you to the School of Computer Science and Applications. Computer, being considered as most significant and revolutionary invention of mankind has metamorphosed the planet earth completely. Predominantly School of Computer Science and Applications have acquired the control of the modern life in a myriad way.

The MCA program is designed keeping in view the current situation and possible future developments, both at national and global levels. This program is designed to give greater emphasis on computer applications. There are ample number of courses providing knowledge in specialized areas of network security, python programming and cloud computing etc. facilitating students to choose specialized areas of their interest. Adequate attention is given to provide students the basic concepts in computer applications.

The program is designed to expose students to various subjects having applications in computers, IT and electronics related industries through outcome based teaching and learning process which emphasizes practical exposure rather than memorization. A variety of activities such as mini projects, seminars, interaction with industries, cultural activities and social activities are in place to shape the all-round development of students.

The benefits of choosing MCA program are:

- Flexibility to choose various fields upon graduation.
- Opportunity to work on live problems.
- Opportunity to work on environmental related technologies.
- Opportunity for programmers to develop software for varied applications in different sectors.

Students after successful completion of MCA program:

- Can start-up their career in either government sector or private sector since there are ample employment opportunities in these sectors.
- Can also start their career as software programmers / engineers, testing engineers, data base administers, system and network administrators, multimedia / web programmers, web designers etc.,

- Can seek placements in diversified fields like banking, e-commerce, insurance, entertainment, and such others.
- The computer application trained graduates are sought after by varied firms for their software based skills.
- Can opt for higher studies in computer applications, IT, business management and so on.

The curriculum caters to and has relevence to local, reginal, natinal and global development needs. All courses are focussed on building skill, employability and entrepreneurship of students. Maximum number of courses are integrated with cross cutting issues with relevant to professional ethics, gender, human values, environment and sustainability.

I am sure the students choosing MCA in REVA University will enjoy the curriculum, teaching and learning environment, the vast infrastructure and the experienced teachers involvement and guidance. We will strive to provide all needed comfort and congenial environment for their studies. I wish all students pleasant stay in REVA and grand success in their career.

Dr. S. Senthil

Director – School of Computer Science and Applications

RUKMINI EDUCATIONAL CHARITABLE TRUST

It was the dream of late Smt. Rukmini Shyama Raju to impart education to millions of underprivileged children as she knew the importance of education in the contemporary society. The dream of Smt. Rukmini Shyama Raju came true with the establishment of Rukmini Educational Charitable Trust (RECT), in the year 2002. **Rukmini Educational Charitable Trust** (RECT) is a Public Charitable Trust, set up in 2002 with the objective of promoting, establishing and conducting academic activities in the fields of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology, among others. In furtherance of these objectives, the Trust has set up the REVA Group of Educational Institutions comprising of REVA Institute of Technology & Management (RITM), REVA Institute of Science and Management (RISM), REVA Institute of Management Studies (RIMS), REVA Institute of Education (RIE), REVA First Grade College (RFGC), REVA Independent PU College at Kattigenahalli, Ganganagar and Sanjaynagar and now REVA University. Through these institutions, the Trust seeks to fulfill its vision of providing world class education and create abundant opportunities for the youth of this nation to excel in the areas of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology.

Every great human enterprise is powered by the vision of one or more extraordinary individuals and is sustained by the people who derive their motivation from the founders. The Chairman of the Trust is Dr. P. Shyama Raju, a developer and builder of repute, a captain of the industry in his own right and the Chairman and Managing Director of the DivyaSree Group of companies. The idea of creating these top notched educational institutions was born of the philanthropic instincts of Dr. P. Shyama Raju to do public good, quite in keeping with his support to other socially relevant charities such as maintaining the Richmond road park, building and donating a police station, gifting assets to organizations providing accident and trauma care, to name a few.

The Rukmini Educational Charitable Trust drives with the main aim to help students who are in pursuit of quality education for life. REVA is today a family of ten institutions providing education from PU to Post Graduation and Research leading to PhD degrees. REVA has well qualified experienced teaching faculty of whom majority are doctorates. The faculty is supported by committed administrative and technical staff. Over 13,000 students study various courses across REVA's three campuses equipped with exemplary state-of-the-art infrastructure and conducive environment for the knowledge driven community.

ABOUT REVA UNIVERSITY

REVA University has been established under the REVA University Act, 2012 of Government of Karnataka and notified in Karnataka State Gazette No. 80 dated 27th February, 2013. The University is empowered by UGC to award degrees any branch of knowledge under Sec.22 of the UGC Act. The University is a Member of Association of Indian Universities, New Delhi. The main objective of the University is to prepare students with knowledge, wisdom and patriotism to face the global challenges and become the top leaders of the country and the globe in different fields.

REVA University located in between Kempegowda International Airport and Bangalore city, has a sprawling green campus spread over 45 acres of land and equipped with state-of-the-art infrastructure that provide conducive environment for higher learning and research. The REVA campus has well equipped laboratories, custom-built teaching facilities, fully air-conditioned library and central computer centre, the well planned sports facility with cricket ground, running track & variety of indoor and outdoor sports activities, facilities for cultural programs. The unique feature of REVA campus is the largest residential facility for students, faculty members and supportive staff.

The University is presently offering 23 Post Graduate Degree programs, 20 Degree and PG Degree programs in various branches of studies and has 12000+ students studying in various branches of knowledge at graduate and post graduate level and 302 Scholars pursuing research leading to PhD in 18 disciplines. It has 800+ well qualified, experienced and committed faculty members of whom majority are doctorates in their respective areas and most of them are guiding students pursuing research leading to PhD.

The programs being offered by the REVA University are well planned and designed after detailed study with emphasis with knowledge assimilation, applications, global job market and their social relevance. Highly qualified, experienced faculty and scholars from reputed universities / institutions, experts from industries and business sectors have contributed in preparing the scheme of instruction and detailed curricula for this program. Greater emphasis on practice in respective areas and skill development to suit to respective job environment has been given while designing the curricula. The Choice Based Credit System and Continuous Assessment Graded Pattern (CBCS – CAGP) of

education has been introduced in all programs to facilitate students to opt for subjects of their choice in addition to the core subjects of the study and prepare them with needed skills. The system also allows students to move forward under the fast track for those who have the capabilities to surpass others. These programs are taught by well experienced qualified faculty supported by the experts from industries, business sectors and such other organizations. REVA University has also initiated many supportive measures such as bridge courses, special coaching, remedial classes, etc., for slow learners so as to give them the needed input and build in them confidence and courage to move forward and accomplish success in their career. The University has also entered into MOUs with many industries, business firms and other institutions seeking their help in imparting quality education through practice, internship and also assisting students' placements.

REVA University recognizing the fact that research, development and innovation are the important functions of any university has established an independent Research and Innovation division headed by a senior professor as Dean of Research and Innovation. This division facilitates all faculty members and research scholars to undertake innovative research projects in engineering, science & technology and other areas of study. The interdisciplinary-multidisciplinary research is given the top most priority. The division continuously liaisons between various funding agencies, R&D Institutions, Industries and faculty members of REVA University to facilitate undertaking innovative projects. It encourages student research projects by forming different research groups under the guidance of senior faculty members. Some of the core areas of research wherein our young faculty members are working include Data Mining, Cloud Computing, Image Processing, Network Security, VLSI and Embedded Systems, Wireless Censor Networks, Computer Networks, IOT, MEMS, Nano-Electronics, Wireless Communications, Bio-fuels, Nano-technology for coatings, Composites, Vibration Energies, Electric Vehicles, Multilevel Inverter Application, Battery Management System, LED Lightings, Renewable Energy Sources and Active Filter, Innovative Concrete Reinforcement, Electro Chemical Synthesis, Energy Conversion Devices, Nano-structural Materials, Photo-electrochemical Hydrogen generation, Pesticide Residue Analysis, Nano materials, Photonics, Nana Tribology, Fuel Mechanics, Operation Research, Graph theory, Strategic Leadership and Innovative Entrepreneurship, Functional Development Management, Resource Management and Sustainable Development, Cyber Security, General Studies, Feminism, Computer Assisted Language Teaching, Culture Studies etc.

The REVA University has also given utmost importance to develop the much required skills through variety of training programs, industrial practice, case studies and such other activities that induce the said skills among all students. A full-fledged Career Development and Placement (CDC) department with world class infrastructure, headed by a dynamic experienced Professor & Dean, and supported by well experienced Trainers, Counselors and Placement Officers.

The University also has University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director facilitating skill related training to REVA students and other unemployed students. The University has been recognised as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana. The Centre conducts several add-on courses in challenging areas of development. It is always active in facilitating student's variety of Skill Development Training programs.

The University has collaborations with Industries, universities abroad, research institutions, corporate training organizations, and Government agencies such as Florida International University, Okalahoma State University, Western Connecticut University, University of Alabama, Huntsville, Oracle India Ltd, Texas Instruments, Nokia University Relations, EMC^2, VMware, SAP, Apollo etc, to facilitate student exchange and teacher–scholar exchange programs and conduct training programs. These collaborations with foreign universities also facilitates students to study some of the programs partly in REVA University and partly in foreign university, viz, M.S in Computer Science one year in REVA University and the next year in the University of Alabama, Huntsville, USA.

The University has also given greater importance to quality in education, research, administration and all activities of the university. Therefore, it has established an independent Internal Quality division
headed by a senior professor as Dean of Internal Quality. The division works on planning, designing and developing different quality tools, implementing them and monitoring the implementation of these quality tools. It concentrates on training entire faculty to adopt the new tools and implement their use. The division further works on introducing various examination and administrative reforms.

To motivate the youth and transform them to become innovative entrepreneurs, successful leaders of tomorrow and committed citizens of the country, REVA organizes interaction between students and successful industrialists, entrepreneurs, scientists and such others from time to time. As a part of this exercise great personalities such as Bharat Ratna Prof. C. N. R. Rao, a renowned Scientist, Dr. N R Narayana Murthy, Founder and Chairman and Mentor of Infosys, Dr. K Kasturirangan, Former Chairman ISRO, Member of Planning Commission, Government of India, Dr. Balaram, Former Director IISc., and noted Scientist, Dr. V S Ramamurthy, Former Secretary, DST, Government of India, Dr. V K Aatre, noted Scientist and former head of the DRDO and Scientific Advisor to the Ministry of Defence Dr. Sathish Reddy, Scientific Advisor, Ministry of Defence, New Delhi and many others have accepted our invitation and blessed our students and faculty members by their inspiring addresses and interaction.

As a part of our effort in motivating and inspiring youth of today, REVA University also has instituted awards and prizes to recognize the services of teachers, researchers, scientists, entrepreneurs, social workers and such others who have contributed richly for the development of the society and progress of the country. One of such award instituted by REVA University is 'Life Time Achievement Award' to be awarded to successful personalities who have made mark in their field of work. This award is presented on occasion of the "Founders' Day Celebration" of REVA University in presence of dignitaries, faculty members and students gathering and the first "REVA Life Time Achievement Award" for the year 2015 has been awarded to Shri. Kiran Kumar, Chairman ISRO on the occasion of Founder's Day Celebration, 6th January, 2016 and the second "REVA Life Time Achievement Award" for the year 2016 has been awarded to Shri. Shekhar Gupta, Renowned Journalist on the occasion of Founder's Day Celebration, 6th January, 2017.

REVA organises various cultural programs to promote culture, tradition, ethical and moral values to our students. During such cultural events the students are given opportunities to unfold their hidden talents and motivate them to contribute innovative ideas for the progress of the society. One of such cultural events is REVAMP conducted every year. The event not only gives opportunities to students of REVA but also students of other Universities and Colleges. During three days of this mega event students participate in debates, Quizzes, Group discussion, Seminars, exhibitions and variety of cultural events. Another important event is Shubha Vidaaya, - Graduation Day for the final year

students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take their future career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and won medals and prizes in academic, cultural and sports activities are also recognised by distributing awards and prizes. The founders have also instituted medals and prizes for sports achievers every year. The physical education department conducts regular yoga classes everyday to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

Recognizing the fast growth of the university and its quality in imparting higher education, the BERG (Business Excellence and Research Group), Singapore has awarded BERG Education Award 2015 to REVA University under Private Universities category. The University has also been honoured with many more such honors and recognitions.

REVA University Vision

 ''REVA University aspires to become an innovative university by developing excellent human resources with leadership qualities, ethical and moral values, research culture and innovative skills through higher education of global standards".

Misson

- To create excellent infrastructure facilities and state-of-the-art laboratories and incubation centers
- To provide student-centric learning environment through innovative pedagogy and education reforms
- To encourage research and entrepreneurship through collaborations and extension activities
- To promote industry-institute partnerships and share knowledge for innovation and development
- To organize society development programs for knowledge enhancement in thrust areas
- To enhance leadership qualities among the youth and enrich personality traits, promote patriotism and moral values.

Objectives

- Creation, preservation and dissemination of knowledge and attainment of excellence in different disciplines
- Smooth transition from teacher - centric focus to learner - centric processes and activities
- Performing all the functions of interest to its major constituents like faculty, staff, students and the society to reach leadership position
- Developing a sense of ethics in the University and Community, making it conscious of its obligations to the society and the nation
- Accepting the challenges of globalization to offer high quality education and other services in a competitive manner

ABOUT SCHOOL OF COMPUTER SCIENCE AND APPLICATIONS

The School of Computer Science and Applications is shouldered by well qualified, experienced and highly committed faculty. The state-of-the-art infrastructure digital classrooms, well equipped advanced computer laboratory, conference rooms and the serene academic atmosphere at REVA University will enhance the transfer as well as creation of knowledge. The School offers BCA, B. Sc. (Honors) in Computer Science with specialization in Cloud Computing and Big Data, MCA and MS (Computer Science) programs. The School also has research program leading to doctoral degree. The curriculum of both graduate and post graduate degree programs have been designed to bridge the gap between industry – academia and hence they are industry oriented. These programs provide ample scope to enter into a wide range of business opportunities, entrepreneurship ventures and as well as job opportunities in different sectors. This is reflected in various core subjects / courses offered within the program. Further the school provides an interactive, collaborative peer tutoring environment that encourages students to break down complex problems and develop strategies for finding solutions across a variety of situations and disciplines. The school aims to develop a learning community of critical thinkers who serve as models of innovative problems solving in the university environment to enrich their academic and professional careers.

VISION

To transform students into good human beings, responsible citizens and competent professionals, focusing on assimilation, generation and dissemination of knowledge in the area of Computer Applications

MISSION

- To impart quality education to meet the needs of profession and society, and achieve excellence in teaching-learning and research in the area of Computer Applications;
- To attract and develop talented and committed human resource, and provide an environment conducive to innovation, creativity, team-spirit and entrepreneurial leadership in Computing field;

- To facilitate effective interactions among faculty and students of the School of Computer Applications, and foster networking with alumni, industries, institutions and other stake-holders; and

- To practice and promote high standards of professional ethics, transparency and accountability.

OBJECTIVES

- To impart programs at graduate, post-graduate and doctoral levels in the field of computer applications;

- To adopt innovative methods of teaching and promote student centric learning process;

- To create infrastructure of international standard and facilitate and create conducive environment for teaching, learning and research;

- To promote faculty development and encourage faculty members and students to organize and participate in national and international level conferences, seminars, symposia and such others;

- To encourage teachers and students to take-up interdisciplinary studies and research;

- To promote students participation in co-curricular and extension activities and develop their personality traits and team spirit

ADVISORY BOARD

SL. No	Name and Affiliation
1	Dr. B.S.Anami Principal, KLE Institute of Technology, Hubli.
2	Dr.M N Birje Professor &Head, Department of Computer Applications, VTU,Belagvi.
3	Dr.Sathish Babu Professor & Head, Department of Computer Science, SIT,Tumkur.
4	Dr.P Nagabhusan Director, IIIT Allahabad.
5	Dr.Pethuru Raj Chief Architect & Vice President, Site Reliability Engineering (SRE), Division,Reliance Jio Infocomm Limited.
6	Mr.Raja Krishnamoorthy Director, SAP, Cognizant Technology Pvt.Ltd, Bengaluru.
7	Dr.Madan Kumar Srinivasan Associate Vice President, AI Innovation Centre, Accenture, Bengaluru.

MASTER OF COMPUTER APPLICATIONS (MCA) PROGRAM

Program Overview

Computers have become ubiquitous part of modern life, and new applications are introduced every day. The use of computer technologies is also commonplace in all types of organizations, in academia, research, industry, government, private and business organizations. As computers become even more pervasive, the potential for computer-related careers will continue to grow and the career paths in computer-related fields will become more diverse. Since 2001, global information and communication technologies (ICTs) have become more powerful, more accessible, and more widespread. They are now pivotal in enhancing competitiveness, enabling development, and bringing progress to all levels of society.

The career opportunities for master of computer applications graduates are plenty and growing. Programming and software development, information systems operation and management, telecommunications and networking, computer science research, web and Internet, graphics and multimedia, training and support, and computer industry specialists are some of the opportunities the graduates find.

The School of Computer Science and Applications at REVA UNIVERSITY is offering Master of Computer Application (MCA) programme to create motivated, innovative, creative thinking post - graduates to fill the roles of software Engineers who can conceptualize, design, analyze and develop computer software to meet the modern day industry requirements.

The programme is designed to meet the growing demand for qualified professionals in the field of Computer Applications. The MCA programme is inclined more toward application development and thus has more emphasis on latest programming languages and tools to develop better and faster applications. It covers various aspects of computational theory, network and database management, mobile technologies, electronics, mathematics, probability, statistics etc. The programme also deals with operation research, user interface design, M-commerce, e-commerce, internet of things, mobile computing, software testing and quality assurance, big data analytics, and many such areas intended to meet IT industry requirements.

Program Educational Objectives (PEO's)

The aim of the programme is to produce postgraduates with advanced knowledge and understanding of Computer Science and Applications with higher order critical, analytical, problem solving and transferable skills; with ability to think rigorously and independently to meet higher level expectations of ICT industry, academics, and research establishments or take up venture.

The Programme Educational Objectives are to prepare the students to:

PEO-1	Be skilled Computer Application Developers, Algorithm developers, Computer Programmers and to operate various commercial software tools to solve scientific and business problems,
PEO-2	be software engineers who can design, code, test and implement computer programs and adopt lifelong learning philosophy for continuous improvement and acquire higher degrees so as to work in colleges/ universities as professors or as scientists in research establishments
PEO-3	To work as a member of a team as well as lead a team and communicate effectively across team members, to be equipped to be competent in the field of computer science and be further trained to become an entrepreneur or act as administrators in public, private and government organisations
PEO-4	be aware of environmental, legal, cultural, social, ethical, public safety issues work along with engineering, medical, ICT professionals and scientists to assist them in their research and development work

Program Outcomes (POs)

1. **Computational Knowledge:** Apply knowledge of computing fundamentals, computing specialisation, mathematics, and domain knowledge appropriate for the computing specialisation to the abstraction and conceptualisation of computing models from defined problems and requirements.

2. **Problem Analysis:** Identify, formulate, research literature, and solve complex computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

3. **Design /Development of Solutions:** Design and evaluate solutions for complex computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

4. **Conduct investigations of complex Computing problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern Tool Usage:** Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

6. **Professional Ethics:** Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.

7. **Life-long Learning:** Recognise the need, and have the ability, to engage in independent learning for continual development as a computing professional.

8. **Project management and finance:** Demonstrate knowledge and understanding of t h e computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

9. **Communication Efficacy:** Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

10. **Societal and Environmental Concern:** Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.

11. **Individual and Team Work:** Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

12. **Innovation and Entrepreneurship:** Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

Programme Specific Outcomes (PSO)

After successful completion of the programme, the graduates will be able to

1. Demonstrate practical skills in a wide Variety of programming languages and software platforms.
2. Deliver intensive software solutions for real world applications with the help of advanced computational tools and techniques
3. Instill life-long learning skills through the development of a research environment and higher educational opportunities.

SCHOOL OF COMPUTER SCIENCE AND APPLICATIONS
Master of Computer Science & Applications – MCA Programme
Scheme of Instructions – 2020

FIRST SEMESTER

Sl. No	Course Code	Course Title	HC/SC/FC	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	M20CA1010	Probability & Statistics	HC	4	0	0	4	4
2	M20CA1020	Data Structures using C	HC	4	0	0	4	4
3	M20CA1030	Operating Systems using Linux	HC	3	0	1	4	5
4	M20CA1040	Relational Database Management Systems	HC	4	0	0	4	4
5	M20CA1050	Web Technologies	HC	2	1	1	4	6
6	M20CA1060	Software Engineering	HC	4	0	0	4	4
Practical Courses								
7	M20CA1070	Data Structures Lab	HC	0	0	2	2	4
8	M20CA1080	RDBMS Lab	HC	0	0	2	2	4
*Mandatory - (Non Creditable Courses)								
9	M20CA1090	Skill Development Program						
		Total Credits		**21**	**1**	**6**	**28**	**35**

Note: Bridge Course: Fundamentals of Computer Organization

SECOND SEMESTER

Sl. No	Course Code	Course Title	HC/SC/ FC	Credit Pattern			Credits	Working Hrs
				L	T	P		
1	M20CA2010	Data Mining and Knowledge Discovery	HC	4	0	0	4	4
2	M20CA2020	Object Oriented Programming using JAVA	HC	4	0	0	4	4
3	M20CA2030	Computer Networks	HC	3	0	1	4	5
4.	M20CA2040	Python Programming	HC	4	0	0	4	4
5	M20CA2051	Advanced Web Technologies	SC	3	0	1	4	5
	M20CA2052	Advanced Database Systems						
	M20CA2053	.NET Framework and Applications						
	M20CA2054	Advanced Linux Programming						
6	M20CA2061	Artificial Intelligence	SC	4	0	0	4	4
	M20CA2062	Software Project Management						
	M20CA2063	Optimization Techniques						
	M20CA2064	Human Computer Interaction						
Practical Courses								
7	M20CA2070	JAVA Lab	HC	0	0	2	2	4
8	M20CA2080	Python Lab	HC	0	0	2	2	4
***Mandatory - (Non Creditable Courses)**								
9	M20CA2090	Soft Skill						
10	M20CA2100	Skill Development Programme						
Total Credits				**22**	**0**	**6**	**28**	**34**

THIRD SEMESTER

Sl. No	Course Code	Course Title	HC/SC/FC	Credit Pattern L	T	P	Credits	Working Hrs
1	M20CA3010	Machine Learning using Python	HC	2	1	1	4	5
2	M20CA3020	Big Data Analytics Using R	HC	2	1	1	4	5
3	M20CA3031	Web Mining & Social Networking	SC	4	0	0	4	4
	M20CA3032	Mobile Computing and Appstore Management						
	M20CA3033	Cloud Computing						
	M20CA3034	Ubiquitous and Pervasive Computing						
4	M20CA3041	Advanced Java Programming	SC	3	0	1	4	5
	M20CA3042	Design and Analysis of Algorithms						
	M20CA3043	Software Testing and Quality Assurance						
	M20CA3044	Internet of Things						
5	****	Open Elective from other schools	OE	4	0	0	4	4
Practical Courses								
6	M20CA3060	Minor Project using R /Python/JAVA	HC	2	0	4	6	10
*Mandatory - (Non Creditable Courses)								
7	M20CA3070	Soft Skill						
8	M20CA3080	Skill Development Programme						
Total Credits				17	2	7	26	33

Open Elective offered to other Schools:

	M20CA3050	Digital Marketing	OE	4	0	0	4	4

FOURTH SEMESTER

Sl No	Course Code	Title of the Course	Credit Pattern L:T:P:J	Credits
1	M20CA4010	Research/Technical paper	0:0:0:2	2
2	M20CA4020	Internship/ Certification	0:0:0:6	6
3	M20CA4030	Major Project	0:0:0:12	12
Total Credits				**20**

* Note:

1. Project Work and Dissertation will be mandatory of 12 Credits

2. The student can select either Internship (4 weeks) or Certification Course for 6 Credits.

3. All final year project students must write & publish a technical/Research paper based on their area of interest that carries 2 credit.

