REVA UNIVERSITY
Bengaluru, India

School of Computing and Information Technology

B.Tech. Computer Science and Information Technology

2019-23 Batch

HANDBOOK

Rukmini Knowledge Park
Kattigenahalli, Yelahanka, Bengaluru – 560064
www.reva.edu.in

SCHOOL OF COMPUTING ANDINFORMATION TECHNOLOGY

B.Tech Computer Science & InformationTechnology

Handbook

2019-2023

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Yelahanka, Bangalore - 560 064
Phone No: +91-080-46966966

Rukmini Educational
Charitable Trust

www.reva.edu.in

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 ofopportunity. 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 tobe 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. 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. S. Y. Kulkarni
Vice-Chancellor, REVA University

Director Message

I Congratulate and welcome all the students to the esteemed School of Computing and Information Technology (C &IT). You are in the right campus to become a computer technocrat. With the rising needs ofautomation and better living for the humanity, computer software and hardware technologies are rapidly developing, thus giving scope to generate more human resources in the areas of computers and IT. The B Tech and M Tech Curriculum in the School are designed to cater to the requirements of industry and society.The curriculum is designed meticulously in association with persons from industries (TCS, CISCO,MPHASIS, etc.), academia and research organizations (IISc, IIIT, Florida University, Missouri S & T University, etc).

This handbook presents the B Tech Curriculum. The course is of 4 years duration and split into 8 semesters. A student has to earn 192 credits to obtain the award, where credits are spread across the semesters. These credits are split among foundation core, hard core, and soft core courses. Soft core courses provide flexibility to students to choose the options among several courses as per the specialization, such as, Data Engineering, System Design and Computing, applications of computing, Software systems, Communication / Networking are taught in first two and half years. Later, advanced courses are introduced in subsequent semesters for pursuing specialization. The Curriculum caters to local, national, regional and global developmental needs. Maximum number of courses are integrated with cross cutting issues relevant to professional ethics, global needs, human values, environment and sustainability. The courses also focus on innovation, skill development and entrepreunership.

The important features of the B Tech CS & IT are as follows:

1. Choice based course selection and teacher selection.
2. Studies in emerging areas like Machine Learning, Artificial Intelligence, Big-Data and Data Analytics, Cloud Computing, Python/R Programming, IoT and Cybersecurity,Advanced Java, Network security,Mobile Application development, Advanced Web Technology, Augmented and Virutal Reality,Block chain technology and computer vision.
3. Short and long duration Internships.
4. Community to pursue MOOC course as per the interest.
5. Attain global and skill certification as per the area of specialization.
6. Self-learning components.
7. Experiential, Practice, Practical, and project based learning.
8. Mini projects and Major projects.
9. Soft skills and Skill development courses.

The School has well qualified faculty members in the areas of foundations of computer science and information technology, like computer networks, image processing, pattern recognition, Big Data and Data Analytics, Data Mining, Machine learning, artificial intelligence, cybersecurity, IoT, cloud computing, Java, Web Technology, Mobile Application development, Data Compression and software systems, Virutalization, Wireless Sensor and Mobile networks, High Performance Computing. There are several state of art laboratories for the purposes of academics and research activities in the aforementioned areas of Computer Science and Information Technology.

Prof. Sunilkumar S. Manvi
Director, School of Computing and IT

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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, setup 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 15,000+ 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 27thFebruary, 2013. The University is recognised by UGC under Sec 2 (a) and empowered under Sec.22 of the UGC Act, 1956 to award degrees in any branch of knowledge. 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 27 Post Graduate Degree programs, 29 Degree and PG Degree programs in various branches of studies and has 15000+ students studying in various branches of knowledge at graduate and post graduate level and 494 Scholars pursuing research leading to PhD in 24 disciplines. It has 900+ 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, Counsellors 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 recognized 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 REVOTSAVA 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 rightspirit, 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 prizesin 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 organises yoga camps for villagers around.