CREDIT SUMMARY

Semester	Credits
First	**28**
Second	**28**
Third	**26**
Fourth	**20**
Total	**96+6(Internship) = 102**

CREDIT DISTRIBUTION

Sem	Hard Core (HC)	Softcore Course (SC)	Open Elective (OE)	Project & Technical Paper	Internship/ Certification	Total Credits
I	28	-	-	-	-	28
II	19	9	-	-	-	28
III	14	8	4	-	-	26
IV	-	-	-	12+2	6	20
	61	17	4	14	6	**102**

FIRST SEMESTER:

M20CA1010		L	T	P	C
Duration:14 Wks	**Probability & Statistics**	4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

This course provides an introduction to the basic concepts and techniques of statistics and probability theory, random variables and develops problem solving skills with both theoretical and practical problems. Probability theory is the branch of mathematics that deals with modeling uncertainty. It is important because of its direct application in all areas. It also forms the fundamental basis for many other areas in the mathematical sciences including modern optimization methods and risk modeling.

Prerequisites:

knowledge of calculas, and real analysis.

Course Objectives:

The objectives of this course are to:

- Know the different Sampling Techniques used in Big data and related areas

- Introduce Random variables and Probability distributions

- Learn the statistical procedures most often used by practicing engineers.

- Understand apply for business applications.

Course Outcomes:

On completion of the course, learners will be able to:
- Formulate and model of a linear programming problem from a word problem and solve them graphically in 2 dimensions, while employing some convex analysis.
- Illustrate and apply the concepts of place a primal linear programming problem into standard form and use the simplex method or dual simplex method to solve it. Effectively communicate complex mathematical ideas and carefully reasoned arguments both orally and in writing.
- Recognize and compute / solve a number of classical linear programming problems and such as the minimum / maximum of the assignment problem, the transportation problem, the shortest-path problem, while taking advantage of the special structures of certain problems.

- Demonstrate the ability to apply analytical and theoretical skills to create quantitative models to solve real world problems in appropriate contexts

Course Contents:

UNIT I   **[13 Hours]**

Descriptive Statistics : Introduction meaning and scope of Statistics - Data classification, Tabulation, Frequency and Graphic representation - Measures of central Tendency - Arithmetic mean, Mode, Partition Values - Median, Quartiles, Deciles, Percentile - Measures of Dispersion – Range, Quartile deviation, Mean deviation, standard deviation, coefficient of Variance, Measure of Skewness, Moments & Kurtosis.

UNIT II   **[13 Hours]**

Predictive Analytics: Predictive modeling and Analysis - Regression Analysis, Correlation analysis, Rank correlation coefficient, multiple correlation, least square, Curve fitting and goodness of fit.

UNIT III   **[13Hours]**

Random Variable and Probability Distribution: Introduction probability and its property, Random variable, its types DRV, CRV and its distributions, two dimensional R V, joint probability function, marginal density function. Some special probability distribution - Binomial, Poison, Uniform, Exponential and Normal Distribution.

UNIT IV   **[13 Hours]**

Hypothesis Testing : Introduction Sampling, Sampling distribution, one and two tailed test, Test of significance, (mean, difference of means), confidence interval 1% and 5% level of significance - Design of Experiments, one way classification, two way classification, ANOVA.

Text Books:
1. Gupta. S.C and Kapoor V.K. Fundamentals of Mathematical Statistics 10 edition , Sultan Chand and sons, 2010
2. Larsen, Richard J., and Morris L. Marx. An introduction to mathematical statistics and its applications. Vol. 5. Pearson, 2017.

References Books:
1. Berenson and Levine, Basic Business Statistics, Prentice- Hall India (1996, 6thedition)
2. S.P.Gupta, "Statistical methods"- Sultan Chand & Sons, New Delhi, 2012 Edition
3. Ross Sheldon, A First Course in Probability, Macmillan , (6th edition)

4. Medhi.J, "Statistical methods - An introductory text", new age publications, 2009 edition.
5. D.C. Montogomery and G.C.Runger, "Applied Statistics and Probability for engineers", New Jersey,John Wiley and Sons, 3rd edition, 2003.
6. P K Srimani and M Vinayaka Murthy, "Probability and Statistics", Subhas Stores, 2000
7. W.N. Venables, D.M Smith, "An introduction to R"
8. S M Ross, "Introduction to Probability and Statistics for Engineers and Scientists", Academic Foundation, 2011
9. http://cran.r-project.org/doc/manuals/R-intro.html

M20CA1020		L	T	P	C
Duration:14 Wks	Data Structures Using C	4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

The course begins by introducing the syntax and semantics of the C programming language. It includesdata types, operators and expressions, control flow logic, program structure, arrays, functions and file I/O. The purpose of this course is to provide the students with solid foundations in the basic concepts of programming: data structures using C. Data structures used for storing information in tables, lists, trees, queues and stacks will be covered. Some basic graph and discrete transform algorithms will also be discussed.This course is used to solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions. Students will also learn how to design new algorithms for each new data structure studied, create and perform simple operations on graph data structures, describe and implement common algorithms for working with advanced data structures and recognize which data structure is the best to use to solve a particular problem.

Prerequisites:

To get started with Data Structures you should be familiar with the Basics of Programming Languages and better knowledge in Logic building skills

Course Objectives:

The objectives of this course are to:

- Introduce the concept of algorithms and flow charts to understand and analyze the problem to write optimized algorithm for given problem statements.
- Provide detailed understanding of basic concepts of C and Data Structure.
- Provide detailed understanding of control statements, function and arrays.
- Provide the knowledge of structures and unions,
- Introduce the concepts of Files for application data maintenance
- Introduce the concepts of Linear and Non-Linear Data Structure

Course Outcomes:

On completion of the course, learners will be able to:
- Understand the basic principles of Programming and Achieve Knowledge of design & development of C problem solving skills.
- Design and develop modular programming skills.
- Effective utilization of memory using pointer technology
- Understands the concepts of pointers and data structures.

Course Contents:

UNIT I   **[13 Hours]**
Basics of C Programming, Arrays And Strings : Introduction to C, The C Character Set, Identifiers and Keywords, Data Types, Constants, Variables, Declarations, Expressions, Statements, Symbolic Constants. Operators, Branching and Looping, goto, break and continue statement. **Arrays and Strings:** Arrays: Initialization, Declaration, One dimensional and Multi-Dimensional arrays String: Declaring, Initializing, Printing and reading strings, string manipulation functions, String input and output functions, array of strings.

UNIT II   **[13 Hours]**
Functions, Pointers, Structures & Unions and File: Functions in C, Argument Passing – call by value, call by reference, Functions and program structure, Passing Arrays and Strings to Functions, Recursion, Storage Classes. **Pointers:** Declaring and Initializing Pointers, Pointer Arithmetic, Function and Pointer Parameters, Pointer and Arrays, Dynamic allocation of memory. **Structures And Unions:** Overview of Structures, Defining and Using a Structure, Structures within a Structure, typedef keyword, Passing Structures to Functions, Structure and Pointers, Unions. **File:** Defining, opening and closing of files, Input and output operations.

UNIT III   **[13 Hours]**
Linear Data Structures: Introduction to Data Structures, Primitive and non-primitive data types, Abstract data types. **Stack:** Definition, Array representation, Operations, Towers of Hanoi,

Applications of stack (Infix to postfix conversion, evaluation of expression). **Queue:** Definition, Array representation, Operations, Applications, Types of queues. Searching & Sorting on arrays.

UNIT IV   **[13 Hours]**
Linked List and Non Linear Data Structures: Linked List: Definition, Representation in memory, Types of Linked List, Operations on Linked List: Traversing, Insertion, Deletion and Searching.
Hashing: Hash table organizations, Hashing Functions, Static and Dynamic Hashing.
Non Linear Data Structures: Need for non-linear structures, Trees and its representation, Binary Tree, types of Binary Trees,Binary search tree, Binary tree traversals and applications of trees.
Graph Introduction to Graph, Graph Traversal Techniques.

Text Books:
   1. Byron S. Gottfried, "Theory and Problems of Programming With C*"*, Second Edition, Tata McGraw Hill, 1996.
   2. Yashwant Kanetkar, "Let us C ",BPB Publications,8th Revised edition (1 January 2008)
   3. Ashok N Kamthane, "Introduction to Data Structures in C", Pearson Education (S) Pvt Ltd., New Delhi: 2005. (Chapter 1 to 11)
   4. YedidyahLangsam and Moshe J. Augenstein and Aaron M Tenanbanum, "Data Structures Uisng C and C++", 2nd Edition, Pearson Education Asia, 2002. (Chapter 1 to 8)

Reference Books:
   1. Deitel and Deitel, "C How to Program", Pearson Education.6th edition,2010
   2. Dennis M Ritchie, Brian W Kernighan, "The C Programming Language" , PHI, 2ndEdition,April 1,1988.
   3. Balaguruswamy. E, "Programming in ANSI C",McGraw Hill Education (India) Private Limited, 6th Edition, May 2012.
   4. Jean-Paul Tremblay and Paul G Sorenson, "An Introduction to Data Structures with Applications", Second Edition, Tata McGraw-Hill Publishing Company Lt., New Delhi: 1995.
   5. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan (2008), Fundamentals of Data Structure in C, 2nd Edition, University Press, India.
   6. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education.

M20CA1030	Operating Systems Using Linux	L	T	P	C
Duration:14 Wks		3	0	1	4

Course Description: (3-4 lines-course aim and summary be added)

Operating System is an essential part of any computer system. This course is the introductory course in operating system at the undergraduate level. It provides a clear description of the concepts that underlie operating systems, what operating systems are, what they do, and how they are designed, constructed, process management and memory management. This course is intended for people not familiar with the UNIX/linux operating system, but familiar with other computer systems such as MS Windows, DOS or VMS. It is meant as an introduction for beginners to help them understand concepts behind the UNIX/linux operating system.

Prerequisites:

The skills required to learn operating systems using Linux are Digital Logic, programming languages, computer organization and computer architecture.

Course Objectives:

The objectives of this course are to:

- To relate the operation, implementation and performance of modern operating systems, and the relative merits and suitability of each for complex user applications.
- Ability to compare, contrast, and evaluate the key trade-offs between multiple approaches to operating system design, and identifies appropriate design choices when solving real-world problems.
- To expose the design of the LINUX operating system.
- To illustrate various commands of the LINUX OS.
- To demonstrate the different types of filters used in LINUX

Course Outcomes:

On completion of the course, learners will be able to:
- Describe the basic principles adopted in the design of modern operating systems.
- Explain the objective and functions of modern operating systems.
- Describe how computing resources are used by application software and managed by
- system software.
- Design and implement the concepts of shell programming. 5. Implement the various filters of LINUX.

UNIT I [13 Hours]

Operating System concepts: Types of Operating Systems, Operating System Components & Services, System calls.

Process Management: Process Concept, Process Scheduling, Threads, CPU Scheduling Criteria, Scheduling algorithm. The Critical Section Problem, Semaphores, Classical problems of synchronization, Monitors.

UNIT II [13 Hours]

Dead locks – system model, Characterization, Dead lock prevention, avoidance and detection, Recovery from dead lock,.

Memory Management: Logical and Physical address space, Swapping, Contiguous allocation, Paging, Segmentation, Segmentation with paging, Virtual memory-Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing.

UNIT III [13 Hours]

Introduction and Interacting with shell and Desktop to Linux: History, salient features, Linux system architecture, Linux command format, Linux internal and external commands, Directory commands, File related commands, Disk related commands.

The Linux Shell Basic command cls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc, script, spell and ispell, Introduction to Shell Scripting, Shell Scripts, read, Command Line Arguments, Exit Status of a Command.

UNIT IV [13 Hours]

Basic Linux Programming: User vs, kernel node, context of a Process, background processes, Process scheduling commands, Process terminating and examining commands. Types of shell Process, shell script features, shell command line processing, executing a shell script, system and user-defined variables, expr command, read and echo statement, command substitution, escape sequence characters. Conditional Control Structures-if statement, case statement, Looping Control Structure-while, until, for, statements.

Text Books:
1. Abraham Silberschatz And Peter Baer Galvin, "Operating System Concepts", 8th Edition, Pearson Education, 2002.
2. M.G.Venkateshmurthy, "Introduction To Unix & Shell Programming", First Edition, Pearson Education, 2004.
3. Richard Petersen, "The Complete Reference Linux " Sixth Edition Petersen, Tata Mcgraw Hill [Chapter 1]

4. Kernighan B W & Robert B, "The Unix Programming Environment".

Reference Books:

1. Harvey M. Deital, "Operating Systems", Third Edition, Pearson Education, 2004.
2. William Stallings, Operating Systems, Prentice Hall.
3. Daniel P. Bovet, Marco Cesati,"Understanding The Linux Kernel(O'Reilly) "
4. William Bo Rothwell ,"Linux for Developers: Jumpstart Your Linux Programming Skills
5. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", O'Reilly Media, 6th Ed., 2009.
6. Neil Matthew, Richard Stones, Alan Cox, "Beginning Linux Programming", 3rd Ed., 2004.

M20CA1040		L	T	P	C
Duration:14 Wks	**Relational Database Management Systems**	4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

The course, Database Management Systems, provides an introduction to the management of database systems. The course emphasizes the understanding of the fundamentals of relational systems including data models, database architectures, and database manipulations. This course covers the fundamental concepts of database systems. Topics include data models (ER, relational, and others); query languages (relational algebra, SQL, and others). Emphasis is on data dictionaries, normalization, data integrity, data modelling, and creation of simple tables, queries, reports, and forms. Upon completion, students should be able to design and implement normalized database structures by creating simple database tables, queries, reports, and forms.

Prerequisites:

Before learning the RDBMS, you must have the basic knowledge of Database systems.

Course Objectives:

The objectives of this course are to:

- To introduce the basic concepts in Relational Databases and its design approaches.
- To provide practical experience in using Oracle9i software to develop and alter tables.
- To train the students to manipulate tables using updation, deletion and arithmetic operations.

- To provide the basic understanding to group data using built-in functions and join multiple tables.
- To expose the students in the creation and manipulation of tables using PL/SQL.

Course Outcomes:

On completion of the course, learners will be able to:
- Relate all basic terminologies in Relational Databases, formulate relational algebra expressions, be skilled in understanding of normalization theory and apply such knowledge to the normalization of a database.
- Identify and recognize Oracle9i software to develop and formulate solutions to a broad range of query, and data update, delete & alter tables.
- Have a basic understanding to group data using built-in functions, arithmetic operations and join multiple tables.
- Demonstrate a new programming language PL/SQL to create and manipulate tables, records in databases.

Course Contents:

UNIT I   **[13 Hours]**
Database Concepts: Database Concepts: A Relational approach: Database, Relationships, DBMS, Relational Data Model, Integrity Rules and Theoretical Relational Languages.
Database Design: Data Modeling and Normalization: Data Modeling, Dependency, Database Design, Normal forms, Dependency Diagrams, Denormalization, Examples of Normalization.

UNIT II   **[13 Hours]**
RDBMS Tools: Overview: Personal Databases, Client/Server Databases, Oracle9i an introduction, SQL *Plus Environment, SQL, Logging into SQL *Plus, SQL *Plus Commands, Errors & Help Alternate Text Editors, SQL *Plus Worksheet, iSQL *Plus.
Oracle Tables: DDL: Naming Rules and conventions , Data Types, Constraints, Creating Oracle Table, Displaying Table Information, Altering an Existing Table, Dropping, Renaming, Truncating Table, Table Types, Spooling, Error codes.

UNIT III   **[13 Hours]**
Working with Oracle Tables : Working with Table: Data Management and Retrieval: DML, adding a new Row/Record, Customized Prompts, Updating and Deleting an Existing Rows/Records, retrieving Data from Table, Arithmetic Operations, restricting Data with WHERE clause, Sorting, Revisiting Substitution Variables, DEFINE command, CASE structure.
Functions and Grouping: Built - in functions, Grouping Data. Multiple Tables: Join, Set operations.

PL/SQL: A Programming Language: History, Fundamentals, Block Structure, Comments, Data Types, Other Data Types, Declaration, Assignment operation, Bind variables, Substitution Variables, Printing, Arithmetic Operators.

UNIT IV [13 Hours]

PL/SQL Control Structures and Embedded SQL : Control Structures, Nested Blocks, SQL in PL/SQL, Data Manipulation, Transaction Control statements.

PL/SQL Cursors and Exceptions: Cursors, Implicit & Explicit Cursors and Attributes, Cursor FOR loops, SELECT...FOR UPDATE, WHERE CURRENT OF clause, Cursor with Parameters Cursor Variables, Exceptions, Types of Exceptions. Named Blocks: Procedures, Functions Packages, Triggers, Data Dictionary Views.

Text Book:
1. Nilesh Shah , Database Systems Using Oracle , 2nd edition, PHI.

Reference Books:
1. Arun Majumdar & Pritimoy Bhattacharya , Database Management Systems ,2007, TMH.
2. Gerald V. Post , Database Management Systems, 3rd edition, TMH.

M20CA1050		L	T	P	C
Duration:14 Wks	**WEB TECHNOLOGIES**	2	1	1	4

Course Description: (3-4 lines-course aim and summary be added)

This course is an overview of the modern Web Technologies used for the web development. The purpose of this course is to give students the basic understanding of how things work in the Web world from the technology point of view as well as to give the basic overview of the different technologies. The topics include: History of the Web, Hypertext Markup Language (HTML), Extensible HTML (XHTML), Cascading Style Sheets (CSS), JavaScript, VB Script and XML. We will follow the guidance of the World Wide Web Consortium (W3C) to create interoperable and functional websites

Prerequisites:

To get started with web technology you should have the basic knowledge of Computer fundamentals.

Course Objectives:

The objectives of this course are to:

- Describe rich internet applications that use most recent client-side programming technologies.
- Apply client-side validations using Java Script.
- Capture core technical skills necessary for a complete understanding of front-end web development, including HTML5 and CSS, JavaScript, DOM.
- Demonstrate the displaying of XML documents using CSS and XSLT.

Course Outcomes:

On completion of the course, learners will be able to:
- Apply and design basic web page using HTML ,CSS and Java Script
- Demonstrate and develop HTML 5 & CSS Programming Skills ,Experience creating various small website project
- Understand the principles of creating an effective web page
- Design & develop Web applications using the web technologies tools

Course Contents:

UNIT I [13 Hours]
Fundamentals of HTML & CSS : Introduction to HTML/XHTML: Origins and Evaluation of HTML and XHTML, Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images, Hypertext Links, Lists, Tables, Forms, Syntactic Differences between HTML and XHTML. CSS: Introduction, Levels of Style Sheets, Style Specification Formats, Selector Forms, Property value forms, Font Properties, List Properties, Alignment of Text, Color, The box Model, Background Images, The <span> and <div> Tags

UNIT II [13 Hours]
HTML 5: Detecting HTML5 features – Canvas, Video, Local Storage, Web Workers, Offline Applications, Geolocation, Placeholders and input types, What Does It All Mean–Doctype, Root, Headers, Articles, Dates and Times, Navigation and Footers. Simple Shapes, Canvas, Paths, Texts, Gradients and Images. Place Holders, Autofocus Fields, Email, and Numbers As Spin boxes and Sliders.

UNIT III [13 Hours]
The Basics of JavaScript and HTML Documents : Object Orientation and JavaScript, Syntax, Primitives, Operations and Expressions, Screen Output and keyboard Input, Control   Statements, Object Creation and Modification,   Arrays, Functions, Constructors and Pattern Matching Using Regular Expressions, The JavaScript Execution Environment, The Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body Elements, Handling events from Button Elements, Handling events from Text Box and Password Elements.

Introduction to XML : Introduction, Syntax of XML, XML document structure, Document Type Definitions, Namespaces, XML Schemas, Displaying Raw XML Documents with CSS. XSLT Style Sheets: Overview of XSLT, XSL Transformations for Presentation, XML Processors.

Textbooks:
1. Robert W. Sebesta: Programming the World Wide Web, 4th & 7th Edition, Pearson education, 2009& 2014 (Chapter 1& 4- 4th edition, 3 & 7- 7th edition)
2. Mark Pilgrim: HTML5 – Up and Running, O'REILLY| GOOGLE Press, 2014.(Chapter 2, 3, 4 & 9)
3. Robert W. Sebesta., Programming the World Wide Web, Seventh Edition, (Chapter 5)

Reference Books:
1. Jeffrey C. Jackson: Web Technologies- A Computer Science Perspective, Pearson Education, Eleventh Impression, 2012.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
3. Internet Technology and Web Design, Instructional Software Research and Development, (ISRD) Group, Tata McGraw Hill, 2011.
4. M. Srinivasan: Web Technology Theory and Practice, Pearson Education, 2012

WEB TECHNOLOGIES LAB
PART-A
1. Create an HTML5 page to demonstrate the usage of
   a. Text Formatting tags
   b. Links
   c. Images
   d. Tables
2. Develop and demonstrate the usage of inline and external style Sheet using CSS.
3. Write a Program using JavaScript to display a table of the numbers from 5 to 15 and their squares and cubes using alert.
4. Develop and demonstrate using Java script, a XHTML document that display random numbers (integers).
5. Write a Program to demonstrate various event handlers when an image is moved from the top stacking position, it returns to its original position   using   JavaScript.
6. Develop using Java script, an XHTML document that uses onload and onfocus events.
7. Write a Program on xml to read Employee details and display the   details using CSS.
8. Develop a web form to display the student details using XML and XSLT style sheets.

   PART-B

1. Build a client-side web application in the following areas:
   a. Educational Institutions.
   b. Online shopping.
   c. Hospital Management System.
   d. Real Estate
   e. Reservation System

M20CA1060		L	T	P	C
Duration:14 Wks	**Software Engineering**	4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

Software engineering is the branch of computer science that creates practical, cost-effective solutions to computing and information processing problems, preferentially by applying scientific knowledge, developing software systems in the service of mankind. This course is aimed at helping students build up an understanding of how to develop a software system from scratch by guiding them thru the development process and giving them the fundamental principles of system development. The course will initiate students to the different software process models, project management, software requirements engineering process, systems analysis and design as a problem-solving activity, key elements of analysis and design, and the place of the analysis and design phases within the system development life cycle.

Prerequisites:

To learn Software Engineering, you must have a basic knowledge of computer fundamentals, software systems, and software development processes.

Course Objectives:

The objectives of this course are to:

- To provide an insight into the processes of software development
- To familiarize students with the different types of designs that need to be incorporated in a project to bring down the complexities.
- Students should be able to identify functionalities, architectures, identification of activities with respect to actors (Use Case Diagrams), activities in a step by step manner (Activity Diagrams), interaction between the different objects (Sequence Diagrams), flow of data (Data Flow Diagrams) and representation of entity framework in a conceptual model (ER Diagram).

- Students should be able to understand how to verify and validate the functionalities starting from high level architecture to low level architecture (Writing Test Scenarios and Test Cases).

Course Outcomes:

On completion of the course, learners will be able to:
- Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
- Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare as well as global, cultural, social, environmental, and economic factors.
- Recognize ethical and professional responsibilities in engineering situations and make informed judgments which must consider the impact of engineering solutions in global, economic, environmental and societal contexts.
- Function effectively on a team whose members together provide leadership, create a collaborative and inclus
- ive environment, establish goals, plan tasks, and meet objectives.
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Course Contents:

UNIT I [13 Hours]
Introduction to Software Engineering: Defining the Discipline, Software Process, software engineering practice, software development myths. The Changing nature of Software, **Software Process structure**: Generic process model, defining a framework activity. **Process models:** Perspective and specialized process models, the unified process. **(Chapter:1-4)**

UNIT II [13 Hours]
Requirement Modeling and Design : Requirement: Functional & Non-functional requirements, **Requirement Modeling:** Understanding Requirements, Requirements Modeling (Scenario-based & Class-based methods), **Design:** Design Concepts, Architectural design (Webapp Design, Mobileapp Design). **(Chapter: 8-10, 12, 17, 18)**

UNIT III [13 Hours]
Agile Implementation and Managing Software Products : AGILE development, **Managing Software Products**: Project Management Concepts, Project Estimation and Scheduling, Risk Management, Maintenance and Re-engineering. **(Chapter:5, 31, 33-36)**

UNIT IV [13 Hours]

Software Quality Management Process & Advanced Topics: Software Quality Management Process: Quality Concepts, Software Quality Assurance, Testing Strategies, Security Engineering, Software Configuration Management Process. **Advanced Topics:** Software Process Improvement, The SPI Process, Trends and Return of Investment, Technology Directions. **(Chapter:19, 21, 22, 27, 29, 37, 38)**

(Note: Students are expected to create these without the help of any tools).
The faculty has to conduct the below exercises with the help of 2 example projects….
   1. Project 1 - Library Management System
   2. Project 2 - ATM (Automatic Teller Machine)
   3. Project 3 – Student Result Analysis
   4. Project 4 – Airline Reservation System
   5. Project 5 - School Bus Operation
   6. Project 6 - Clinic Management System

Details of Project Classes

S.No	Class	Exercise
1.	**Class 1:** To write the complete problem statement for Project1 and Project2.	Write the problem statement for Project3 and Project4
2.	**Class 2:** To identify the purpose and scope with the analysis of existing system and proposed system for Project1 and Project2.	Write the same for Project3 and Project4
3.	**Class 3:** Identification of Functional and Non Functional Requirements for Project1 and Project2.	Write the Functional and Non Functional Requirements for Project3 and Project4.
4.	**Class 4:** To draw the use case diagram, identify actors, activities with their relationships and their extensions for Project1 and Project2.	Write use case diagrams for Project3 and Project4.
5.	**Class 5:** To draw Activity diagrams, Sequence diagrams, Data flow diagrams (with different levels) for Project1 and Project2.	Write Activity diagrams, Sequence diagrams, Data flow diagrams (with different levels) for Project3 and Project4.

6.	**Class 6:** Database design (identification of entities and attributes) for Project1 and Project2.	**I**dentify entities and attributes for database design from Project3 and Project4.
7.	**Class 7:** To draw ER diagram for the database of Project1 and Project2.	Draw ER diagram for database of Project3 and Project4.
8.	**Class 8**: Identification of Test Scenarios for Project1 and Project2 (according to V Model)..	Identify Test Scenarios for Project3 and Project4.
9.	**Class 9:** Writing Test cases for Project1 and Project2 based on scenarios identified.	**Exercise:** Identify and write Test cases for Project3 and Project4.
10	**Class 10:** To develop SRS, Design Diagrams and Test Cases for sample projects for **School Bus Operation (Project5)**	
11	**Class 11**	**Continuation of Project5**
12	**Class 12:** To develop SRS, Design Diagrams and Test Cases for sample projects for **(Project6)**	**Clinic Management System (Project6)**
13	**Class 13:**	**Continuation of Project6**
14	**Class 14: Learning and Best Practices (of all the Project Classes conducted).**	

Project Description (Project5):

A New Branch School District operates a fleet of 40 buses that serve approximately 1,000 students in grades 1 to 12. The bus operation involves 30 regular routes, plus special routes for activities, athletic events, and summer sessions. The district employs 12 full time drivers and 25 to 30 part-time drivers. A dispatcher coordinates the staffing and routes and relays messages to drivers regarding students and parents who call about pickup and drop-off arrangements.
The System stores information like:

- Personal info of each student using the facility
- Information regarding each bus run by the school
- Personal info of Bus Employees
- Information like which bus is running on which route, which students are using the services of which bus. etc.

Project Description (Project6):

There is a Clinic Management system. An assistant of the doctor and the doctor himself uses the system. The system keeps information about all the patients visiting the clinic. Each patient is charged a fee of Rs 100 on his visit to the clinic. If the patient revisits the clinic within 5 days he is not charged any fees but after that he is charged again. The clinic also provides the facility of medicines which is optional for the patients to take. Each patient is provided with a prescription and receipt on his each visit. The system stores the following info:

- Personal data about each patient visiting the clinic.
- The different medicines available in the store with their manufacturing date and expiry date.
- Also information like the company which is manufacturing that medicine, etc
- Information like who are all the patients who have got treatment from that clinic and against what disease.

Text Books:

1. Software Engineering A practitioner's Approach, 8th edition, Roger S Pressman, Bruce R. Maxim. McGraw Hill Education, 2015.

Reference Books:

1. Software Engineering, Ian Somerville, 9th edition, Pearson education.
2. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007.

M20CA1070	DATA STRUCTURES LAB	L	T	P	C
Duration:14 Wks		0	0	2	2

Lab Experiments

PART-A

1. Develop a program to compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
2. Develop a program to find the reverse of a positive integer and check for palindrome or not. Display appropriate messages
3. An electricity board charges the following rates for the use of electricity: for the first 200 UNITs 80 paise per UNIT: for the next 100 UNITs 90 paise per UNIT: beyond 300 UNITs Rs 1 per UNIT. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs. 400, then an additional surcharge of 15% of total amount is charged. Write a program to read the name of the user, number of UNITs consumed and print out the charges.
4. Develop a program to insert and delete an element at desired position in an array
5. Develop a program to introduce 2D Array manipulation and implement Matrix multiplication and ensure the rules of multiplication are checked.
6. Write functions to implement string operations such as compare, concatenate, string length. Convince the parameter passing techniques.
7. Develop a program to swap two variable value using call by value and call by reference.
8. Implement recursive functions for Binary to Decimal Conversion
9. Implement structures to read, write and compute average marks and the students scoring above and below the average marks for a class of N students.
10. Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of n real numbers.

PART-B

1- Write a C Program to Implement the search techniques of
   a. Linear Search
   b. Binary Search
2- Develop a program to sort a list of N elements using Insertion Sort.
3- Develop a program to sort a list of N elements using quick sort
4- Develop a program using recursive function for the following:
   a. Calculate GCD and LCM of 3 integer numbers
   b. Solve Towers of Hanoi Problem
   c. Calculate the sum for a given number 'n' from 1 to n.

5- Develop a program to Simulate the working of STACK providing the following operations–Insert, Delete and Display.

6- Develop a program to convert infix arithmetic expression to post fix expression

7- Develop a program to Simulate the working of Circular Queue providing the following operations–Insert, Delete and Display.

8- Develop a program to Simulate the working of a linked list providing the following operations

 a. Insert at the beginning
 b. Insert at the end
 c. Delete at the beginning
 d. Delete at the end
 e. Display

9- Develop a program to Create a binary search tree and implement the tree traversal techniques of inorder, preorder and postorder.

M20CA1080		L	T	P	C
Duration:14 Wks	**RDBMS LAB**	**0**	**0**	**2**	**2**

LabExperiments

LISTING – I : Creation of tables:

Table Name: Client_master :

Description: Use to store information about clients.

Column Name	Data Type	Size	Attributes
Client_no	Varchar	6	Primary Key / First letter must start with 'C'.
Name	Varchar	20	Not Null
Address1	Varchar	30	
Address2	Varchar	30	
City	Varchar	1J	
State	Varchar	1J	
Pincode	Numeric	6	
Bal_due	Numeric	10,2	

Table Name :product_master

Description : Use to store information about products.

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Column Name	Data Type	Size	Attributes
Product_no	Varchar	6	Primary Key / first letter must start with 'P'
Description	Varchar	J	Not Null
Profit_percent	Numeric	J,2	Not Null
UNIT_measure	Varchar	10	Not Null
Qty_on_hand	Numeric	8	Not Null
Reorder_lvl	Numeric	8	Not Null
Sell_price	Numeric	8,2	Not Null, Cannot be 0.
Cost_price	Numeric	8,2	Not Null, Cannot be 0.

Table Name :salesman_master

Description : Use to store information about salesman working in the company

Column Name	Data Type	Size	Attributes
Salesman_no	Varchar	6	Primary Key / First letter must start with 'S'
Salesman_name	Varchar	20	Not Null
Address1	Varchar	30	Not Null
Address2	Varchar	30	
City	Varchar	20	
Pincode	Varchar	6	
State	Varchar	20	
Sal_amt	Numeric	8,2	Not Null, cannot be 0
Tgt_to_get	Numeric	6,2	Not Null, cannot be 0
Ytd_sales	Numeric	6,2	Not Null
Remarks	Varchar	60	

Table Name :sales_order

Description : Use to store information about order

Column Name	Data Type	Size	Attributes
S_order_no	Varchar	6	Primary Key / First letter must start with 'O'
S_order_date	Date		
Client_no	Varchar	6	Foreign Key references client_no of client_master table
Dely_addr	Varchar	2J	
Salesman_no	Varchar	6	Foreign Key references salesman_no of salesman_master table.
Dely_type	Char	1	Delivery : part (P) / full (F), Default 'F'
Billed_yn	Char	1	

Dely_date	Date		Cannot be less than s_order_date
Order_status	Varchar	10	Values('ln Process', 'Fulfilled', 'BackOrder','Canceled')

Table Name :sales_order_details

Description : Use to store information about products ordered.

Column Name	Data Type	Size	Attributes
S_order_no	Varchar	6	Primary Key / Foreign Key references s_order_no of sales_order table.
Product_no	Varchar	6	Primary Key / Foreign Key references product_no of product_master table.
Qty_ordered	Numeric	8	
Qty_disp	Numeric	8	
Product_rate	Numeric	10,2	

Table Name : Challan_Header

Description : Use to store information about challans made for the order.

Column Name	Data Type	Size	Attributes
Challan_no	Varchar	6	Primary Key / first two letters must start with 'CH'.
S_order_no	Varchar	6	Foreign key references s_order_no of sales_order table.
Challan_date	Date		Not Null
Billed_yn	Char	1	Values('Y','N'), Default 'N'.

LISTING - II :lnsertion of values

1. **Data for client_mastr table:**

Client_no	Name	City	Pincode	State	Baldue
C00001	lvanBayross	Bombay	4000J4	Maharashtra	1J000
C00002	VandanaSaitwal	Madras	780001	Tamil Nadu	0
C00003	PramadaJaguste	Bombay	4000J7	Maharashtra	J000
C00004	BasuNavindgi	Bombay	4000J6	Maharashtra	0
C0000J	Ravi Sreedharan	Delhi	100001		2000
C00006	Rukmini	Bombay	4000J0	Maharashtra	0

2. **Data for Product_master table:**

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Product_no	Description	Profit Percent	UOM	Qtyonhand	Reorderlvl	Sellprice	Costprice
P00001	1.44 Floppies	J	Piece	100	20	J2J	J00
P034J3	Monitors	6	Piece	10	3	12000	11280
P06734	Mouse	J	Piece	20	J	10J0	1000
P0786J	1.22 Floppies	J	Piece	100	20	J2J	J00
P07868	Keyboards	2	Piece	10	3	31J0	30J0
P0788J	CD Drive	2.J	Piece	10	3	J2J0	J100
P0796J	J40 HDD	4	Piece	10	3	8400	8000
P0797J	1.44 Drive	J	Piece	10	3	10J0	1000
P0886J	1.22 Drive	J	Piece	2	3	10J0	1000

3. **Data for Salesman_master table:**

Salesman No	Salesman Name	Add1	Add2	City	Pincode	State	Sal Amt	Tgt_to Get	YtdSales	Remarks
S00001	Kiran	A/14	Worli	Bombay	400002	MAH	3000	100	J0	Good
S00002	Manish	6J	Nariman	Bombay	400001	MAH	3000	200	100	Good
S00003	Ravi	P-7	Bandra	Bombay	400032	MAH	3000	200	100	Good
S00004	Ashish	A/J	Juhu	Bombay	400044	MAH	3000	200	1J0	Good

4. Data for sales_order table:

S_order_no	Sorderdate	Clientno	Dely Type	Bill YN	Salesman No	Delydate	Order Status
O19001	12-jan-96	C00001	F	N	S00001	20-jan-96	lP
O19002	2J-jan-96	C00002	P	N	S00002	27-jan-96	C
O4686J	18-feb-96	C00003	F	Y	S00003	20-feb-96	F
O19003	03-apr-96	C00001	F	Y	S00001	07-apr-96	F
O46866	20-may-96	C00004	P	N	S00002	22-may-96	C
O10008	24-may-96	C0000J	F	N	S00004	26-may-96	lP

5..Data for sales_order_details table :

S_order_no	Productno	Qtyordered	Qtydisp	Productrate
O19001	P00001	4	4	J2J
O19001	P0796J	2	1	8400
O19001	P0788J	2	1	J2J0
O19002	P00001	10	0	J2J
O4686J	P07868	3	3	31J0
O4686J	P0788J	3	1	J2J0
O4686J	P00001	10	10	J2J
O4686J	P034J3	4	4	10J0
O19003	P034J3	2	2	10J0
O19003	P06734	1	1	12000
O46866	P0796J	1	0	8400
O46866	P0797J	1	0	10J0
O10008	P00001	10	J	J2J
O10008	P0797J	J	3	10J0

6. **Dataforchallan_headertable:**

Challan_no	Sorderno	Challandate	Billed
CH9001	O19001	12-dec-9J	Y
CH686J	O4686J	12-nov-9J	Y
CH396J	O10008	12-oct-9J	Y

7. **Data for challan_details table:**

Challan_no	Productno	Qtydisp
CH9001	P00001	4
CH9001	P0796J	1
CH9001	P0788J	1
CH686J	P07868	3
CH686J	P034J3	4
CH686J	P00001	10
CH396J	P00001	J
CH396J	P0797J	2

LISTING – III : SINGLE TABLE RETRIEVAL

1) Find out the names of all clients.

2) print the entire client_master table.

3) Retrieve the list of names and the cities of all the clients.

4) List the various products available from the product_master.

5) Find the name of all clients having 'a' as the second letter in their names.

6) Find out the clients who stay in city whose second letter is 'a' .

7) Find the list of all clients who stay in bombay or city delhi or city madras.

8) List all the clients who are located in 'Bombay'.

9) Print the list of clients whose bal_due are greater than value 10000

10) Print the information from sales_order table of order placed in month of january.

11) Display order information for client_no 'c00001' and 'c00002' ;

12) Find the products with description as '1.44 drive' and '1.22 drive' .

14) Find the product whose selling price is more than 1500 and also find the new selling price as original price * 15

15) Rename the new in the above query as new_price

16) Find the product whose cost price is less than 1500

17) List the product in sorted order of their description

18) Calculate the square root of price of each product.

19) Divide the cost of product '540 HDD' by difference between its price and 100.

20) List the names,city,state of clients not in the state of 'Maharashtra' .

21) List the product_no,description,sell_price of products whose description begin with letter 'M' .

22) List of all orders that were canceled in month of March.

LISTING – IV : TABLE UPDATIONS

1)Change the s_order_date of cllient_no'C00001' to 24/07/96

2)Change the selling price of '1.44 Drive' to Rs. 1150.00

3) Delete the record with order no 'O19001' from the order table

4) Delete all the records having delivery date before 10-jul-96

5)Change the city of client_no 'C00005' to 'Bombay'

6) Change the delivery date of order no 'O10008' to 16-08-96

7) Change the bal_due of client_no 'C00001' to 1000

8) Change the cost price of '1.22 Floppy Drive' to Rs.950.00

LISTING – V : SET FUNCTIONS AND CONCATENATION

1)Count the total no. of orders.

2)Calculate the average price of all the products.

3)Calculate the minimum price of product

4)Determine the maximum and minimum product price.Rename the title as max_price and min_price respectively.

5)Count the number of product having price greater than or equal to 1500.

6)Find all products whose qty_on_hand is less than recorder level.

7)Print the information of client_master,product_master,sales_order table in the following format for all the record.{cust_name}has placed order {order_no}on {s_order_date}.

LISTING – VI : JOINS AND CORRELATION

1) Find out the product which has been sold to 'ivanbayroos'.

2) Find out the product and their quantities that will have to delivered in the current month.

3) Find the product_no and description of moving products.

4) Find the names of the clients who have purchased 'CD Drive'.

5) List the product_no and s_order_no of customers having qty_ordered less than 5 from the order detail Table for the product '1.44 Floppies'.

6) Find the products and their quantities for the orders placed by 'VandanaSaitwal' and 'Ivan Bayross'.

7) Find the products and their quantities for the orders placed by client_no'C00001' and 'C00002'.

LISTING – VII : NESTED SUBQUERIES

1) Find the product_no and description of non-moving products(eg.products not being sold).

2)Find the customers name,address1,address2,city and pincode for the client who has placed order no   "O19001'.

3) Find the client name who have placed order before the month of may,96.

4)Find out if product "1.44 Drive" is ordered by any client and print client_no name to whom it was sold.

5) Find the name of clients who have placed ordered worth RS. 10000 or more.

LISTING – VIII : PL/SQL

1. Write a PL/SQL to update the rate field by 20% more than the current rate in inventory table which has the following fields: Prono, ProName and Rate. After updating the table a new field (Alter) called for Number of item and place for values for the new field without using PL/SQL block.

2. Write a PL/SQL to split the student table into two tables based on result (One table for ―Pass‖ and another for ―Fail‖). Use cursor for handling records of student table. Assume necessary fields and create a student details table.

LISTING – IX : PL/SQL

1. Create a database trigger to implement on master and transaction tables which are based on inventory management system for checking data validity. Assume the necessary fields for both tables.

2. Write a PL/SQL to raise the following Exception in Bank Account Management table when deposit amount is zero.

SECOND SEMESTER

M20CA2010	Data Mining and Knowledge Discovery	L	T	P	C
Duration: 14 Weeks		4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

Data Mining studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. It is currently regarded as the key element of a more general process called Knowledge Discovery that deals with extracting useful knowledge from raw data. The knowledge discovery process includes data selection, cleaning, coding, using different statistical and machine learning techniques, and visualization of the generated structures. The course will cover all these issues and will illustrate the whole process by examples. Special emphasis will be given to the Machine Learning methods as they provide the real knowledge discovery tools.

Prerequisites:

The skills set required for data mining are basic knowledge database and Data Warehousing concepts.

Course Objectives:

The objectives of this course are to:

- Understand and apply the data mining techniques on various datasets.
- Develop the Multidimensional model and evaluate its performance
- Analyse and interpret the results of various mining techniques by applying in real time complex datasets.
- Apply and Integrate datamining techniques in various broad areas of research innovatively.

Course Outcomes:

On successful completion of this course; the student will be able to:

1. Compare various conceptions of data mining as evidenced in both research and application.
2. Characterize the various kinds of patterns that can be discovered by association rule mining.
3. Evaluate mathematical methods underlying the effective application of data mining.

Course Contents:

UNIT I [13 Hours]

Introduction to Data mining, Getting to Know about the Data. **Data Pre-processing:** An Overview , Data Cleaning , Data Integration , Data Reduction , Data Transformation and Discretization.

UNIT II [13 Hours]

Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule Based Classification, Techniques to Improve Classification Accuracy. Advanced Methods: Classification by Back Propagation , Support Vector Machines , K- NN Classifiers.

UNIT III [13 Hours]

Cluster Analysis : Basic Concepts and Methods: Cluster Analysis , Partitioning Methods , Hierarchical methods , Density-Based Methods, Grid-Based Methods. **Advanced Cluster Analysis:** Probabilistic Model-Based Clustering, Clustering High, Dimensional Data , Clustering with Constraints, Outlier Analysis.