Within short span of time, REVA University has been recoged as a fast growing university imparting quality higher education to the youth of the country ans received many awards, ranks, and accolades from various agencies, institutions at national and international level. These include: Asia'sGreatest Brand and Leaders, by Asia One, National Award of Leadership Excellence, by Assocham India, Most promising University, by EPSI, Promising Upcoming Private University in the Country, by The Economic Times, Best University of India (South), by Dialogue India, Gold Brand by QS University Ranking, placed under 151-200 band by NIRF, 6^{TH} Rank in the Super Excellence category by GHRDC, 6^{TH} Rank in All India Law School Survey, ranked among Top 30 Best B Schools by Business World, India's Best Law Institution by Careers 360, to mention a few.

About School of Computing and Information Technology (C & IT)

The School has a rich blend of experienced and energetic faculty who are well-qualified in various aspects of computing and information technology apart from the numerous state-of-the-art digital classrooms and laboratories having modern computing equipment. The school offers following two full-time undergraduate programs: B Tech in Computer Science and Engineering and B Tech in Computer Science and Information Technology and the following three postgraduate programs: M Tech in Data Science, M Tech in Computer Networks and Engineering and M Tech in Computer Science and Engineering (Both Full-time and Part-time). In addition, the school has a unique academic collaboration with the University of Alabama in Huntsville to jointly offer an MS program in Computer Science. In addition, the school has a research center in which students can conduct cutting edge research leading to a PhD degree.

Curricula of both undergraduate and postgraduate programs have been designed through a collaboration of academic and industry experts in order to bridge the growing gap between industry and academia. This makes the program highly practical-oriented, and thus industry-resilient. The B Tech programs aim to createquality human resources to play leading roles in the contemporary, competitive industrial and corporate world. The masters' degrees focus on quality research and design in the core and application areas of computing to foster a sustainable world and to enhance the global quality of life by adopting enhanced design techniques and applications. This thought is reflected in the various courses offered in the masters' programs. Following are the vision, mission, program educational objectives and program outcomes.

Vision

To create a pool of high-caliber technologists and researchers in computer science and information technology who have potential to contribute to the development of the nation and the society with their expertise, skills, innovative problem-solving abilities and strong ethical values.

Mission

- Create a center of excellence where new ideas flourish and from which emerge tomorrow's researchers, scholars, leaders and innovators.
- Provide quality education in both theoretical and applied foundations of computer science, information technology and related inter-disciplinary areas and to train students to effectively apply the education to solve real-world problems.
- Amplify students' potential for life-long high-quality careers and give them a competitive advantage in the ever-changing and challenging global work environment of the 21st century.
- Forge research and academic collaboration with industries and top global universities in order to provide students with greater opportunities.
- Support the society by encouraging and participating in technology transfer.

Advisory Board

Sl. No.	Name and Designation of the Members
1.	Mr. Himesh Misra, Program Director, IBM Innovation Center, IBM India Private Limited Bengaluru-560017
2.	Dr. Rajkumar Buyya, Director, Cloud Computing and Distributed Systems Laboratory Department of Computing and Information Systems University of Melbourne, Australia
3.	Mr. Nagaraj Kulkarni, Director, COMPEGENCE, Bengaluru
4.	Dr. Venkatesulu Dondeti, Group Head, Wipro Technologies Sholinganallur, Chennai
5.	Dr. Rabi N Mahapatra, Professor, Department of CS&E Texas A&M University, College Station, USA
6.	Dr. Heggere S Ranganath, Professor and Chair, Computer Science Department University of Alabama in Huntsville Huntsville, AL 35899, USA
7.	Mr. Mrityunjay Hiremath, Director, AMD Inc. USA, Bengaluru
8.	Dr. Manjunath Joshi, Professor Dheerubhai Ambani Institute of Information and Communication Technology Gandhinagar
9.	Dr. K. Gopinath, Professor, Dept. of Computer Science and Automation IISc., Bengaluru
10.	Dr. S. S. Iyengar, Professor, Louisiana State University (LSU), USA.

B. Tech (Computer Science & Information Technology) Program

Programme Overview

Computer Science and Information Technology (CS & IT) encompasses a variety of topics that relates to computation and applications of computing like, development of algorithms, analysis of algorithms, programming languages,software design, computer hardware, e-commerce, business information technology, Data Analytics, Machine Learning, Block Chain Technology, Augmented Virtual Reality, Mobile Application Development, IoT, Wireless Sensor network, Web Technology.

Computer Science and Information Technology (CS & IT) has roots in electrical engineering, mathematics, and linguistics. In the past Computer Science and information science were taught as part of mathematics or engineering departments and in the last 3 decades they are emerged as separate engineering fields. In the present information era (Knowledge era), the computer science and information technology program will see an exponential growth as the future machines work on artificial intelligence.

The oldest known complex computing device, called the Antikythera mechanism, dates back to 87 B.C., to calculate astronomical positions and help Greeks navigate through the seas. Computing took another leap in 1843, when English mathematician Ada Lovelace wrote the first computer algorithm, in collaboration with Charles Babbage, who devised a theory of the first programmable computer. But the modern computing-machine era began with Alan Turing's conception of the Turing Machine, and three Bell Labs scientists invention of the transistor, which made modern-style computing possible, and landed them the 1956 Nobel Prize in Physics. For decades, computing technology was exclusive to the government and the military; later, academic institutions came online, and Steve Wozniak built the circuit board for Apple-1, making home computing practicable. On the connectivity side, Tim Berners-Lee created the World Wide Web, and Marc Andreessen built a browser, and that's how we came to live in a world where our glasses can tell us what we're looking at. With wearable computers, embeddable chips, smart appliances, and other advances in progress and on the horizon, the journey towards building smarter, faster and more capable computers is clearly just beginning.

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 computer science and information techonology graduates are plenty and growing. Programming and software development, Data Scientists, Data Analysts, 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 Computing and Information Technology at REVA UNIVERSITY offers B. Tech., Computer Science and information technology, an undergraduate programme to create motivated, innovative, creative and thinking graduates to fill ICT positions across sectors who can conceptualize, design, analyse, and develop ICT applications to meet the modern day requirements.

The B. Tech. in Computer Science and Information Technology curriculum developed by the faculty at the School of Computing and Information Technology, is outcome based and it comprises required theoretical concepts and practical skills in the domain. By undergoing this programme, students develop critical, innovative, creative thinking and problem solving abilities for a smooth transition from academic to real-life work environment. In addition, students are trained in interdisciplinary topics and attitudinal skills to enhance their scope. The above mentioned features of the programme, advanced teaching and learning resources, and experience of the faculty members with their strong connections with ICT sector makes this programme unique.

Program Educational Objectives (PEO's)

After few years of graduation, the graduates of B. Tech CS&IT will:

- **PEO-1:** Pursue higher education in the core or allied areas of Computer Science and Information Technology.
- **PEO-2:** Have technical career in the core or allied areas of Computer Science and Information Technology or start entrepreneurial activity for the growth of the economy.
- **PEO-3:** Continue to learn and to adapt to ever changing technologies in the core or allied areas of Computer Science and Information Technology.

Program Outcomes (PO's)

On successful completion of the program, the graduates of B. Tech CS & IT program will be able to:

- **PO-1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals for the solution of complex problems in Computer Science and Engineering.
- **PO-2: Problem analysis:** Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.
- **PO-3: Design/development of solutions:** Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO-4: Conduct investigations of complex problems:** Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO-5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **PO-6: The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **PO-7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO-8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- **PO-9: Individual and team work:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
- **PO-10: Communication:** Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.
- **PO-11: Project management and finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.
- **PO-12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO's)

On successful completion of the program, the graduates of B. Tech CS & IT program will be able to:

- **PSO-1:** Apply the knowledge of mathematics, Computer Science and Information Technology to solve complex problems in CS and IT.
- **PSO-2:** Analyze, design, develop solutions and conduct investigations in the domains of database, networks and security, system software and system administration.
- **PSO-3:** Apply appropriate techniques, use modern programming languages, tools, and packages for quality software development.