UNIT IV [13 Hours]

Basic Concepts and algorithms : Problem Definition, Frequent Itemset Generation, Rule Generation , Compact representation of Frequent itemsets , Alternative methods for generating Frequent Itemsets , FP- growth Algorithm , Evaluation of Association Patterns.

Text Book:
1. Jiawei Han and Micheline Kamber, "Data Mining - Concepts and Techniques", Third Edition, Elsevier, 2012.(UNIT I, II & III)
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison Wesley, 2006.(UNIT IV)

Reference Books:
1. Daniel. T. Larose Knowledge discovery, An Introduction to Data Mining, Wiley Publishers, 2014
2. Margaret H.Dunham, "Data mining introductory and advanced topics", Pearson education, 2003.
3. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

M20CA2020		L	T	P	C
Duration: 14 Weeks	**Object Oriented Programmimg Using Java**	4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

Java is a general-purpose programming language that is Robust, Platform Independent, compiled and interpreted. It is intended to let application developers "Write Once Run Anywhere", meaning that compiled Java code can run on all platforms that support Java without the need for recompilation. Java applications are typically compiled to "Bytecode" that can run on any JVM regardless of the Computer Architecture.

Prerequisites:

To learn Java, you must have a basic understanding of the C/C++ programming language.

Course Objectives:

- The objectives of this course are to:

- Understand fundamentals of object-oriented programming in Java, including defining Classes, invoking methods, using class libraries, exception handling etc.
- Understand the fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
- Develop simple Java programs, debug and execute using Java SDK environment
- Develop object oriented Applications using packages, interfaces, threads with Exception handling mechanism.

Course Outcomes:

- On successful completion of this course; the student will be able to:

- Learn Fundamentals to Design and Develop Java Application for real Life problems
- Apply the fundamentals to Effectively create and use objects from predefined class libraries
- Analyse the problem and solve Using interfaces, inheritance, and polymorphism as programming techniques.
- Design and formulate the problems using multithreading and evaluate the problem using exceptions.

Course Contents:

UNIT I   [13 Hours]
Introduction to OOPS & JAVA Programming: Fundamentals of object –oriented programming: Introduction, Object_oriented Paradigm, Basic concepts of Object-oriented

programming: objects & classes, Data Abstraction & Encapsulation, Inheritance, Polymorphism, Dynamic Binding , Message communication. Benefits & Applications of OOP. **Java Evolution:** Java History, Java Features, How Java Differs from C & C++?, Java Environment.

UNIT II [13 Hours]
Types, Arrays, Control Statements, String , Classes & Objects: Data Types, Variables & Arrays, Operators, Control Statements. **String Handling:** The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Modifying a String, StringBuffer. **Classes, Objects and Methods:** Introduction, Defining a class, Declaration of Fields & methods, Creating Objects, Accessing the class members, Constructors, Methods Overloading, Static members, Nesting of methods.

UNIT III [13 Hours]
Inheritance, Packages & Interfaces, Exception Handling: Inheritance, Final Variable and Methods, Final Classes, Finalizer Methods, method overriding, Abstract Methods and Classes, visibility control. **Packages and Interfaces:** Packages – importing packages – interfaces.

UNIT IV [13 Hours]
 Exception Handling , Multithreading And Applets: Handling: Fundamentals – types – Uncaught Exceptions – Using try and catch – throw-throws-finally –Builtin Exceptions – User defined Exceptions. Multithreaded Programming: The Java Thread model, Thread priorities, Thread class anad Runnable Interface, main Thread, Creating a Thread,& Multiple Threads, Extending a Thread, Using isAlive() and join(),suspend(), resume(), stop() – Synchronization, InterThread Communication. Applet Class: Applet Basics- Applet Initialization and Termination Display methods - A Simple Banner Applet.

Text Book:
1. Herbert Schildt, Java 2: The Complete Reference. 5th Edition, McGraw-Hill Education Group.(Chapter 3,4,5,9,10, 11, 13 & 19)
2. E. Balagurusamy, Programming with Java – A Primer 3rd Edition, McGraw-Hill companies.(Chapter 1,2, & 8)

Reference Book:
1. Herbert Schildt, Dale Skrien, "Java Fundamentals, A comprehensive Introduction" - Tata McGraw Hill Edition 2013.
2. Deitel and Deitel, "Java How to Program", 9th Edition, PHI publisher,2013.
3. Herbert Schildt, "Java™: The Complete Reference, 2014", 9th Edition, Oracle Press.
4. Aaron Walsh and John Fronckowick, "Java Bible, Programming Version 2", IDG Books Worldwide, Inc. 2000.

M20CA2030	**Computer Networks**	**L**	**T**	**P**	**C**
Duration: 14 Weeks		**3**	**0**	**1**	**4**

Course Description: (3-4 lines-course aim and summary be added)

This course is designed to provide a full overview of computer networking. We'll cover everything from the fundamentals of modern networking technologies and protocols. The course focus on be computer networks in terms of a five-layer model, standard protocols involved with TCP/IP communications, powerful network troubleshooting tools and techniques and network services like DNS and DHCP that help make computer networks run.

Prerequisites:

Before starting this course, the learner should have elementary knowledge of basic search algorithms and a working knowledge of Linux and virtual machines is recommended.

Course Objectives:

The objectives of this course are to:

- The subject will introduce the basics of computer networks to students through a study of layered models of computer networks and applications.
- To analyze the functions and design strategies of various layers.
- To understand network architectures and components required for data communication.
- To understand networking concepts and basic communication model.
- To gain knowledge of various application protocols standard developed for internet Layer

Course Outcomes:

On successful completion of this course; the student will be able to:

- Identify the components required to build different types of networks.

- Estimate the functionalities needed for data communication into layers.

- Understand the working principles of various application protocols.

- Identify the security issues and services available.

Course Contents:

UNIT I   **[13 Hours]**
Introduction to Data communication & Network Models: Introduction to Data communication and Reference Model: Data communication, Network Criteria, Physical topology, Transmission technology: broadcast link, point-point link; Network Models: PAN, LAN, MAN,WAN; Internetwork; Network software, Uses of computer Network
Reference Models: Network architecture, OSI reference Model, TCP/IP model, Addressing, Protocols and Standards.

UNIT II   **[13 Hours]**
Physical Layer: Analog & digital signals, Transmission impairment, Performance, Data transmission: serial transmission, parallel transmission; Transmission media: guided and unguided media; Data interface types, Band utilization- multiplexing; Switching techniques.

UNIT III   **[13 Hours]**
Data Link Layer : Data link layer design issues; Framing, Flow control and Error control; Error detection & correction: Parity, Checksum, CRC, Hamming code; Data link-layer Protocols: Stop-and-wait, Stop-and-wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ.
Multiple access control: Random access, Controlled access, Channelization.

UNIT IV   **[13 Hours]**
Network & Transport Layer : Network Layer: Network Design issues, Forwarding and Routing, Routing Algorithm types, Static & Dynamic routing algorithm-distance vector, link - state, IP protocol, ARP.
Congestion Control: Congestion, Approaches to congestion control, Traffic shaping as QoS: Leaky and token bucket algorithm.
Transport Layer: The transport service, process-to-process delivery, TCP, UDP –features, services.

Text Books:
1. Data communications and Networking by Berhrouz A Forouzan , 4th edition, McGraw-Hill Publication [Chapters: 1,23]
2. Computer Networks by Andrew S. Tanenbaum , 5th edition, Pearson Publication, .[Chapters: 1,2,3,4]
3. A guide to designing & Implementing Local and wide area network by Michael Paimer, Robert Bruce Sinclair, Thomson Publication. [Chapters: 3, 4, 5]

Reference Books:
1. Data and Computer Communications by William Stalling, Pearson Publication
2. W. Tomasi: Introduction to Data Communications and Networking, Pearson Education.
3. P.C. Gupta: Data Communications and Computer Networks, Prentice-Hall of India.

COMPUTER NETWORKS LAB

PART – A [PROGRAMS USING PACKET TRACER]

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Study of basic network command and Network configuration commands using command prompt and packet tracer.
3. Connect the computer in local area network.
4. Set upNetwork topology using packet tracer software.

PART –B [PROGRAMS USING NS2]

1. Create a Simple Star Topological LAN in windows and provide provision for sharing the files using NS2
2. By using NS2 simulator setup a star topology with 7 nodes (n1 to n7) with n1 as source and n7 as destination n1 should be connected to router n2 and n7 is connected to network router n6 except n1 and n7 all reaming nodes are connected to n4.
3. Set up network using NS2 with source n1 connected to n4 through n2 and n3. Create an application with TCP as transport layer and calculate amount of time spent in retransmissions.
4. Create a network as like program 3 and measure number of pocket dropped at n4 because of congestion.
5. Capture the traffic of your LAN and identify the IP Address of your default router

PART - C

1. Create a messenger application by using the socket programming which should establish communication between two systems
   OR
2. Create a FTP application to transfer the file from one application to other application in different system

M20CA2040	Python Programming	L	T	P	C
Duration: 14 Weeks		4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

This course is an introduction to the Python programming language for students without prior programming experience. We cover data types, control flow, object-oriented programming, and graphical user interface-driven applications. The examples and problems used in this course are drawn from diverse areas such as text processing, simple graphics creation and image manipulation, HTML and web programming, and genomics.

Prerequisites:

To get started with Python Programming You should have a basic knowledge of programming concepts and Computer Programming terminologies.

Course Objectives:

The objectives of this course are to:

- Introduce the concepts of OOPs in Python programming.
- Illustrate the usage of control structures with basic and advanced data types
- Demonstrate the need of python functions & Exception handling
- Discuss the file handling mechanism with file I/O operations.

Course Outcomes:

On successful completion of this course; the student will be able to:

- Understand the OOPs programming paradigm in Python.
- Apply the various data types and control structures in programming.
- Implement functions to build real time applications.
- Handle file techniques along with exception handling mechanism.

Course Contents:

UNIT I [13 Hours]
Introduction to Python: Getting started: Introducing python, setting up python on windows and other operating systems, introducing IDLE **Py Ingredients: Numbers, Strings, and Variables:** Variables, Names and Objects, Numbers, Strings.

UNIT II [13 Hours]

Advanced Data Structures & Control structures: Py Filling: Lists, Tuples, Dictionaries, and Sets: Lists and Tuples, Lists, Tuples , Dictionaries, Sets, Compare Data Structures. **Py Crust: Code Structures:** Comment with #, Continue Lines with \ , Compare with if, elif, and else, Repeat with while, Iterate with for.

UNIT III [13 Hours]

Functions & Exception Handling: Functions: Positional Arguments, Keyword Arguments , Specify Default Parameter Values, Gather Positional Arguments with *, Gather Keyword Arguments with ** , Docstrings , Inner Functions, Anonymous Functions: the lambda() Function. Generators, Decorators, Namespaces and Scope, Uses of _ and __ in Names , Handle Errors with try and except, Make Your Own Exceptions.

UNIT IV [13 Hours]

OOPs concepts & Files: Oh Oh: Objects and Classes: What Are Objects?, Define a Class with class, Inheritance, Override a Method, Add a Method, Get Help from Your Parent with super, Get and Set Attribute Values with Properties, Duck typing , Special Methods, Composition. **Data Has to Go Somewhere:** File Input/Output, Write a Text File with write(), Read a Text File with read(), readline(), or readlines(), Write a Binary File with write(), Read a Binary File with read(), Close Files Automatically by Using with, Change Position with seek().

Text Books:
1. Bill Lubanovic , Introducing Python :Modern Computing in Simple Packages , O'reilly Publishers, 2015.
2. Python Programming for absolute beginners by Michael Dawson, Course Technology-A part of CENGAGE Learning, 3rd Edition

References books:
1. Python Programming, Michael Dawson, 3rd Edition, Course technology PTR, 2010.
2. Robert Galanakis, Practical Maya Programming With Python, Shroff Publishers & Distributors, 2014.
3. Mark Lutz , Python Programming, Shroff Publishers & Distributors, 2011

M20CA2051	Advanced Web Technologies	L	T	P	C
Duration: 14 Weeks		**3**	**0**	**1**	**4**

Course Description: (3-4 lines-course aim and summary be added)

The Advanced Web Technologies pathway is centered on a core theme of the same name, Advanced Web Technologies, and combines it with a choice of closely related yet complimentary themes, including Software Engineering 1 & 2, Making Sense of Complex Data, and Learning from Data. Students following this theme will gain an understanding and insight into the technologies that deliver the Web as we see it today. The topics covered include underlying languages and standards used to represent information on the web; techniques for understanding and managing data and information in a web context; and techniques and technology used to design and deliver web infrastructure.

Prerequisites:

To get started with Advanced Web Technology you should have the basic knowledge of Web technologies such as HTML, CSS, and JavaScript.

Course Objectives:

The objectives of this course are to:

- Understand various forms of data representation and structures supported by the Perl language.
- Discuss the perl scripting and concepts of server programming by using PHP
- Differentiate use of AJAX objects over normal HTML objects
- Review the need of AngularJS

Course Outcomes:

On successful completion of this course; the student will be able to:

- Design server webpage by using perl scripting
- Describe a server side webpage by using PHP
- Apply AJAX objects over normal HTML objects
- Develop a server side scripting by using SOAP architecture , Construct Angular views and templates by implementing built-in directive.

Course Contents:

UNIT I [13 Hours]

Programming in Perl: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output, Examples. CGI Scripting, Developing CGI Applications, Processing CGI, CGI.pm, CGI.pm methods, An Example, Adding Robustness, Carp, Cookies.

UNIT II [13 Hours]

Programming in PHP : Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Building Web applications with PHP Tracking users, cookies, sessions, Using Databases, Handling XML.

UNIT III [13 Hours]

Introduction to RUBY: Origins and uses of Ruby ,Scalar types and their operations ,Simple input and output, Control statements, Arrays, Hashes ,Methods, Classes, Code blocks and iterators ,Pattern matching ,Overview of Rails ,Document requests, processing forms , Rails applications with Databases, Layouts.

UNIT IV [13 Hours]

Introduction to Ajax & Angular JS : Web Services: Web 2.0 and 3.0, Software as a Service (SaaS) ,Rich user experience, Social Networking .SOAP ,RPC style SOAP , Document style SOAP ,WSDL ,REST services, JSON format ,

Introduction, Client – Side Templates, Model View Controller (MVC), Data Binding, Dependency Injection, Directives, Data Binding, Organizing Dependencies with Modules, Formatting Data with Filters.

Text Books:
   1. Brad Green &ShyamSeshadri: AnhularJS, O'ReillyPublications, 2015.[Chapter 1 &2]
   2. Robert W. Sebesta: Programming the World Wide Web, 4th & 7thedition Pearson Education,
    2009. [Chapter 8 & 11 - 4th edition, 10 & 14 – 7th edition]
   3. Chris Bates: Web Programming Building Internet Applications 3rd edition Willey india, 2006.
    [Chapter 10, 13]

Reference Books:
   1. Professional AJAX 2nd Edition, Nicholas C Zakas et al, Wrox publications, 2007.
   2. SOA: Concepts, Technology and Design – Thomas Erl, Pearson, 2005.
   3. P.J. DEITEL & H.M.DEITEL: Internet &World Wide Web How to Program, 4th edition.
   ADVANCED WEB PROGRAMMING LAB

1. Write a Perl program to display various Server Information like Server Name, Server Software, Server protocol, CGI Revision etc.
2. Write a Perl program to accept UNIX command from a HTML form and to display the output of the command executed.
3. Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.
4. Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
5. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.
6. Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date-time on the web page upon reopening of the same page.
7. Using PHP and MySQL develop a program to accept book information viz. Accession number, title, Authors, Edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.
8. Create a registration form using PHP which contains name, email, and contact no, address and gender, display the details in other server page when user clicks the submit button.

M20CA2052		L	T	P	C
Duration: 14 Weeks	**Advanced Database Systems**	**3**	**0**	**1**	**4**

Course Description: (3-4 lines-course aim and summary be added)

Databases underlie most complex computing systems. There has been rapid growth and development in the field of relational database management systems. This course will address the advanced issues in modern database systems and applications.

Increasingly, software systems that involve databases are heterogeneous. Traditionally, such systems are made to function in an unprincipled manner. This is because the simple approaches designed for small, centralized, homogeneous databases are ineffective and inappropriate for dealing with large, distributed, heterogeneous environments. However, the past few years have seen significant advances in techniques for operating and maintaining heterogeneous database systems. Consequently, expectations are rising in industry.

Prerequisites:

Before starting this course one should have a basic understanding of Database Management System.

Course Objectives:

The objectives of this course are to:

- learn the modeling and design of databases
- acquire knowledge on parallel and distributed databases and its applications
- study the usage and applications of Object Oriented database
- understand the usage of advanced data models
- acquire inquisitive attitude towards research topics in databases
-

Course Outcomes:

On successful completion of this course; the student will be able to:

- Justify the need of indexing techniques to retrieve the data from different sources
- Analyze the plans to optimize the relational query evaluation
- Relate the different tuning techniques to increase the performance for a relational data model
- Model and represent the real-world data using emerging technologies

Course Contents:

UNIT I [13 Hours]
Overview of Storage and Indexing : Memory hierarchy: RAID; Disk space management; Buffer manager: Files of records; Page formats and record format, Structured Indexing,, Data on external storage; File organizations and Indexing, Index data structures; Comparison of file organizations; Indexes and performance tuning. Intuition for tree indexes; Indexed sequential access method; B+trees , Hash-Based Indexing.

UNIT II [13 Hours]
Overview of Query Evaluation, External Sorting and Relational Query Optimizer : The system catalog, Introduction to operator evaluation; Algorithm for relational operations; Introduction to query optimization; When does a DBMS sort data? A simple two-way merge sort; External merge sort, Evaluating Relational Operators The Selection operation; General selection conditions; The Projection operation; The Join operation; The Set operations; Aggregate operations; The impact of buffering.

UNIT III [13 Hours]

Concurrency Control : Serializability and Transaction processing: Enforcing, Serializability by Locks, Locking Systems With Several, Lock Modes, Architecture for a Locking Scheduler Managing. **Transaction processing**: Introduction of transaction processing, advantages and disadvantages of transaction processing system, online transaction processing system, resolving deadlock, Transaction management in multi-database system, long duration transaction, high-performance transaction system.

UNIT IV [13 Hours]

Parallel and Distributed Databases and XML data : Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations; Parallel query optimizations; Introduction to distributed databases; Distributed DBMS architectures; Storing data in a Distributed DBMS;
Information retrival and XML data: Colliding Worlds: Databases, IR, and XML, Introduction to Information Retrieval, Indexing for Text Search, Web Search Engines, Managing Text in a DBMS, A Data Model for XML, XQuery: Querying XML Data.

Text Books:
1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003[Chapters:8,9,10,11,12,13,14,22,23,27,29]

Reference Books:
1. Michael Rosenblum and Dr. Paul Dorsey," PL/SQL FOR DUMMIES",WILLEY Publications 2006
2. Elmasri and Navathe: Fundamentals of Database Systems,5th Edition, Pearson Education, 2007.
3. Conolly and Begg: Database Systems, 4th Edition, Pearson Education, 2002.
   Steven Feuerstein,"oracle PL/SQL Programming",OREILLY publications, Sixth edition 2014

ADBMS LAB

1. Design a PL/SQL program to work with implicit cursors
2. Design a PL/SQL program to work with Explicit Cursors
3. Design a PL/SQL program to demonstrate triggers
4. Design a PL/SQL program to illustrate working of functions
5. Design a PL/SQL program to demonstrate packages

M20CA2053		L	T	P	C
Duration: 14 Weeks	**.Net Framework and Applications**	**3**	**0**	**1**	**4**

Course Description: (3-4 lines-course aim and summary be added)

The goal of this course is to introduce the students to the basics of distributed application development. We will introduce the students to Web Service development and .NET remoting. Technologies covered include the Common Language Runtime (CLR), .NET framework classes, C#, ASP.NET, and ADO.NET. We will also cover service-oriented architecture, design, performance, security, content managements systems and deployment issues encountered in building multi-tier distributed applications.

Prerequisites:

The prerequisites for understanding .Net Frameworkand Applications are C, C++ and VB.

Course Objectives:

The objectives of this course are to:

- The course primarily focuses on using platform and components of platform.
- Gain knowledge and write programs in C# programming language which is second pillar towards application development.
- To understand and follow best practices to connect front end and back end using ADO.Net, which is third pillar.
- To design and develop user interface and functionality respectively for windows application.
- To design and develop web application using C# language and ASP.Net.

Course Outcomes:

On successful completion of this course; the student will be able to:

- Problem solving skills -to analyze real life problem and develop an algorithm to solve it.
- Utilize the .Net Framework to build distributed enterprise Applications
- Develop and design establish connection between front end to to back end using Tools
- Design user interface and develop functionality for windows and web application.
-

Course Contents:

UNIT I [13 Hours]

NET Framework 4.0 : Introduction to the .NET Platform, Introduction to Visual Studio; .NET Architecture: CLR, FCL, CTS, CLS; Compilation Process**;** Assemblies Shared assemblies and GAC; .Net Framework Design Principles; Developing and Deploying of application (monolithic or component-based application).

Introduction to C# Language: Data Type: Reference Type and Value type; Memory: Stack and Heap Memory, Variables and Constants & its scope, Program structure, Command line arguments, Boxing and Unboxing, Conversion: Implicit and Explicit Casting, Operators, Control statements, Arrays and Strings, OOPS concept: Class, Object, Class members, types of Classes.

UNIT II [13 Hours]

C# programming Features : Encapsulation, Inheritance, Polymorphism- Method overloading, Operator overloading, Method overriding; Interfaces- implicit interface, explicit interface; Properties, Indexers (custom indexers), Collections, Exception Handling, Garbage Collection, Delegates and Events.

UNIT III [13 Hours]

Windows Programming &ADO.NET : Windows Programming: Introduction to Windows Forms, Hello World! Program, Handling Events on Tools (buttons, Textboxes, Radio buttons, combo boxes, Grid and List Views, Date Picker, List box).

ADO.NET: ADO.Net Architecture, Connected and Disconnected Data model, Database connection using ADO.Net, CURD operation- inserting, deleting and updating Database.

UNIT IV [13 Hours]

Web Applications Using ASP.NET : Web Application, Websites, Structure of an ASP.Net Website, The Asp.Net Life, Internet Information Services (web server), Asp.Net Coding Models, Asp.net Web Page Syntax, State Management, SPA vs MPA, Developing and Deploying your website.

Text Books:
1. C# 2008 /2010 Programming Black Book, Platinum Edition, Kogent Solutions Inc. (for UNIT 1 & UNIT 4)
2. The Complete Reference C# 4.0 by Herbert Schildt , 1st edition, McGrawHill publication (For Introduction to C# language and UNIT 2)
3. Ado.Net The Complete Reference by (English, Paperback, Michael Otey), 1st edition, Mc Graw Hill publication (for UNIT 3)
4. Beginning ASP.NET 4: in C# and VB by Imar Spaanjaars , Wiley publications , March 2010 (for UNIT 4)

Reference Books:

1. The Book of Visual Studio .NET—A Guide for Developers by Robert B. Dunaway, No Starch Press, 2002(for Introduction to .Net .
2. Programming Microsoft Windows with C# by Charles Petzold , Microsoft Press publication, 2002 (for UNIT 3)
3. Windows Forms Programming using C#, A practical guide to windows application development in .NET
4. Microsoft Ado.Net 4 Step by Step by – Tim Patrick, 2014
5. Build Your Own Web Site The Right Way Using HTML & CSS, by Ian Lloyd
6. Professional JavaScript for Web Developers – by Nicholas C. Zakas

Website:
1. Platform).https://doc.lagout.org/Others/No%20Starch%20Press%20%20The%20Book%20of%20Visual%20Studio.NET.pdf

.NET LAB PROGRAMS

1. Design and develop a C# program following constrains
   - Room class with 1 abstract method and 1 Virtual Method in it
   - Class-Room and Lab classes should inherit Room Class
   - Class-Room should override both abstract and virtual method from Room Class
   - Lab class Should override only abstract class
   - Display proper messages in the main class

2. Design and develop a C# program which should create a class 'Arithmetic Operations' which should have methods sum, sub, mul and div with two integer arguments and no return type. Access these methods by creating delegate. Perform all this operations on the same input and display the results.

3. Design and develop a C# program which creates an event named file created. This event should fire as soon as a file is created. Inside the event handling method open the file in write mode and insert a text "DATA INSERTED SUCCESSFULLY" in to the file. Display the content in the main function.

4. Design and develop a C# Program which should create a table in SQL SERVER database and insert some content in to that table and display that content in the console.

5. Design and develop a windows form for student and accept his

usn(in Text box, should have 10 characters only),

name(in textbox, should not have numbers in it),

address(in multiline textbox) ,

Course(in combo box),

Sem(in combo box with 1 to 6 sems)

Section(in combo box with minimum three sections for each course) ,

Year of Joing(in combo box with years staring from 2007 to till year should increase the year based on current year)

Accept these details with proper validation and insert them in SQL SERVER database.

M20CA2054	**Advanced Linux Programming**	L	T	P	C
Duration: 14 Weeks		3	0	1	4

Course Description: (3-4 lines-course aim and summary be added)

This course will provide the prospective student with the fundamentals, tools, techniques and use case examples to configure, manage and troubleshoot Linux in a networking context. You will work with tools like nc, ss, tcpdump, wireshark and more to develop the experience to understand networking protocols, addressing, routing, and subnetting. By the end of this course, the student will feel comfortable in working with a large variety of networking tools and configurations to manage complex Linux networking implementations.

Prerequisites:

To get started with Advanced Linux Programming student's shoud have basic knowledge of C Programming, Basics of OS and UNIX.

Course Objectives:

The objectives of this course are to:

- Introduce the student to Unix/Linux Kernel programming techniques
- Teach advanced C systems programming and debugging techniques in a Unix/Linux environment.
- Review basic concepts covered in the core Operating Systems course prerequisite as they are realized in the Linux platform.
- Discuss correct synchronization techniques for both application programs and kernel code running on Unix process as well as multiprocessor platforms.
- Review basic concepts covered in the core Operating systems course

Course Outcomes:

On successful completion of this course; the student will be able to:

- Describe the LINUX Operating Systems features.
- Discuss the fundamental LINUX system tools and utilities
- Write shell scripts in order to perform basic shell programming
- Describe the LINUX file systems
- Describe the directory layout of a typical Linux system, and maintain and secure Linux directories and files
- Use basic Linux commands.
- Use Linux pipes and file redirection efficiently to manipulate data.

Course Contents:

UNIT I [13 Hours]

Linux Operating System : Overview: Linux history, Linux features, distributions, Operating Systems and Linux, difference between Linux and Unix ,Linux software , Documentation .**Getting Started** : Install Issues ,Accessing Linux System , Start up scripts, Linux Security, Command line Interface, Process utilities ,Disk Utilities ,File System Management RAID and LVM, Kernal Administrations.

UNIT II [13 Hours]

Linux Files, Directories and Archives : Linux Files, File Structure, Types File and directory management commands, Archiving and Compressing Files , system calls , The shell History ,Features ,Types of Shells, test command, debugging shell script ,here document ,Shell meta character ,File name substitutions shell variable , command substitutions.

UNIT III [13 Hours]

The Process : Process basic , Ps, Internal and External Commands , running jobs in background ,nice ,at and batch ,cron, time commands File name Extension ,Standard Input/ Output and Redirection ,pipes : Pipes, FIFOs,looping structure arithmetic in shell, shell script examples, Filters- Simple filter : pr, head, tail, cut, paste ,sort ,uniq ,tr commands The grep family, advanced filters-sed and awk.

UNIT IV [13 Hours]

System Administration: File permissions, File ownership, links-soft links and hard links , root, administrator's privileges ,startup and shutdown ,Managing disk space ,GNOME Interface ,GNOME Desktop ,KDE Desktop.

Text Books:

1. Richard Petersen "The Complete Reference Linux ", sixth Edition Petersen TATA McGraw HILL [Chapter 1,2,3,4,5]

2. Sumitabha Das, "Unix Concepts and Applications", TMH, 4th Ed., 2009. 3. M>G Venkateshmurthy,"Unix and Shell Programming " Pearson Education

3. R. Stevens, "UNIX Network Programming", PHI, 3rd Ed., 2008.

Reference Books:

1. Ellen Siever, Stephen Figgins, Robert Love, Arnold Robbins, "Linux in a Nutshell", O'Reilly Media, 6th Ed., 2009.

2. Neil Matthew, Richard Stones, Alan Cox, "Beginning Linux Programming", 3rd Ed., 2004.

3. Robert Love, "Linux System Programming" ,O'Reilly Media, 2nd Ed., 2007.

4. Evi Nemeth, Garth Snyer, Trent R. Hein, "Linux Administrator Handbook", Pearson, 2nd Ed., 2007.

5. Mark G. Sobell, "A Practical Guide to Ubuntu Linux", Pearson, 2nd Ed., 2008.

6. Cox K, "Red Hat Linux Administrator's Guide", PHI, 2001.

ADVANCED LINUX LAB

1. Write a non-recursive shell script which accepts any number of arguments and prints them in the reverse order (For example, if the script is named rags, then executing args A B C should produce C B A on the standard output

2. Write a shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions and otherwise output each file name followed by its permissions

3. Write a shell script which accepts valid log-in names as arguments and prints their corresponding home directories, if no arguments are specified, print a suitable error message.

4. Write a shell script that accept one or more filenames as argument and convert all of them to uppercase, provided they exist in current directory

5. Write a shell script that accepts as filename as argument and display its creation time if file exist and if it does not send output error message.

6. Write a shell script to display the calendar for current month with current date replaced by * or ** depending on whether the date has one digit or two digits

7. Write a shell script to compute the sum of number passed to it as argument on command line and display the result.

8. Write a shell script that delete all lines containing a specific word in one or more file supplied as argument to it.

9. Write a shell script that gets executed displays the message either "Good Morning" or "Good Afternoon" or "Good Evening" depending upon time at which the user logs in

10. Write a shell script that accept a list of filenames as its argument, count and report occurrence of each word that is present in the first argument file on other argument files.

M20CA2061	Artificial Intelligence	L	T	P	C
Duration: 14 Weeks		**4**	**0**	**0**	**4**

Course Description: (3-4 lines-course aim and summary be added)

Artificial Intelligence is the second booming field after Data mining and Data Science. Although research on this carried out from 1956 after that had seen many ups and downs. Way back from the year 2015 because of the commercial success in Artificial Intelligence, once again AI field has taken up charge. This course not only gives the broad perspective of Artificial intelligence process but also the various techniques, methods and approaches carried out.

Prerequisites:

The skills required to learn Artificial Intelligence are Strong knowledge of Mathematics, Good command over programming languages, Good Analytical Skills, Ability to understand complex algorithms Basic knowledge of Statistics, and modeling.

Course Objectives:

The objectives of this course are to:

- Familiarize students with Artificial Intelligence principles and techniques
- Introduce the facts and concepts of cognitive science by computational model and their applications
- Explore problem-solving paradigms, search methodologies and other Artificial Intelligence techniques
- Write the basic programs using LISP and PROLOG

Course Outcomes:

On successful completion of this course; the student will be able to:

- Apply knowledge of various discipline and computing heuristic methodologies in state-space problems.
- Analyze a problem, identify and define the computing requirements appropriate to its solution.
- To design efficient algorithm to achieve optimized solution in complex situation and adaptive mechanism in case of uncertainty.

- Implement learning algorithms to apply and resolve in real world problems and evaluate a computer-based system, process, component or program to meet desired needs.
- Characterize various ways to represent the environmental knowledge and to infer from it.

Course Contents:

UNIT I [13 Hours]
Artificial Intelligence: Definition**,** AI Problems-Task Domains of Artificial Intelligence; The Underlying Assumption - Physical Symbol System Hypothesis; AI technique - Knowledge properties, Knowledge Representation.

Problems, Problem Spaces and Search: Steps in building a System; Production Systems; Control Strategies-Requirements of a good control strategy; Problem Characteristics; Production System Characteristics-Categories of Production Systems

Heuristic search techniques: Generate-and-test, Hill Climbing-Simple Hill Climbing, Best First Search-OR Graphs

UNIT II [13 Hours]
Intelligent Agents: Agents and Environments; A Rational Agent – Performance measures; Examples of Agent Types and PEAS (Performance Measure, Environment, Actuators, Sensors) descriptions, Properties of Task environment; The Structure of Agents, Types of Agent Programs

Knowledge Representation: Introduction, Definition, Importance, Representation and Mappings-mappings between facts and representations, Representation of Facts; Approaches to Knowledge Representation-Properties, Types of Knowledge; Issues in Knowledge Representation-Important Attributes, Relationship among Attributes.

UNIT III [13 Hours]
Symbolic Reasoning under Uncertainty: Introduction to Nonmonotonic Reasoning; Logics for Nonmonotonic Reasoning, Default Reasoning and Minimalist Reasoning;

Learning: Introduction, Different methods of Learning – Rote Learning, Inductive Learning, Reinforcement Learning, Unsupervised Learning, Supervised Learning, Analogy , Derivational and Transformational

Expert Systems: Introduction, Rule based and Knowledge based, knowledge acquisition, Maintenance and Manipulations

Planning: Components of a Planning System; Goal Stacks Planning - A very Simple Blocks World Problem; Reactive Systems; Other Planning techniques.

UNIT IV [13 Hours]
Parallel and Distributed AI: Psychological modeling; Parallelism in Reasoning Systems; Distributed Reasoning Systems

Perception and Action: A design for Autonomous Robot; Perception-Vision, Speech Recognition; Action-navigation, Manipulation; Robot Architectures

Fuzzy Logic Systems: Introduction; Crisp Sets; Fuzzy Sets; Fuzzy Terminology; Fuzzy Logic Control-Fuzzy Room Cooler.

Prolog: Introduction; Converting English to Prolog Facts and Rules; Goals; Prolog Terminology; Variables; Control Structures; Arithmetic Operators; Matching in Prolog; Backtracking; Recursion.

LISP: Introduction, Syntax and Numeric Functions, Basic List Manipulation Functions, Functions, Predicates and Conditionals Input, Output and Local variables, Iteration and Recursion, Property List and Arrays.

Text Book:

1. Elaine Rich, Kevin Knight, Shivashankar B Nair, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2013
2. PROLOG: PROLOG, Programming for Artificial Intelligence, 3rd edition, Ivan Bratko, Pearson publication.
3. Introduction to Artificial Intelligence and Expert System, Dan W. Patterson, Prentice-Hall of India, 1992

Reference Books:

1. Jean-Louis Ermine,"Expert Systems : Theory and Practice",Prentice Hall of India, 1995
2. Stuart Russel, Peter Norvig,"Artificial Intelligence: A Modern Approach", 3rd Pearson 3rd edition 2013.

M20CA2062	Software Project Management	L	T	P	C
Duration: 14 Weeks		4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

This course describes the key aspects of a software project management. It begins with the overview of project planning and elaborates software evaluation and costing. This course also includes those topics relevant to successful software development management, including organizing software development management, Risk and quality management. The AGILE project management using SCRUM is also introduced.

Prerequisites:

To get started with students should have knowledge of Project Planning, Scope Management and Project Estimation etc.

The objectives of this course are to:

- Will be able to understand the fundamental principles of Software Project management & also have a good knowledge of responsibilities of project manager and to handle the various projects.
- Be familiar with the different methods and techniques used for project management.
- By the end of this course student will have good knowledge of the issues and challenges faced while doing the Software project Management.
- Will be able to know the reasons for the software projects failures and how that failure probability can be reduced effectively.
- Will be able to do the Project Scheduling, Tracking, Risk analysis, Quality management.
- Will be able to estimate the Project Cost using different techniques.

Course Outcomes:

On successful completion of this course; the student will be able to:

- Understand the software project planning, design and development process to relate the project with all other project management activities (Level 1).
- Identify, classify various types of risks and recognize the importance of project cost evaluation (Level 2).
- Implement the risk management techniques and the optimum resource allocation to develop quality projects.(Level 3).
- Analyze and illustrate Agile Project Management using SCRUM to develop reliable software projects. (Level 4 and 5).

Course Contents:

UNIT I   **[13 Hours]**
Introduction to Software Project Management: Project Definition – Contract Management – Activities Covered By Software Project Management.Management Activities.**Project Evaluation:** Project Portfolio Management, Cost Benefit Evaluation Techniques, Risk Evaluation, Strategic programme Management, Creating a programme, Aids to program management. An Overview of Project Planning: Introduction to Stepwise Project Planning. Step 0 to Step 10.

UNIT II [13 Hours]

Activity Planning : Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks. Risk Management: Introduction, Nature of Risk, categories of Risk, A framework for dealing with Risk, Risk Identification, Risk Planning, Risk Management, Evaluating risks to Schedule PERT technique, Monte Carlo Simulation.

UNIT III [13 Hours]

Monitoring and Control : Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change Control. **Managing Contracts**– Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT IV [13 Hours]

Introduction to Agile and DEVOPS : Introduction: Values, Principles, agile Manifesto, SCRUM Methodology: Roles and Responsibilities in Scrum, Implementing Scrum Process, Estimating Scrum Project, Challenges and Benefits of APM, Case Study: APM Using Scrum,.

Text Book:
   1. TB1: "Software Project Management", Bob Hughes, Mike Cotterell&Rajib Mall, Fifth Edition, Tata McGraw Hill, 2016. **(Chapters: 1, 2, 3, 6, 7, 9, 10)**

Reference Books:
   1. Software Engineering Project management, Wiley Edition Second Edition edited by Richard H Thayer Foreword by Edward Yourdon
   2. "Managing Global Projects", Ramesh, Gopalaswamy,Tata McGraw Hill, 2001.

M20CA2063	**Optimization Techniques**	L	T	P	C
Duration: 14 Weeks		4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

This course introduces the fundamentals of Operations Research Models including linear programming and applications. Topics includes Introduction to Linear Programming and Overview of the OR Modeling, Solving LPP - The Simplex Method, Transportation and Assignment Problems and Game Theory and Network Analysis. Course will help to the students how to construct appropriate models to particular applications/Problems, develop optimal solutions, understand the theory behind solutions and translate solutions into directives for action. The main goal is to find the lowest cost or the maximum profit to take decisions related to the Business and to resolve the issues related to the game theory, Transport and Assignment problems.

Prerequisites:

To start with this course you should have a good knowledge, basic knowledge of calculus of several variables, linear or matrix algebra.

Course Objectives:

The objectives of this course are to:

- To provide the concept and an understanding of basic concepts in Operations Research Techniques for Analysis and Modeling in Computer Applications
- To understand develop and solve mathematical model of linear programming problems
- To understand develop and solve mathematical model of Transport and assignment problems
- To understand network modeling for planning and scheduling the project activities

Course Outcomes:

On successful completion of this course; the student will be able to:

- Formulate and model of a linear programming problem from a word problem and solve them graphically in 2 dimensions, while employing some convex analysis.
- Illustrate and apply the concepts of place a primal linear programming problem into standard form and use the simplex method or dual simplex method to solve it. Effectively communicate complex mathematical ideas and carefully reasoned arguments both orally and in writing.

- Recognize and compute / solve a number of classical linear programming problems and such as the minimum / maximum of the assignment problem, the transportation problem, the shortest-path problem, while taking advantage of the special structures of certain problems.
- Demonstrate the ability to apply analytical and theoretical skills to create quantitative models to solve real world problems in appropriate contexts

Course Contents:

UNIT I [13 Hours]

Introduction to Linear Programming and Overview of the OR Modeling : The origin of OR, the nature of OR, the impact of OR, defining the problem and gathering data, Formulating a mathematical model, deriving solutions from the model, testing the model, preparing to apply the model, implementation.

Formulation of linear programming problem (LPP), examples, Graphical solution, the LP Model, Special cases of Graphical method, assumptions of Linear Programming (LP), additional example.

UNIT II [13 Hours]

Solving LPP - The Simplex Method : The essence of the simplex method, setting up the simplex method, algebra of the simplex method, the simplex method in tabular form, special cases in the simplex method, tie breaking in the simplex method, adopting to other model forms (Two Phase method, Big-M method), post optimality analysis. The essence of duality theory, economic interpretation of duality, primal dual relationship, adapting to other primal forms.

UNIT III [13 Hours]

Transportation and Assignment Problems : The transportation problem, a stream line simplex method for the transportation problem, Least Corner Method, Matrix Minima Method, Vogel's Approximation Method for finding basic feasible solution and its optimal (U V Method) solution problem, the assignment problem, a special algorithm for the assignment problem.

UNIT IV [13 Hours]

Game Theory and Network Analysis : The formulation of two persons, zero sum games, solving simple games- a prototype example, games with mixed strategies, graphical solution procedure, Shortest Path: Dijkstra Algorithm; PERT-CPM problems (Cost Analysis, Crashing, Resource Allocation excluded).

Text books:
1. Frederick S.Hillier& Gerald J.Lieberman: Introduction to Operations Research, 8thEdition, Tata McGraw Hill, 2006.

2. Hamdy A Taha: Operations Research - An Introduction, 7th Edition, Pearson Education 2007
3. Operations Research Problems & Solutions, V K Kapoor, Sultan Chand & Sons Educational Publishers, 2003.

Reference books:

1. A Wayne L. Winston: Operations Research Applications and Algorithms, 4th Edition, Thomson Course Technology, 2003.
2. Theory and Problems of Operations Research, Richard Bronson and GovindasamiNaadimuthu, Schaum's Outline, Tata McGraw Hill, 2nd Edition, 1997.
3. P K Srimani and M Vinayaka Murthy, "Computer Oriented Numerical Methods & Linear Programming", Subhas Stores, Bengaluru, 2001.

M20CA2064	**HUMAN COMPUTER INTERACTION**	**L**	**T**	**P**	**C**
Duration: 14 Weeks		**4**	**0**	**0**	**4**

Course Description: (3-4 lines-course aim and summary be added)

This subject emphasis on design and evaluation of human computer interfaces using different frameworks and elements. It also provides the techniques to measure the usability and flexibility of softwares or applications. The subject covers the basics of human computer interaction, guidelines to design the websites and selection of colours, widgets, functional keys and interaction devices

Prerequisites:

This course requires basic knowledge of C programming language/UNIX, Software tools, Web, AI.

Course Objectives:

The objectives of this course are to:

- Learn the foundations of Human Computer Interaction.
- Be familiar with the design technologies for individuals and persons with disabilities. Be aware of mobile HCI.
- Learn the guidelines for user interface.
- Design mock-ups and carry out a user and expert evaluation of interfaces.

On successful completion of this course; the student will be able to:

- Interpret the contributions of human factors and technical constraints on Human-Computer interaction.
- Apply Human-computer Interaction techniques and methods to the design of software
- Practice in developing Human-Computer Interfaces with respect to usability.
- Design effective HCI for individuals and persons with disabilities. Assess the importance of user feedback.

Course Contents:

UNIT I [11 Hours]
Foundations of HCI : The Human: I/O channels ,Memory, Reasoning and problem solving; The computer: Devices, Memory, processing and networks; Interaction: Models, frameworks, Ergonomics, styles ,elements, interactivity, Paradigms.

UNIT II [15 Hours]
Design Process : Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions, Screen Designing:- Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis

UNIT III [13 Hours]
Windows and Software tools : Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls, Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.
Software tools - Specification methods, interface – Building Tools, Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays –drivers.

UNIT IV [13 Hours]
Mobile HCI and Web Interface Design : Mobile Ecosystem: Platforms, Application frameworks-Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow.

Text Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004

2.The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.

3. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia

4.Brian Fling, "Mobile Design and Development", First Edition , O'Reilly Media Inc., 2009

5. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O'Reilly, 2009

Reference Books:

1. Human – Computer Interaction. Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg, Pearson

Education

2. Interaction Design Prece, Rogers, Sharps. Wiley Dreamtech,

3. User Interface Design, Soren Lauesen , Pearson Education.

M20CA2070	Java Programming Lab	L	T	P	C
Duration: 14 Weeks		0	0	2	2

Lab Experiments

Basic programs

1) Write java program to print Biggest of 3 Numbers using Command line arguments.

2) Write a java program to print Factorial of a given number.

3) Write a java program to print sum of Sum of Digits and check for palindrome.

4) Write a java program to print the names in sorted order using arrays.

5) Write a java program to compute matrix multiplication using arrays.

II. Method Overloading

6) Write a java program to demonstrate method overloading to add two integers, add two strings.

III. Constructor overloading

7) Write a java program for Rectangle class using constructor overloading with different number of parameter list.

IV.Inheritance & Abstract class

8) Write a java program to demonstrate i. Simple Inheritance ii. multilevel inheritance.

9) Write a Java program to implement an abstract class.

V.Method Overriding

10) Write a java program to demonstrate Method overriding (use super keyword)

VI) Packages

11). Write a Java program to demonstrate user defined packages.

VII) Multiple Inheritance: Interface

12) Write a Java program to illustrate the multiple inheritance by using i. single Interface ii. Multiple interfaces iii. Inherited interface.

VIII) Super , Static, final keywords

13)Write a java program to illustrate the keywords i)super ii)static iii)final

IX) Exception handling

14) Write a java program to demonstrate exception handling with i. single catch block ii. multiple catch blocks

X) Multithreading

15) Write a Java program to demonstrate the concept of Inter thread communication by Suitable example

16) Write a Program on MultiThreads using Thread Class

M20CA2080	**Python Programming Lab**	L	T	P	C
Duration: 14 Weeks		0	0	2	2

LabExperiments

PART-A

1. Demonstrate runtime reading of Strings.
   i)   Illustrate the concept of String Slicing.
   ii)   Also demonstrate a minimum of 5 functions defined on Strings.
2. Write a program to add two integers and print the result on the screen. Accept the values at runtime.
3. Demonstrate the usage of math and cmath module.(For Ex. Program to find the roots of a Quadratic Equation)
4. Illustrate the usage of files with the help of different functions defined on Files(such as write, read(demonstrate all four forms), open, and close(use both the forms of closing a file)
5. Write a program to find the largest of two numbers
6. Write a program to find the biggest of three numbers
7. Design a menu driven program to check whether the number is
   i)A perfect number or not
   ii)Armstrong number or not
   iii)Palindrome or not
8. Show the different operations defined on Lists, Tuples and Dictionaries

9. Write a program to find the factorial of a number using functions and without using functions. Accept the input at runtime.
10. Demonstrate the i) Designing of a class ii) Creation of Object of that class iii) accessing the methods and instance variables in the class. The student is at the liberty of choosing their own Description of the object for designing the class.

PART-B

A few programs on GUI and a mini project.

THIRD SEMESTER

M20CA3010	**Machine Learning Using Python**	**L**	**T**	**P**	**C**
Duration: 14 Weeks		**2**	**1**	**1**	**4**

Course Description: (3-4 lines-course aim and summary be added)

Machine Learning is concerned with computer programs that automatically improve their performance through experience. This course covers the theory and practical algorithms for machine learning from a variety of perspectives. Topics such as Bayesian networks, decision tree learning, Support Vector Machines, statistical learning methods and unsupervised learning are covered. Short programming assignments include hands-on experiments with various learning algorithms gives students a chance to dig into an area of their choice. This course is designed to give a thorough grounding in the methodologies, technologies, mathematics and algorithms currently needed by people who do research in machine learning.

Prerequisites:

To get started with Machine Learning you must be familiar with Statistics, Linear Algebra, Calculus, Probability, Python and Programming Languages

Course Objectives:

The objectives of this course are to:

- Describe the basic components of Machine Learning with concepts of Python
- Differentiate broad categories of Supervised Machine learning
- Explain various data preprocessing techniques and Compare different types of algorithms used in Machine Learning domain and
- Examine the limitations of various machine learning algorithms and Discuss Reinforcement Learning.

On successful completion of this course; the student shall be able to:

- Understand the fundamental concepts and theories of Machine Learning and Python Programming
- Analyze and Apply techniques of Supervised machine learning and solve the real world problems
- Interpret and Apply Unsupervised Machine Learning algorithms for specific problems.
- Understand the Reinforcement Learning Technique and Understand Q Learning.

Course Contents:

UNIT I [13 Hours]
Python: Origin, Programming Basics, data types and Operators, Program Files, Directories, Changing Data Through Names, Copying Data, Accessing a Tuple Through Another Tuple, packages and libraries.
Overview of ML, broad categories of Machine learning- Supervised, Unsupervised, Semi-supervised, and Reinforcement Learning, Applications areas of Machine Learning. Examples and Case studies

UNIT II [13 Hours]
Supervised Learning: Introduction, Classification and Linear Regression, k-Nearest Neighbor, Linear models, Decision Trees, Naive Bayes Classifiers, Kernelized Support Vector Machine (SVM) Algorithm.Neural Networks (deep learning), Comparison of different algorithms, discussions on case studies.

UNIT III [13 Hours]
Unsupervised Learning: Introduction, types and challenges, preprocessing and scaling of datasets, Dimensionality reduction, feature extraction. Principal Component Analysis (PCA), k-means, agglomerative,and DBSCAN clustering algorithms. Comparison of different cluster algorithms, discussions on Case studies

UNIT IV [13 Hours]
Semi-supervised: Introduction, discussion on Generative models and Graph-based methods.
Reinforcement: Introduction, the learning task, Q learning –function, convergence, & updating sequence, rewards and actions, relationship to dynamic programming, discussions on Case studies

Text Books:
1. Introduction of Machine Learning with Python – by Andreas C Muller & Sarah Guidp – O'Reilly & Shroff publishers. Chapters 1, 2 and 3.
2. Introducing Python by Bill Lubanovic(chapters 1-6), Oriely Publications, 1st Edition

3. Python Programming for absolute beginners by Michael Dawson, Course Technology-A part of CENGAGE Learning, 3rd Edition
4. Machine Learning by Tom M Mitchell – McGraw Hill Education publication – 2013. Chapter 13.

References Books:

1. Machine Learning: The Art and Science of algorithms – by Peter Flach – Cambridge University Press. Chapter 12
2. Machine Learning - by EthemAlpaydin – PHI learning private limited. Chapter 1, 7, 16, 18, 19
3. Bayesian Reasoning and Machine Learning – by David barber - Cambridge University Press. Chapter 13, 15
4. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2006
5. Semi-Supervised Learning - by Olivier Chapelle, Bernhard Sch¨olkopf, and Alexander Zien - The MIT Press Cambridge
6. The Elements of Statistical Learning – by Trevor Hastie, Robert Tibshirani and Jerome Friedman – Springer 2017 publication
7. Python Programming for absolute beginners-3rd Edition by Michael Dawson

LAB PROGRAMMES

1. Write a program to implement how to read and display a dataset in Python
2. Write the program to implement Data Pre-processing for Machine learning
3. Write a program to learn how to select features for machine learning
4. Write a program to implement classification algorithm
5. Write a program to implement Classification Algorithm. Calculate the accuracy, precision, recall and lift measure.
6. Write a program to create a classification model using medical data and demonstrate how to analyze the data and predict the resultant diagnosis.
7. Write a program to create the clustering model
8. Create two different clustering models using the same dataset Compare the results of these two algorithms and comment on the quality of clustering.
9. Write a program to demonstrate Semi Supervised Learning with SVM's
10. Write a program to demonstrate Reinforcement learning

M20CA3020	Big Data Analytics Using R	L	T	P	C
Duration: 14 Weeks		**2**	**1**	**1**	**4**

Data Analytics is the science of analyzing data to convert information to useful knowledge. This knowledge could help us understand our world better, and in many contexts enable us to make better decisions. This course seeks to present you with a wide range of data analytic techniques and is structured around the broad contours of the different types of data analytics, Fundamentals of Big Data, Big Data Analytics, Big Data Management, and Applications of Big Data Analytics.

Prerequisites:

To know the concepts of data analytics you should have some basic knowledge in Programming languages, Algorithm and Data Structure, Database concepts, and Strong knowledge in statistics and mathematics.

Course Objectives:

The objectives of this course are to:

- To understand the basics of Big Data
- To know the role and use of Big Data in various relevant industries
- To have a clear idea on the various tools and techniques used with big data
- To get the overview of various types of Big Data Analytics

Course Outcomes:

On successful completion of this course; the student shall be able to:

- Identify the concept and challenges of big data and its existing technologies.

- Understand Hadoop Distributed File System (HDFS) and Map Reduce Concepts

- Understand the basics in R programming in terms of constructs, control statements, string functions

- Apply the R programming from a statistical perspective.

UNIT I [13 Hours]

Overview of Big Data : Introduction to BigData and its importance, Understanding the Characteristics of Big Data-The Vs, Types of Data- Examples of structured, unstructured and Semi-structured data. Understanding the Waves of managing Data, Big Data architecture, Big Data Technology Components.

Industry examples of Big Data , big data and Digital marketing, fraud and big data, risk and big data, credit risk management, big data and healthcare, advertising and big data.

UNIT II [13 Hours]

Analytics and Big Data : Data Science: Business Intelligence vs Data Science. Role of a Data scientist, Profile of a Data Scientist.

Big Data Analytics- Importance of Big Data Analytics, Types of Big data Analytics: Diagnostic, Descriptive, Predictive and Prescriptive analytics. Data Analytics Life cycle –the six Phases Viz. Discover, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize. Analysis Vs Reporting.

Technologies and tools: Introduction to distributed computing, Hadoop and Hadoop Eco system, cloud and big data, Introducing Map Reduce. Examples of Map Reduce.

UNIT III [13 Hours]

Basics of R : Basics of R: Basic Math – Variables - Data Types - Vectors - Calling Functions - Function Documentation - Missing Data. Advanced Data Structures: data.frames - Lists - Matrices – Arrays.Reading Data into R: Reading CSVs - Excel Data - Reading from Databases - Datafrom Other Statistical Tools - R Binary Files. Writing R functions – Control statements – Loops.
Statistical graphics-Visualization.

UNIT IV [13 Hours]

Basic Statistics : Basic Statistics: Summary Statistics - Correlation and Covariance - T-Tests - ANOVA. Linear Models: Simple Linear Regression - Multiple Regression. Generalized Linear Models: Logistic Regression - Poisson Regression – Polynomial Regression. Nonlinear Models: Nonlinear Least Squares - Generalized Additive Models - Decision Trees - Random Forests.

Text Books:
1. Paul Buhler, WajidKhattak and Thomas Erl, "Big Data Fundamentals: Concepts, Drivers & Techniques", Prentice Hall Publications, 2016.
2. Norman Matloff, "The Art of R Programming", published by William Pollock, 2011.

R PROGRAMMING LAB

Lab Exercises

1. Program to Perform the following Statistical operations in the vector sequence

    a. Sum   d. Standard Deviation   g. Min

    b. Length   e. Variance   h. Max

    c. Median   f. Summary

2. Program to create Simple Calculator
3. Program to import data set and perform the various statistical operations
4. Program to perform matrix operations
5. Program to perform t test
6. Program to perform ANOVA operations
7. Program to Perform Regression Analysis
8. Program to merge the dataset
9. Program to perform Scatter Plot
10. Program to plot 3D Graphs

M20CA3031	Web Mining & Social Networking	L	T	P	C
Duration: 14 Weeks		4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

The course will cover machine learning techniques to mine the Web and other information networks, social networks, and social media. We will discuss applications to search, retrieval, classification, and recommendation. Various models to explain the dynamics of Web processes will also be emphasized. The course covers Usage of web mining techniques and social networks analysis, it is possible to process and analyze large amount of social data (such as blogtagging, online game playing, instant messenger etc.) and by this to discover valuable information from data. It covers basic techniques to mine the Web and information networks (including social networks and social media).

Prerequisites:

The skills required to learn Web Mining & Social Networking are Web technologies, Data Mining, Data base and Network analysis.

The objectives of this course are to:
- To understand the methods of Web usage mining
- To learn various techniques to mine the Web and other information networks, social networks, and social media.
- To learn how to extract knowledge from web scale datasets by various techniques.
- Able to gainknowledge from disciplines as diverse as sociology, mathematics, computer science.
- Understand the Online interactive demonstrations and hands-on analysis of real-world data sets.

On successful completion of this course; the student shall be able to:

- Be familiar with classic and recent developments in Web search and web data mining
- Analyze the structure and evolution of networks
- Able to gainknowledge from disciplines as diverse as sociology, mathematics, computer science
- Understand the Online interactive demonstrations and hands-on analysis of real-world data sets.

UNIT I [15 Hours]
Web DataMining Introdutcion and Web Usage Mining : Introduction to Web Data Mining: Importance, Applications of Web Data mining. Capturing users web activities, Client side v/s middleware v/s server side data and usage logging. Web Mining and its types, Web Usage Mining, Web Structure Mining, Web Content Mining.

Web Usage Mining: Learning from Browser, Server Logs, Identifying frequent item sets, pattern identification, representing patterns in form of relations or Graphs, Understanding web application or website usage, Heat maps. Using statistical tools for usage analysis and machine learning for prospective improvements.

UNIT II [15 Hours]
Web Structure Mining and Web Content Mining : Web Structure Mining : Understanding link structure of the web, Static v/s dynamic linking, representing the link structure as graphs, identifying most / least used links, paths, Categorizing links based on required attributes, Clustering links based on required attributes.

Web Content Mining: Storing web content as text, database, various document types, generating meta-information of web documents, labeling, tagging, identifying feature sets. Representing web

documents, Vector Space Model. TF-IDF, web-page summarization, tokenization, n-gram analysis, categorizing web pages based on required attributes.

UNIT III   **[12 Hours]**
Social Media Mining : Social media mining, Fundamentals, newchallenges, key concepts, Good Data vs Bad Data, under standing sentiments, Sentiment Analysis, Classification, supervised social media mining, unsupervised social media mining, human sensors under honest signals.

UNIT IV   **[10 Hours]**
Social Media and Challenges:
Recommendation in Social Media, Challenges, Classical Recommendation Algorith ms, Recommendation Using Social Context, Evaluating Recommendations.

Text Books:
1. Bing Liu, Web Data Mining: Exploring Hyperlinks, Content, and Usage Data, 2nd Edition, Springer, 2011
2. Soumen Chakrabarti, Mining the Web, Morgan-Kaufmann, first edition, 2002
3. Mining the Social Web, 2nd Edition Data Mining Face book, Twitter,Linked in, Google+, GitHub, and More By Matthew A. Russell Publisher: O'Reilly Media.
4. Social Media Mining with R [Kindle Edition] NATHAN DANNEMAN RICHARD HEIMAN N

Reference Books:
1. Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data by Bing Liu (Springer Publications).
2. Data Mining: Concepts and Techniques, Second Edition Jiawei Han, Micheline Kamber (Elsevier Publications)
3. Web Mining:: Applications and Techniques by Anthony Scime
4. Mining the Web: Discovering Knowledge from Hypertext Data by Soumen Chakrabarti
5. Maksim Tsvetovat & Alexander Kouznetsov,Social Network Analysis for Start ups,Sharoof publishers,2015

Supplementary Reading:
Web Resources:
https://www.kdnuggets.com/2014/09/most-viewed-web-mining-lectures-videolectures.html
Weblinks:
https://www.cs.uic.edu/~liub/WebContentMining.html
MOOCs:
https://www.coursera.org/specializations/data-mining

M20CA3032	**Mobile Computing and Appstore Management**	**L**	**T**	**P**	**C**
Duration: 14 Weeks		**4**	**0**	**0**	**4**

Course Description: (3-4 lines-course aim and summary be added)

Mobile application development is one of the fastest growing sectors of information technology. The main focus of the program is to provide the basic concepts of Mobile Computing and leading platform in mobile devices: Android. students will participate in either a co-op work term or applied project that will provide the experience necessary to improve employability. Students will learn strategies related to the development of mobile applications from a business perspective such as performing competitive research and exploring revenue-generating approaches. They will also be exposed to the process of App Store and Android Market submissions.

Prerequisites:

To get started you have a general understanding of computer networks. You should also be able to do some basic programming, read pseudo codes, and interpret algorithms.

Course Objectives:

The objectives of this course are to:
- To impart basic understanding of the wireless communication systems.
- To expose students to various aspects of mobile and ad-hoc networks.
- Learn to setup Android application development environment
- Illustrate user interfaces for interacting with apps and triggering actions
- Interpret tasks used in handling multiple activities

Course Outcomes:

On successful completion of this course; the student shall be able to:

- Explain various Mobile Computing application, services and architecture.
- Understand various technology trends for next generation cellular wireless networks.
- Implement adaptive, responsive user interfaces that work across a wide range of devices.
- Demonstrate methods in storing, sharing and retrieving data in Android applications
- Describe the steps involved in publishing Android application to share with the world.

UNIT I [13 Hours]

Mobile Computing Application and Services: Introduction to mobile computing, Middleware and Gateways, Application and services, Internet-Ubiquitous networks, Architecture and three-tier architecture for Mobile Computing, Design consideration for Mobile Computing. Spread spectrum – Direct sequence, Frequency hoping. Medium Access Control - SDMA, FDMA, TDMA, CDMA, Cellular concepts- channel assignment strategy- hand off strategy interface and system capacity-improving coverage and capacity in cellular system, Satellite Systems-GEO, LEO, MEO. Wireless Communication Systems- Telecommunication Systems- GSM- GSM services & features, architecture -DECT features & characteristics, architecture.

Wireless LANS: Wireless LAN Standards – IEEE 802 Protocol Architecture, IEEE 802.11 System Architecture, Protocol Architecture & Services

UNIT II [13 Hours]

4G Networks: Introduction – 4G vision – 4G features and challenges – Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM - MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

UNIT III [13 Hours]

Introduction to Android: Introduction to Android Architecture: Introduction, History, Features and Android Architecture. Android Application Environment, SDK, Tools: Application Environment and Tools, Android SDK. Programming paradigms and Application Components - Part 1: Application Components, Activity, Manifest File, Programming paradigms and Application Components.

UNIT IV [13 Hours]

User Interface Design: User Interface Design part 1: Views &View Groups, Views : Button, Text Field, Radio Button, Toggle Button, Checkbox, Spinner, Image View, Image switcher, Event Handling, Listeners, Layouts : Linear, Relative, List View, Grid View, Table View, Web View, Adapters. User Interface Design part 2: Menus, Action Bars, Notifications : Status, Toasts and Dialogs, Styles and Themes, Creating Custom Widgets, Focus, Touch Mode, Screen Orientation.

Text Books
1. Asoke K. Talukder, Hasan Ahmad, Mobile Computing Technology- Application and Service Creation, 2nd Edition, McGraw Hill Education. (chapter 1 & 2)
2. An introduction to LTE LTE, LTE-advanced, SAE and 4G mobile communications, Christopher Cox, John Wiley & Sons Ltd.
3. Professional Android 4 Development by Reto Meier, John Wiley and Sons, 2012 .(Chapter 1, 2,3)

Reference Books:

1. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014.
2. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD Publishers, 2015.
3. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580 4. Anubhav Pradhan, Anil V Deshpande, " Composing Mobile Apps" using Android, Wiley 2014, ISBN: 978-81-265-4660-2
4. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017.

M20CA3033	Cloud Computing	L	T	P	C
Duration: 14 Weeks		4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

This course introduces the fundamental principles of Cloud computing and its related paradigms. It discusses the concepts of virtualization technologies along with the architectural models of Cloud computing. It presents prominent Cloud computing technologies available in the marketplace. It contains topics on concurrent, high-throughput and data-intensive computing paradigms and their use in programming Cloud applications. Various application case studies from domains such as science, engineering, gaming, and social networking are introduced along with their architecture and how they leverage various Cloud technologies. Hope that this motivates the students to address their own future research and development.

Prerequisites:

To start learning cloud computing one should have better knowledge in Virtualization concepts, operating system, Networking, and coding skills.

Course Objectives:

The objectives of this course are to:

- To introduce the broad perceptive of cloud architecture and model
- To distinguish between the various types of Virtualization.
- To be familiar with the lead players in cloud.
- To choose the right cloud providers as per need.
- To learn to design the trusted cloud Computing

On successful completion of this course; the student shall be able to:

- Understand the fundamentals of Cloud Computing and evaluate ideas for building cloud computing environments

- Explain the fundamental concepts of Virtualization and analyze the characteristics of virtualized environments.

- Analyze existing cloud architecture to design and develop new systems using software tools that can solve real time problems without harming environment.

- To familiarize with the AWS Cloud environment and apply the knowledge gained in developing cloud computing applications in various areas and analyze their usage.

Course Contents:

UNIT I   [15 Hours]
Fundamentals of Cloud Computing : Cloud computing at a glance, the vision of cloud computing, Defining a cloud, Historical developments, Building cloud computing environments, Application development. Characteristics of Cloud computing. Scalability, types of scalability. Horizontal Scalability and Cloud Computing. Computing platforms and technologies, Principles of Parallel and Distributed Computing.

UNIT II   [15 Hours]
Fundamental concept and Models : Basics of Virtualization, Characteristics of virtualized environments, and Taxonomy of virtualization techniques, - Types of Virtualization- OS virtualization, Application level virtualization, Programming Language virtualization and Desktop Virtualization. Virtualization and cloud computing, Technology examples, Xen: paravirtualization, VMware: full virtualization.

UNIT III   [10 Hours]
Cloud Infrastructure Mechanisms and Architecture : Fundamentals of Cloud Architecture, The cloud reference model, Cloud Delivery Models: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Comparing Cloud Delivery Models, Cloud Deployment Models: Public Clouds, CommUNITy Clouds, Private Clouds, Hybrid Clouds, Introduction to Cloud Software Environments , Aneka.Framework overview

UNIT IV   [12 Hours]
AWS Cloud platform: Amazon Web Services Cloud: Amazon Web Services overview, working with Amazon Simple Storage Service (S3), Elastic compute cloud: security groups, key pair, launch Linux and windows instances. Working with Amazon Machine Images. Deploy applications to

Amazon EC2, EC2 applications, Simple queue Service, SQS applications, Elastic Block Storage, RDS, beansta

Text Books:
1. RajkumarBuyya, Christian Vechiolla, ThamaraiSelvi, "Mastering Cloud Computing , Elsevier publications, 2013, USA (Chapter 1, 2, 3, 4, 5.1, 5.2, 5.3, 9.1 and 10)
2. Programming Amazon Web Services: S3, EC2, SQS, FPS, and SimpleDB Paperback ,by James Murty
3. AWS System Administration: Best Practices for Sysadmins in the Amazon Cloud Paperback – March 25, 2015 by Mike Ryan (Author)
4. Amazon Web Services For Dummies Paperback – September 10, 2013 by Bernard Golden

Web Link:
1. https://aws.amazon.com/documentation

Reference Books:
1. RajkumarBuyya, James Broberg, AndrzejGoscinski, "Cloud Computing: Principles and Paradigms", Wiley, India   .
2. Kai Hwang, Geoffrey C Fox, Jack G Dungaree, "Distributed and Cloud Computing, From ParallelProcessing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
3. Thomas Erl, Zaigham,Mahmood, Ricardo Puttini, " Cloud Computing:Concepts, Technology & Architecture", Prentice Hall/Pearson

Online References:
1. Getting started with Amazon book series available on AWS Book references http://www.amazon.com/Getting-Started-AWS-Amazon-Services-ebook
2. For Azure online documentations https://docs.microsoft.com/en-us/azure/

M20CA3034	Ubiquitous and Pervasive Computing	L	T	P	C
Duration: 14 Weeks		4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

The course is about the emerging discipline of Ubiquitous & Pervasive Computing, it is about moving beyond the traditional desktop computing model into embedding computing into everyday objects and everyday activities. The key elements are independent information devices including but not limited to wearable computers, mobile phones, smart phones, smart-cards, wireless sensor-compute nodes etc. and the services made available by them in typical Ubiquitous/ Pervasive / Everywhere

Computing environment. It includes select aspects of human-computer interaction using several types of elements including sensing, text, speech, handwriting and vision.

The skills set required for Ubiquitous and Pervasive Computing are basic knowledge Artificial Intelligence, operating systems, distributed systems, *computer* networks and mobile *computing.*

Course Objectives:

The objectives of this course are to:
- To Study the ubiquitous computing, mobile computing.
- To Study the ubiquitous computing in network based applications.
- To study the pervasive computing and its applications.
- To study the pervasive computing web based applications.

Course Outcomes:

On successful completion of this course; the student shall be able to:

- Describe the characteristics of pervasive computing applications including the basic computing application problems, performance objectives and quality of services, major system components and architectures of the systems.
- Analyze the strengths, problems and limitations of the current tools, devices and communications for pervasive computing systems.
- To learn pervasive computing devices and interfaces
- Design and deploy wireless sensor networks for specific applications
- Have understood the basic concepts of ubiquitous computing

Course Contents:

UNIT I   **[15 Hours]**

Definition, scope, essential elements of ubiquitous, pervasive, and mobile computing. An introduction, overview, and challenges to research topics in ubiquitous computing, including sensors, ambient displays, tangibles, middleware, mobility, and location and context awareness.

Architecture for ubiquitous computing: new devices and communications, software architectures. Wireless standards & protocols for ubiquitous networks: Near field communication (NFC), Bluetooth classic, Bluetooth Low Energy (BLE), WiFi, and WiFi Direct.

UNIT II [15 Hours]

Location in ubiquitous computing: Personal assistants, Location aware computing, Location tracking, Architecture, Location based service and applications (Indoor Positioning Techniques).

Ubiquitous applications: the appropriate design, Weiser's vision of ubiquitous computing; mixed reality and sensible design. Wearable computing, Glass and Augmented Reality, Eye-Tracking, Digital Pen and Paper Mobile social networking & crowd sensing, Event based social network.

UNIT III [10 Hours]

Pervasive Computing Issues, Challenges and Applications, Pervasive Computing devices and Interfaces , Device technology trends, Connecting issues and protocols.

UNIT IV [12 Hours]

Pervasive Computing and web based Applications: - XML and its role in Pervasive Computing - Wireless Application Protocol (WAP) Architecture and Security, Pervasive Application Architecture.

Text Books:
1. Ubiquitous Computing Fundamentals, John Krumm, CRC Press, 2010
2. Stefan Poslad, "Ubiquitous Computing, Smart devices, environment and interaction," Wiley.
3. Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaec & Klaus Rindtorff. --- Pervasive Computing Technology and Architecture of Mobile Internet Applications, Addision Wesley, Reading, 2002.
4. Uwe Ha nsman, Lothat Merk, Martin S Nicklous & Thomas Stober: Principles of Mobile Computing, Second Edition, Springer- Verlag, New Delhi, 2003.

Reference Books:
1. Frank Adelstein, Sandeep Gupta, Golden Richard III, Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing," Tata McGraw Hills.
2. Jochen Burkhardt, Horst Henn, Stefan Hepper, Klaus Rindtor, Thomas Schaeck, "Pervasive Computing," Pearson, Eighteenth Impression, 2014.
3. Rahul Banerjee: Internetworking Technologies: An Engineering Perspective, Prentice –Hall of India, New Delhi, 2003. (ISBN 81-203-2185-5).

M20CA3041	Advanced Java Programming	L	T	P	C

Duration: 14 Weeks		3	0	1	4

Course Description: (3-4 lines-course aim and summary be added)

The goal of the course is to help students gain knowledge in the basic concepts of object-oriented programming and build skills to develop modern software programmers using the language Advanced Java. The course helps to provide an overview of working principles of web related functionalities in Java, understand and apply the fundamentals core java, packages, database connectivity for computing

Prerequisites:

To learn Advanced Java Programming , you must have a basic understanding of the C++, Java programming language.

Course Objectives:

The objectives of this course are to:
- Gain mastery in various advanced features like generic programming, Servlets, JSP, J2EE, JDBC.
- Impart the major Software Design Patterns available in J2EE to meet demanding Software Engineering problems encountered in various Industries.
- Provide hands on experience working with the various J2EE features.
- Describe the J2EE Specifications to produce well designed, effective web applications using JSP and supportive technologies

Course Outcomes:

On successful completion of this course; the student shall be able to:

- Apply the generic programming techniques
- Understand the components and patterns that constitute a suitable architecture for a web application using java servlets.
- Demonstrate systematic knowledge of backend and front end by developing an appropriate application.
- Develop a web application with specific characteristics using JSP.

Course Contents:

UNIT I [13 Hours]

Generics & Event Handling & Swing : Generics: Generics Fundamentals - A Simple Generics Example - Generics Work Only with Reference Types - Generic Types Differ Based on Their Type Arguments - A Generic Class with Two Type Parameters - The General Form of a Generic Class - Bounded Types - Using Wildcard Arguments - Bounded Wildcards - Generic Methods - Generic Constructors - Generic Interfaces. Event Handling, AWT Programming

UNIT II [13 Hours]

Swings & Java Beans : Introduction to Swing: JApplet, Handling Swing Controls like Icons – Labels – Buttons – Text Boxes – Combo – Boxes – Tabbed Pains – Scroll Pains – Trees – Tables Differences between AWT Controls & Swing Controls Developing a Home page using Applet & Swing.

Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizers, Java Beans API.

UNIT III [15 Hours]

Servlets & Java Server Pages Servlets: Introduction to Servelets: Lifecycle of a Serverlet, JSDK The Servelet API, The javax.servelet Package, Reading Servelet parameters, Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues

JSP: Introduction, JSP Life Cycle, JSP API, JSP Scripting elements, JSP Implicit Objects, JSP directives, JSP Action Tags, MVC in JSP, JSTL, JSP, JSP Custom Tags, JSP Pagination.

UNIT IV [11 Hours]

JDBC : Database Access Database Programming using JDBC Studying Javax.sql. package Accessing a Database from a JSP Page Application – Specific Database Actions Deploying JAVA Beans in a JSP Page.

Text Books:
1. Jim Keogh, The Complete Reference J2EE , Tata McGrawHill Publishing Company Ltd,2002.
2. Herbert Schildt, Java A Beginner 's Guide Sixth Edition, Oracle Press, MCH Education, 6th Edition.

3. Internet and World Wide Web – How to program by Dietel and Nieto Pearson Education Asia.
4. The complete Reference Java 2 Third Edition by Patrick Naughton and Herbert Schildt.
5. Java Server Pages by Hans Bergstan.

Reference Books:

1. A Brain-Friendly Guide Head First Servlets and JSPs, Bryan Basham, Kathy Sierra and Bert Bates, Oreilly, 2nd Edition.
2. Programming Jakarta Struts By Chuck Cavaness, Oreilly.

ADVANCED JAVA LAB

LAB Experiments:

1. Demonstrate the generic programming to implement sorting the list of integer and float elements.
2. Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (user name and Password should be accepted using HTML and displayed using a Servlet).
3. Write a JAVA Servlet Program to Auto Web Page Refresh (Consider a webpage which is displaying Date and time or stock market status. For all such types of pages, you would need to refresh your web page regularly; Java Servlet makes this job easy by providing refresh automatically after a given interval).
4. Write a JAVA Servlet Program to implement and demonstrate get() and Post Methods (Using HTTP Servlet Class).
5. Write a JAVA JSP Program to implement verification of particular user login and display a Welcome page.
6. Write a JAVA JSP Program which uses JSP: include and JSP: forward action to display a Webpage.
7. Write a JAVA JSP Program to get student information through an HTML and create a JAVA Bean Class, populate Bean, and display the same information through another JSP.
8. Write a JSP Program to implement all the attributes of the page directive tag.
9. Develop a Banking Account Application using the Struts concept. You can also use JSP or Servlets, JDBC concepts.
10. Write a JAVA Program to insert data into Student DATABASE and retrieve info based on particular queries(For example update, delete, search etc…).

Applications:

Develop Fee Management Project in Servlet :

Objective/ Vision: A fee management application where admin can add/edit/view/delete accountant and accountant can add/view/edit/delete student, check due fee and logout.

Users of the System

1. Admin

2. Accountant

Functional Requirements

a. Admin

1. Can login
2. Can add/view/edit/delete accountant
3. Can logout

b. Accountant

1. Can login
2. Can add/view/edit/delete students
3. Can check due fee
4. Can logout

Tools to be used

1. Use any IDE to develop the project. It may be Eclipse /Myeclipse / Netbeans etc.
2. Oracle or MySQL for the database. Here we are using Oracle 10g database. Assuming that username is system and password is oracle.

Front End and Back End

1. Front End: Servlet with HTML5, CSS and Bootstrap
2. Back End: Oracle 10g
3. Company Mailer Servlet Project

M20CA3042	**Design And Analysis Of Algorithms**	**L**	**T**	**P**	**C**
Duration: 14 Weeks		**3**	**0**	**1**	**4**

Course Description: (3-4 lines-course aim and summary be added)

The main aim of the course is to design and analyses the efficiency of algorithms using various designing techniques. It also allows the user to design multiple solutions for the same problem and also evaluates its performance. The course covers various problem like sorting, searching, subset problem, divide and conquer, string matching, sorting, NP, NP hard and NP complete problems

Prerequisites:

To get started with Design and Analysis of Algorithms You should have a basic knowledge of C, Data Structure etc.

Course Objectives:

The objectives of this course are to:

- Analyze the asymptotic performance of algorithms.
- Provide the knowledge on the Analysis and design of Algorithms.
- Demonstrate a familiarity about Divide and Conquer & Decrease and Conquer algorithm design technique and data structures used.
- Synthesis algorithms that employs graph computations as a key components in Dynamic Programming & Greedy Technique.
- Evaluate the Limitations, Approximation and randomizations factors of an Algorithms

Course Outcomes:

On successful completion of this course; the student shall be able to:

- Analyze the fundamental principles underlying algorithm analysis and design and be able to apply them in specific instances.
- Elucidate algorithms asymptotically and compute the performance analysis of algorithms with the same functionality.
- Synthesize divide-and-conquer algorithms using recurrences for evaluating the performance of the algorithms.
- Examine the complexities of various problems in different domains.
- Design an efficient algorithm for a problem using a Dynamic programming or Greedy paradigm along with a proper data structure.

Course Contents:

UNIT I [15 Hours]
Introduction & Brute Force: Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental Data Structures, Notation of Algorithms, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Recursive and Non Recursive Algorithms with Examples, Brute Force: Selection Sort, Bubble Sort, Sequential Search, String Matching.

UNIT II [14 Hours]
Divide and Conquer & Decrease and Conquer : Divide and Conquer: Merge Sort, Quick Sort and Binary Search .Decrease and Conquer: Insertion Sort, Depth First and Breadth First search and Topological Ordering. Transform and Conquer: Heap Sort.

UNIT III [13 Hours]
Dynamic Programming & Greedy Technique : Dynamic Programming: Warshall's and Floyd's Algorithm, 0/1 Knapsack Problem. Greedy Technique: Introduction, Prim's Algorithm, Kruskal's

Algorithm, Dijkstra's Algorithm, Fractional Knapsack. Time and Space Tradeoff: Input Enhancement in string matching.

UNIT IV [10 Hours]
Limitations, Back Tracking & Approximation Algorithms : Limitations of Algorithm power**:** Lower bound Arguments, Decision Trees, P, NP and NP Complete Problems Back Tracking: Introduction, N- Queens Problem, Sum of subset Problem. Branch and Bound: Introduction, Knapsack Problem, Assignment problem, Approximation Algorithms: Introduction, Travelling Salesman problem.

Text Books :
 1. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 3rd Edition, Copyright © 2012 (Chapters 1-9, 11 and 12).
 2. Horowitz E., Sahani S., Rajasekharan S, "Fundamentals of Computer Algorithms", Galgotia Publication 2005(Chapters 1, 3-8, 11 and 12).

Reference Books:
 1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design- Foundations, Analysis and Internet examples", Wiley India publications, 2014 (Chapters 4-7 and 13).
 2. R C T Lee, S S Tseng, R C Chang, Y T Tsai : Introduction to Design and Analysis of Algorithms: A Strategic Approach, Tata McGraw Hill, 2012 (Chapters 2-5, 8 and 9).
 3. Thomas H. Coremen., Charles E, Leiserson , and Ronald L. Rivest , "Introduction to Algorithms", Eastern Economy Edition , 3rd Edition, 2009(Chapters 3,4,6,7,22,25).
 4. Jon Kleinberg, Eva Tardos, "Algorithm Design", Pearson Publication,2015(Chapters 2-6 and 8).

ADA LAB

 1. Implement Recursive Binary search and Linear search and determine the time required to search an element. Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.
 2. Sort a given set of elements using the Heap sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
 3. Sort a given set of elements using Merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
 4. Obtain the Topological ordering of vertices in a given graph.
 5. Implement 0/1 Knapsack problem using Dynamic Programming
 6. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

7. Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
8. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
9. Print all the nodes reachable from a given starting node in a digraph using BFS method.
10. Check whether a given graph is connected or not using DFS method.
11. Implement Horspool algorithm for String Matching.
12. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
    a. Implement Floyd's algorithm for the All-Pairs Shortest Paths Problem.
    b. Compute the transitive closure of a given directed graph using Wars hall's algorithm

M20CA3043	Software Testing And Quality Assurance	L	T	P	C
Duration: 14 Weeks		3	0	1	4

Course Description: (3-4 lines-course aim and summary be added)

This course describes the key aspects of a Software Testing and Quality Assurance. It begins with the overview of project planning and elaborates software evaluation and testing. This course also includes those topics relevant to successful software testing and quality assurance management, Risk and quality management.

Prerequisites:

The skills required to Software Testing And Quality Assurance are Strong knowledge of software applications, SDLC.

Course Objectives:

The objectives of this course are to:

- Explain the concepts and process of testing activates that occur within the process.
- Describe the various Testing Technique and Design different type of Test cases.
- Characterize the look and feel and usage aspects of Usability and Accessibility Testing.

- Describe the Test Planning, Management, and Execution and design checklist and Templates for planning and Execution.
- Demonstrate the framework, Design of Test Automation.
- Analyze the different perspective of test metrics and measurements.

Course Outcomes:

On successful completion of this course; the student shall be able to:

- Understand fundamental concepts in software testing, to identify software process, strategies to analyze the testing requirements.
- Obtain the knowledge on various types of software testing methods to develop suitable test cases by implementing best policies.
- Learn and demonstrate various software evaluation techniques and relationship of Software Quality Assurance to software life cycle.
- Comprehend the concepts related to Software Quality Attributes, Metrics.

Course Contents:

UNIT I: [15 Hours]

A perspective on Testing : Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Level of testing, Examples: Generalized pseudo code, The triangle problem, the Next Date function, The commission problem, The SATM (Simple Automation Teller Machine) problem, The currency converter, Saturn windshield wiper.

UNIT II: [12 Hours]

Boundary value testing, Equivalence class testing, Decision table based testing : Boundary value analysis, Robustness testing, Worst-case testing, special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for triangle problem, Next Date function and commission problem, Guidelines and observations, Decision tables, Test cases for triangle problem.

UNIT III: [15 Hours]

Path Testing, Data flow testing, Levels of Testing, Integration Testing : DD Paths, Test coverage metrics, Basis path testing, guidelines and observations, Definition Use testing, Slice based testing, Guidelines and observations. Traditional view of testing levels, Alternative life cycle models, the SATM systems, separating integration and system testing.case studies: Development of test cases using various software testing tools like UFT,SELENIUM etc.

UNIT IV: [10 Hours]

Software Quality, Maturity Models : Five views of software quality, McCall's quality and criteria, ISO 9126 Quality characteristics, Quality Metrics, ISO 9000:2000 Software Quality Standard, The

basic idea in Software Process, Capability Maturity Model, Test Process Improvement, Testing Maturity Model.

Text Books:
1. Paul C Jorgensen, "Software Testing A Craftsman's Approach", Aueredach publications, 3rd edition, 2011. **[Chapters: 1, 2, 5, 6, 7, 9, 10, 12, 13]**
2. KshirasagaraNaik, PriyadarshiTripathy: Software Testing and Quality Assurance, Wiley India 2012.[C**hapters 17 & 18]**

Reference Books:
1. Mauro Pezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012.
2. M.G.Limaye: Software Testing-Principels, Techniques and Tools – McGraw Hill, 2009.

SOFTWARE TESTING LAB

1. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Derive test cases for your program based on decision-table approach, execute the test cases and discuss the results.

2. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on boundary-value analysis, execute the test cases and discuss the results.

3. Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on equivalence class partitioning, execute the test cases and discuss the results.

4. Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results.

5. Design, develop, code and run the program in any suitable language to implement the NextDate function. Analyze it from the perspective of equivalence class value testing, derive different test cases, execute these test cases and discuss the test results.

M20CA3044	**The Internet Of Things**	L	T	P	C
Duration: 14 Weeks		3	0	1	4

Course Description: (3-4 lines-course aim and summary be added)

Internet of Things as a buzzword has caught the attention of all of us. This course will help you gain adequate knowledge on the Internet of Things. It helps the students to understand the potential of the Internet of Things for our society, in terms of impact on the lives of billions of people and on the world economy, understand the underlying technology that powers the Internet of Things, Challenges that comes with such technologies,real-life examples of IoT devices that are commercially available and the future of the Internet of Things and.Advanced topics will cover a selection of modern algorithms, many of which come from real-world applications.

Prerequisites:

Knowledge Analog and Digital Communication, Probability and Information Theory, fundamentals of Wireless communication

Course Objectives:

The objectives of this course are to:
- Discuss the basics of things in IoT
- Identify different IoT applications and their application areas.
- Explain the emerging field of wireless sensor networks, which consist of many tiny, low-power devices equipped with sensing, computation, and wireless communication capabilities.
- Describe operating systems, radio communication, networking protocols

Course Outcomes:

On successful completion of this course; the student shall be able to:

- Understand and analyze the usability of the IoTs across various real-world applications

- Analyze low-power devices equipped with sensing, computation, and wireless communication capabilities.
- Illustrate of environmental parameters measurement and monitoring by exposing participants to the comprehensive fundamentals of Smart Sensors and Internet of Things
- Understand the operating systems, radio communication, networking protocols and develop application with a programming language.

Course Contents:

UNIT I: [13 Hours]
Introduction to Internet of Things : Definition & Characteristics of IoT, Physical Design of IoT, Things in IoT, IoT Protocols, Logical Design of IoT, IoT Functional Blocks , Communication Models, ,
Domain Specific IoTs: Home Automation, Smart Cities, Smart Surveillance, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle.

UNIT II: [13 Hours]
Overview of Wireless Sensor Networks & Architectures: Architecture of Sensor MOTE, Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks. Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Gateway Concepts.

UNIT III: [13 Hours]
Networking Sensors : Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - S-MAC, the Mediation Device Protocol, Introduction of Routing Protocols.

UNIT IV: [13 Hours]
Advanced topics in IoT : Logical Design of IOT using Python, Introduction to Python, Basics of Programming with Rasphberry PI with PYTHON and Arduino Board , IOT Physical devices and end points. IoT Physical Servers & Endpoints, Introduction to cloud storage Models for IOT.

Text Books:
1. Internet of Things-An Hands on Approach- Vijay Madisetti (Author), ArshdeepBahga, 2014. (Chapter 1, 2, 5)
2. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 1st edition, 2005. (chapter 1 -5)

Reference Books:
1. FrancisDaCosta, Rethinking Internet of things, Apress Open Edition, 2013
2. Adrian McEwen, Hakim Cassimally, Design of Internet of Things, 2014 John Wiley and Sons, Ltd.

IOT -LAB

Design a IOT applications using Arduino/ Raspberrypi:
1. Agriculture
2. Traffic
3. Industry
4. Traffic Control
5. Educational System.

OPEN ELECTIVE

M20CA3050	Digital Marketing	L	T	P	C
Duration: 14 Weeks		4	0	0	4

Course Description: (3-4 lines-course aim and summary be added)

The Digital Marketing basic concepts and technologies used in the field of business and its Marketing. It involves comparing traditional marketing vs internet based marketing strategies. Marketing Goals achieved by search engine optimization, Digital marketing by making advertment using banner, ads, email, social media postings. Marketing and business strategies through pay per click and paid vs organic links in a website. Digital approaching through analyze, planning, develop, designing and content to achieve goals in business. Targeting the audience through various strategies and helping them in getting right things through email marketing and social media marketing.

Prerequisites:

The skills required to learn Digital Marketing is Social Media, Sales skills, ability to think objectively, drip marketing campaigns, a mix of creativity and analytical abilities

Course Objectives:

The objectives of this course are to:

- To develop industry background knowledge to knowledgeably navigate Internet Marketing topics including online advertising, search, social media, and online privacy.
- To evaluate an experiment quantitatively and qualitatively to measure the effectiveness of business decisions and online advertising effectiveness in particular.
- To design and implement an experiment.
- To apply best practices for social media marketing.

Course Outcomes:

On successful completion of this course; the student shall be able to:

- To identify the techniques involved in formulating the search engine optimization.
- To analyze and evaluate the process involved digital advertisement.
- To Design and develop the process involved in digital marketing using Email.
- To Analyze and interpret the techniques involved in social media marketing

Course Contents:

UNIT I: [15 Hours]
Introduction To Digital Marketing: Start with the Customer and Work Backward, What Are the 3i Principles? **Search Engine Optimization (Seo):** An Introduction, Search Engine Result Pages: Positioning, Search Behavior, Goals, On-Page Optimization, Off-Page Optimization, Analyze.

UNIT II: [15 Hours]
Pay Per Click: An Introduction, Goals, Setup, Manage, Analyze. **Digital Display Advertising :**An Introduction, Display Advertising: An Industry Overview, Define, Format, Configure, Analyze.

UNIT III: [12 Hours]
Email Marketing: An Introduction, Data—Email Marketing Process, Design and Content, Delivery, Discovery. **Mobile Marketing:**An Introduction, OpportUNITy, Optimize, Advertise, Analyze.

UNIT IV: [10 Hours]
Social Media Marketing (Smm): An Introduction, Goals, Channels, Implementation, Analyze, Laws and Guidelines.

Text Books:
1. Ian Dodson–" THE ART OF DIGITAL MARKETING : The Definitive Guide to Creating Strategic, Targeted and Measurable Online Campaigns",1st Edition, Wiley Publications, 2016. (Chapters : 1, 2, 3, 4, 5, 6, 7, 8, 9).

Reference Books:

1. Damian Ryan – "UNDERSTANDING DIGITAL MARKETING : Marketing Strategies for engaging the digital generation" 4th Edition, Kogan Page, 2017.
2. Ryan Deiss and Russ Henneberry – "DIGITAL MARKETING : For Dummies ", , John Wiley & Sons, Inc, 2017.
3. Alan Charlesworth – " DIGITAL MARKETING : A Practical Approach", 2nd Edition, Routledge, 2009.

M20CA3060	**Minor Project Using R /Python/Java**	L	T	P	C
Duration: 14 Weeks		2	0	4	6

Prerequisites:

Programming and logical skill set

Course Objectives:

To carry out the research under the guidance of supervisor and in the process learn the techniques of research.

Course Outcomes:

On successful completion of the project, the student shall be able to:

- Familiarize with literature search
- Conduct the experiments related to research and formulate computational techniques
- Interpret the primary data.
- Write report and defend the research findings.

PROJECT:

Each student or a group of maximum of 3 students will choose the topic of research and work under the guidance of allocated faculty member. The project shall preferably be application oriented or industry need based that could be useful to the society. In case of industry need based project or R & D project, the student may opt co-supervisor from the concerned industry / research institution as the case may be. The student will have to make a preliminary survey of research done in broad area of his/her area of interest and decide on the topic in consultation with his/her supervisor(s). The project work floated should be completed within 16 weeks and project report has to be submitted within the stipulated date by the University/ within 18 weeks whichever is earlier. The student has to meet the concerned supervisor(s) frequently to seek guidance and also to produce the progress of

the work being carried out. The student should also submit progress report during 5th week and 10th week of the beginning of the semester and final draft report with findings by 15th week. After the completion of the project the student shall submit project report in the form of dissertation on a specified date by the School.

FOURTH SEMESTER:

Sl No	Course Code	Title of the Course	Credit Pattern L:T:P:J	Credits
1	M20CA4010	Research/Technical paper	0:0:0:2	2
2	M20CA4020	Internship/ Certification	0:0:0:6	6
3	M20CA4030	Major Project	0:0:0:12	12
Total Credits				**20**

* Note:
1. Project Work and Dissertation will be mandatory of 12 Credits
2. The student can select either Internship (4 weeks) or Certification Course for 6 Credits.
3. All final year project students must write & publish a technical/Research paper based on their area of interest that carries 2 credit.

CAREER DEVELOPMENT AND PLACEMENT

Having a degree will open doors to the world of opportunities for you. But Employers are looking for much more than just a degree. They want graduates who stand out from the crowd and exhibit real life skills that can be applied to their organizations. Examples of such popular skills employers look for include:

1. Willingness to learn
2. Self motivation

3. Team work
4. Communication skills and application of these skills to real scenarios
5. Requirement of gathering, design and analysis, development and testing   skills
6. Analytical and Technical skills
7. Computer skills
8. Internet searching skills
9. Information consolidation and presentation skills
10. Role play
11. Group discussion, and so on

REVA University therefore, has given utmost importance to develop these skills through variety of training programs and such other activities that induce the said skills among all students. A full-fledged Career Counseling and Placement division, namely Career Development Center (CDC) headed by well experienced senior Professor and Dean and supported by dynamic trainers, counselors and placement officers and other efficient supportive team does handle all aspects of Internships and placements for the students of REVA University. The prime objective of the CDC is to liaison between REVA graduating students and industries by providing a common platform where the prospective employer companies can identify suitable candidates for placement in their respective organization. The CDC organizes pre-placement training by professionals and also arranges expert talks to our students. It facilitates students to career guidance and improves their employability. In addition, CDC forms teams to perform mock interviews. It makes you to enjoy working with such teams and learn many things apart from working together in a team. It also makes you to participate in various student clubs which helps in developing team culture, variety of job skills and overall personality.

The need of the hour in the field of Computer Science is not only knowledge in the subject, but also the skill to do the job proficiently, team spirit and a flavour of innovation. This kept in focus, the CDC has designed the training process, which will commence from second semester along with the curriculum. Special coaching in personality development, career building, English proficiency, reasoning, puzzles, and communication skills to every student of REVA University is given with utmost care. The process involves continuous training and monitoring the students to develop their soft skills including interpersonal skills that will fetch them a job of repute in the area of his / her interest and March forward to make better career. The School of Computer Science and Applications also has emphasised subject based skill training through lab practice, internship, project work,

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industry interaction and many such skilling techniques. The students during their day to day studies are made to practice these skill techniques as these are inbuilt in the course curriculum. Concerned teachers also continuously guide and monitor the progress of students.

The University has also established University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director to facilitate skill related training to REVA students and other unemployed students around REVA campus. The center conducts variety of skill development programs to students to suite to their career opportunities. Through this skill development centre the students shall compulsorily complete at least two skill / certification based programs before the completion of their degree. The University has collaborations with Industries, Corporate training organizations, research institutions and Government agencies like NSDC (National Skill Development Corporation) to conduct certification programs. REVA University has been recognised as a Centre of Skill Development and Training by NSDC (National Skill Development Corporation) under Pradhan Mantri Kaushal Vikas Yojana.

The University has also signed MOU's with Multi-National Companies, research institutions, and universities abroad to facilitate greater opportunities of employability, students' exchange programs for higher learning and for conducting certification programs.

Programme Regulations

Summary of REVA University Regulations for Choice Based Credit System (CBCS) and Continuous Assessment Grading Pattern (CAGP) for Post Graduate Degree Program

1.0 Teaching and Learning Process

The teaching and learning process under CBCS-CAGP of education in each course of study will have three components, namely-

(i) L= Lecture   (ii) T= Tutorial (iii) P= Practice, where:

L stands for **Lecture** session consisting of classroom instruction.

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T stands for **Tutorial** session consisting participatory discussion / self-study/ desk work/ brief seminar presentations by students and such other novel methods that make a student to absorb and assimilate more effectively the contents delivered in the Lecture classes.

P stands for **Practice** session and it consists of Hands on Experience / Laboratory Experiments / Field Studies / Case Studies that equip students to acquire the much required skill component.

2.0. A course shall have either or all the three components. That means a course may have only lecture component, or only practical component or combination of any two or all the three components.

2.1. Various course of s**tudy** are labeled and defined as: (i) Core Course (CC) (ii) Hard Core Course (HC), (iii) Soft Core Course (SC), (iv) Foundation Core Course (FC) and (v) Open Elective Course (OE).

(i)   **Core Course:** A course which should compulsorily be studied by a candidate as a core-requirement is termed as a Core course.

(ii)   **Foundation Course (FC):**

The foundation Course is a core course which should be completed successfully as a part of graduate degree program irrespective of the branch of study.

(iii)   **Hard Core Course (HC):**

The **Hard Core Course** is a Core Course in the main branch of study and related branch (es) of study, if any that the candidates have to complete compulsorily.

(iv)   **Soft Core Course (SC):**

A Core course may be a **Soft Core** if there is a choice or an option for the candidate to choose a course from a pool of courses from the main branch of study or from a sister/related branch of study which supports the main branch of study.

(v)   O**pen Elective Course:**

An elective course chosen generally from other discipline / subject, with an intention to seek exposure is called an O**pen Elective Course.**

2.2. Project Work:

Project work is a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem.

2.3. Minor Project:

A project work up to **Six to Eight credits** is called **Minor Project** work. A Minor Project work may be a hard core or a Soft Core as decided by the BOS / concerned.

2.4. Major Project / Dissertation:

A project work of **EIGHT, TEN, TWELVE, SIXTEEN or TWENTY** credits is called **Major Project** work. The Major Project / Dissertation shall be Hard Core.

3.0. Minimum Credits to be earned:

3.1. A candidate has to earn 102 credits for successful completion of MCA degree with a distribution of credits for different courses as prescribed by the university.

3.2. A candidate can enroll for a maximum of 32 credits per Semester. However he / she may not successfully earn a maximum of 32 credits per semester. This maximum of 32 credits does not include the credits of courses carried forward by a candidate.

3.3. Only such full time candidates who register for a minimum prescribed number of credits in each semester from I semester to IV semester and complete successfully 102 credits in 4 successive semesters shall be considered for declaration of Ranks, Medals, Prizes and are eligible to apply for Student Fellowship, Scholarship, Free ships, and such other rewards / advantages which could be applicable for all full time students and for hostel facilities.

4.0. Add- on Proficiency Certification:

In excess to the minimum of 102 credits for the MCA program, a candidate can opt to complete a minimum of 4 extra credits either in the same discipline/subject or in different discipline / subject to acquire **Add on Proficiency Certification** in that particular discipline / subject along with the MCA degree.

4.1. Add on Proficiency Diploma:

In excess to the minimum of 102 credits for the MCA program, a candidate can opt to complete a minimum of 18 extra credits either in the same discipline/subject or in different discipline / subject to acquire Add on Proficiency Diploma in that particular discipline / subject along with the MCA. The A**dd -on Proficiency Certification / Diploma** so issued to the candidate contains the courses studied and grades earned.

5. Scheme of Assessment & Evaluation

5.1.The Scheme of Assessment and Evaluation will have **TWO PARTS**, namely;

> i.   Internal Assessment (IA); and
> ii.   Semester End Examination (SEE)

5.2. Assessment and Evaluation of each Course shall be for 100 marks. The Internal Assessment (IA) and Semester End Examination (SEE) of PG programs shall carry 50 marks each (i.e., 50 marks internal assessment; 50 marks semester end examination).

5.3. The 50 marks of Internal Assessment (IA) shall comprise of:

Internal Test	= 30 marks
Assignments	= 10 marks
Presentations / Quizzes / Case studies	= 10 marks

5.4. There shall be two internal tests conducted as per the schedule given below. The students have to attend all the two tests compulsorily.

- 1st test for 15 marks at the end of 8th week of the beginning of the Semester; and
- 2nd test for 15 marks at the end of the 16th week of the beginning of the Semester; and

5.5. The coverage of syllabus for the said three tests shall be as under:
- For the 1st test syllabus shall be 1st and 2nd unit of the course;
- For the 2nd test it shall be 3rd and 4th unit;

5.6. There shall be two Assignments and two Presentations / Quizzes / Case studies each carrying 5 marks. Hence two assignments carry 10 marks (5+5 marks) and two Presentations / Quizzes / Case studies carry 10 marks (5+5 marks) as stated at Sl.No.5.3 above. In place of assignments and seminars, there shall be model designs or some task based activity wherein the number of designs/ activity the marks each design / activity carries shall be decided by the respective School Board. However such decision shall be done well in advance and it should be announced before commencement of the Semester after communicating the same to the Registrar and Registrar (Evaluation) to avoid ambiguity and confusion among students and faculty members.

5.8. The Semester End Examination for 50 marks shall be held during 19th and 20th week of the beginning of the semester and **the syllabus for the semester end examination shall be entire 4 units**.

5.9. The **duration of the internal test shall be 75 minutes and for semester end examination the duration shall be 3 hours.**

5.10. There shall be double evaluation, viz, first valuation by the internal teachers who have taught the subject and second evaluation shall be the external examiner.

5.11. The average of the two evaluations (internal examiner & external examiner) shall be the marks to be considered for declaration of results.

<u>Summary of Continuous Assessment and Evaluation Schedule</u>

Type of Assessment	Period	Syllabus	Marks	Activity
First Test	8th Week	1st and 2nd Units	15	Consolidation of 1st and 2nd Unit
Allocation of Topics for Assignments	-	First Unit and second unit		Instructional process and Continuous Assessment
Submission of Assignments	-	First Unit and second unit	5	Instructional process and Continuous Assessment
Presentations / Quizzes/Case studies	-	First Unit and second unit	5	Instructional process and Continuous Assessment
Second Test	16th Week	Third unit and Fourth unit	15	Consolidation of 3rd and 4th Unit
Allocation of Topic for 2nd Assignment	-	2nd half of second unit and 3rd Unit		Instructional process and Continuous Assessment
Submission of Assignments	-	2nd half of second unit and 3rd Unit	5	Instructional process and Continuous Assessment
Presentations / Quizzes / Case studies	-	2nd half of second unit and 3rd Unit	5	Instructional process and Continuous Assessment
Semester End Practical Examination	17th Week	Entire syllabus	50	Conduct of Semester - end Practical Exams
Preparation for Semester–End Exam	16th & 17th Week	Entire Syllabus		Revision and preparation for semester–end exam
Semester End Theory Examination	18th Week & 19th Week	Entire Syllabus	50	Evaluation and Tabulation
	End of 20th Week			Notification of Final Grades

Note:

1. *As per the model making is concerned, the School shall decide about the Marks and the Number of Model Designs and as well the schedule of allocation and presentation of model design(s). If the model design carries 5 marks, there shall be two model designs; and in case of 10 marks, there shall be one model design. However, the decision of the School should be announced in the beginning of the Semester for students to avoid ambiguity and confusion.*

2. *Examination and Evaluation shall take place concurrently and Final Grades shall be announced latest by 5 day after completion of the examination.*

3. Practical examination wherever applicable shall be conducted after 2nd test and before semester end examination. The calendar of practical examination shall be decided by the respective School Boards and communicated well in advance to the Registrar (Evaluation) who will notify the same immediately.

6.   Assessment of Performance in Practicals

6.1.   The performance in the practice tasks / experiments shall be assessed on the basis of:

a) Knowledge of relevant processes;

b) Skills and operations involved;

c) Results / products including calculation and reporting

6.2. The 50 marks meant for continuous assessment of the performance in carrying out practical

shall further be allocated as under:

i	Conduction of regular practical / experiments throughout the semester	20 marks
ii	Maintenance of lab records	10 marks
iii	Performance of mid-term test (to be conducted while conducting second test for theory courses); the performance assessments of the mid-term test includes performance in the conduction of experiment and write up about the experiment.	20 marks
	Total	**50 marks**

6.3. The 50 marks meant for Semester End Examination, shall be allocated as under:

i	Conduction of semester end practical examination	30 marks
ii	Write up about the experiment / practical conducted	10 marks
iii	Viva Voce	10 marks
	Total	**50 marks**

6.4.   The duration for semester-end practical examination shall be decided by the concerned School Board.

7.   Evaluation of Minor Project / Major Project / Dissertation:

Right from the initial stage of defining the problem, the candidate has to submit the progress reports periodically and also present his/her progress in the form of seminars in addition to the regular discussion with the supervisor. At the end of the semester, the candidate has to submit final report of the project / dissertation, as the case may be, for final evaluation. The components of evaluation are as follows:

i	Periodic Progress and Progress Reports (25%)
ii	Results of Work and Draft Report (25%)
iii	Final Evaluation and Viva-Voce (50%). Evaluation of the report is for 30% and the Viva-Voce examination is for 20%.

8. Provision for Appeal

If a candidate is not satisfied with the evaluation of Internal Assessment components (Mid-term Tests and Assignments), he/she can approach the grievance cell with the written submission together with all facts, the assignments, test papers etc, which were evaluated. He/she can do so before the commencement of respective semester-end examination. The grievance cell is empowered to revise the marks if the case is genuine and is also empowered to levy penalty as prescribed by the university on the candidate if his/her submission is found to be baseless and unduly motivated. This cell may recommend taking disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the grievance cell is final.

For every program there will be one grievance cell. The composition of the grievance cell is as follows:-

- The Registrar (Evaluation) - Ex-officio Chairman / Convener
- One Senior Faculty Member (other than those concerned with the evaluation of the course concerned) drawn from the school / department/discipline and/or from the sister schools / departments/sister disciplines – Member.
- One Senior Faculty Members / Subject Experts drawn from outside the University school / department – Member

9.0 Eligibility to Appear for Semester - end Examination.

Only those students who fulfill a minimum of 75% of attendance in aggregate of all courses including practical courses / field visits etc, as part of the program shall be eligible to appear for Semester End Examination.

10. Requirements to Pass a Course / Semester and Provision to Drop / withdraw Course

10.1 **Requirements to Pass a Course**

A candidate's performance from IA and SEE will be in terms of scores, and the sum of IA and SEE scores will be for a maximum of 100 marks (IA = 50 + SEE = 50) and have to secure a minimum of 40% to declare pass in the course. However, a candidate has to secure a minimum of 25% (12 marks) in Semester End Examination (SEE) which is compulsory.

10.2. **Requirements to Pass a Semester**

To pass the semester, a candidate has to secure minimum of 40% marks in each subject / course of study prescribed in that semester.

10.3. **Provision to Carry Forward the Failed Subjects / Courses:**

A student who has failed in a given number of courses in odd and even semesters shall move to next semester of immediate succeeding year and final year of the study. However, he / she shall have to clear all courses of all semesters within the double duration, i. e., within **four years** of admission of the first semester failing which the student has to re-register to the entire program.

10.4. **Provision to Withdraw Course:**

A candidate can withdraw any course within ten days from the date of notification of final results. Whenever a candidate withdraws a course, he/she has to register for the same course in case it is hard core course, the same course or an alternate course if it is Soft Core Course or Open Elective Course.

A DROPPED course is automatically considered as a course withdrawn.

11. Re-Registration and Re-Admission:

11.1. A candidate's class attendance in aggregate of all courses in a semester is less than 75% or as stipulated by the University and is considered as dropped the semester and is not allowed to appear for Semester End Examination (SEE) shall have to seek re-admission to that semester during subsequent semester / year within a stipulated period.

11.2 In such a case where in a candidate drops all the courses in a semester due to personal reasons, it is considered that the candidate has dropped the semester and he / she shall seek re-admission to such dropped semester.

12. Attendance Requirement:

   a.   All students must attend every lecture, tutorial and practical classes.

   b. In case a student is on approved leave of absence (e g:- representing the university in sports, games or athletics, placement activities, NCC, NSS activities and such others) and / or any other such contingencies like medical emergencies, the attendance requirement shall be minimum of 75% of the classes taught.

   c. Any student with less than 75% of attendance in a course in aggregate during a semester shall not be permitted to appear to the end semester (SEE) examination.

   d. Teachers offering the courses will place the above details in the School / Department meeting during the last week of the semester, before the commencement of SEE, and

subsequently a notification pertaining to the above will be brought out by the Head of the School before the commencement of SEE examination. A copy of this notification shall also be sent to the office of the Registrar & Registrar (Evaluation).

13. **The Grade and the Grade Point:**

The Grade and the Grade Point earned by the candidate in the subject will be as given below.

Marks P	Grade G	Grade Point (GP=V x G)	Letter Grade
90 >100	10	v*10	O
80 > 90	9	v*9	A+
70 > 80	8	v*8	A
60 > 70	7	v*7	B+
55 > 60	6	v*6	B
50 > 55	5.5	V*5.5	C+
40 > 50	5	v*5	C
0-40	0	v*0	F
ABSENT			AB

O - Outstanding; A+-Excellent; A-Very Good; B+-Good; B-Above Average; C+-Average; C-Satisfactory; F – Unsatisfactory.

Here, P is the percentage of marks (P=[IA + SEE]) secured by a candidate in a course which is **rounded to nearest integer**. V is the credit value of course. G is the grade and GP is the grade point.

14. **Provisional Grade Card:**

The tentative / provisional Grade Card will be issued by the Registrar (Evaluation) at the end of every Semester indicating the courses completed successfully. The provisional grade card provides **Semester Grade Point Average** (SGPA). This statement will not contain the list of DROPPED / WITHDRAWN courses.

14.1 Computation of SGPA

The Following procedure to compute the Semester Grade Point Average (SGPA)

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses

undergone by a student in a given semester, i.e : **SGPA (Si) = ∑(Ci x Gi) / ∑Ci** where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

15. **Challenge Valuation:**

A student who desires to apply for challenge valuation shall obtain a Xerox copy of the answer script by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the Grade awarded to him/her by surrendering the Grade Card and by submitting an application along with the prescribed fee to the Registrar (Evaluation) within 10 days after the announcement of the results. **This challenge valuation is only for Semester End Examination (SEE) component.**

b. **The answer scripts for which challenge valuation is sought for shall be evaluated by another external examiner (third examiner) who has not involved in the first evaluation. The higher of two marks from the average of first two valuations and challenge valuation shall be the final.**

16. **Final Grade Card:**

Upon successful completion of MCA degree a Final Grade card consisting of Grades / CGPA of all courses successfully completed by the candidate shall be issued by the Registrar (Evaluation).

16.1. Cumulative Grade Point Average (CGPA):

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits (102) for MCA degree is calculated taking into account all the courses undergone by a student over all the semesters of a program, i.e.,

CGPA = ∑(Ci x Si) / ∑Ci Where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

CONVERSION OF GRADES INTO PERCENTAGE:

Conversion formula for the conversion of CGPA into Percentage is:

Percentage of marks scored = CGPA Earned x 10

Illustration: CGPA Earned 8.93 x 10=89.30

17. Classification of Results

The final grade point (FGP) to be awarded to the student is based on CGPA secured by the candidate and is given as follows.

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CGPA	Grade (Numerical Index) G	Letter Grade	Performance	FGP Qualitative Index
9 >= CGPA 10	10	O	Outstanding	Distinction
8 >= CGPA < 9	9	A+	Excellent	Distinction
7 >= CGPA < 8	8	A	Very Good	First Class
6 >= CGPA < 7	7	B+	Good	First Class
5.5> = CGPA < 6	6	B	Above average	Second Class
> 5 CGPA < 5.5	5.5	C+	Average	Second Class
> 4 CGPA <5	5	C	Satisfactory	Pass

Overall percentage=10*CGPA

18. With regard to any specific case of ambiguity and unsolved problem, the decision of the Vice-Chancellor shall be final.

REVA UNIVERSITY
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