B Tech (Computer Science & Information Technology) Program

Scheme of Instruction

(effective from Academic Year 2019-2020)

Sl. No	Course Code	Course Title	Course Type	Credit Pattern and Value					Weekly Contact Hours	Teaching School/ Dept.
				L	T	P	J	C		
FIRST SEMESTER:										
1	B19IT1010	Multivariable Calculus and Linear Algebra	HC	4	0	0	0	4	4	CIT/Mat
2	B19IT1020	Chemistry	HC	3	0	0	0	3	3	Chemistry
3	B19IT1030	Problem Solving with Programming	HC	3	0	0	0	3	3	CIT
4	B19IT1040	Basic Electrical and Electronics Engineering	HC	4	0	1	0	5	6	EE
5	B19IT1050	Environmental Science	FC	2	0	0	0	2	2	Chemistry
6	B19IT1060	Technical English-1	FC	0	0	2	0	2	4	Arts and Humanities
7	B19IT1070	Problem Solving with Programming Lab	HC	0	0	2	0	2	2	CIT
8	B19IT1080	Chemistry Lab	HC	0	0	2	0	2	2	Chemistry
9	B19IT1090	Skill Development-1	HC	0	0	0	0	1	2	UIIC/CIT
Total								**24**	**28**	
Note: 1) Workshop lab and Mechanical Engineering Labs, Civil Engineering labs along with building construction techniques to be introduced to students by having one day tour to such schools. (2) Industrial visits will be organized for a day to Public/Private Sectors in Bengaluru.										
SECOND SEMESTER:										
1	B19IT2010	Probability and Statistics	HC	4	0	0	0	4	4	CIT/Mat
2	B19IT2020	Physics	HC	3	0	0	0	3	3	Physics
3	B19IT2030	Python Programming	HC	3	0	0	0	3	3	CIT
4	B19IT2040	Technical English-2	FC	0	0	2	0	2	4	Arts & Humanities
5	B19IT2050	Indian Constitution and Professional Ethics	FC	2	0	0	0	2	2	Law
6	B19IT2060	Computer Aided Engineering Drawing Lab	HC	0	0	2	0	2	4	ME
7	B19IT2070	Python Programming and Applications Lab	HC	0	0	2	0	2	2	CIT
8	B19IT2080	Physics Lab	HC	0	0	2	0	2	2	Physics
9	B19IT2X10	Skill Development-2	HC	0	0	0	0	1	2	UIIC/CIT
10	B19IT2X20	Sports/Yoga/Music/Dance/Theatre	RULO	0	0	2	0	2	2	Others
Total								**23**	**28**	
Note: (1) Industrial visits may be organized for a day to Public/Private Sectors in Bengaluru. (2) All the students must										

participate in a Mini Project Exhibition (Application of Programming Skills to Solve the Problems) and Hackathon (Coding Skills based on C/C++); Synopsis of project to be submitted before IA 1.

THIRD SEMESTER

1	B19IT3010	Digital Logic Design	HC	3	0	1	0	4	5	CIT
2	B19IT3020	Computer Organization and Architecture	HC	3	0	0	0	3	3	CIT/ECE
3	B19IT3030	Object Oriented Programming with Java	HC	3	0	0	0	3	3	CIT
4	B19IT3040	Data Structures	HC	3	0	0	0	3	3	CIT
5	B19IT3050	Discrete Mathematics and Graph Theory	HC	3	0	0	0	3	3	CIT/Mat
6	B19IT3060	Software Engineering	HC	3	0	0	0	3	3	CIT
7	B19IT3070	Data Structures Lab	HC	0	0	2	0	2	2	CIT
8	B19IT3080	Object Oriented Programming with Java Lab	HC	0	0	2	0	2	2	CIT
9		Skill Development-3	HC	0	0	0	1	1	2	UIIC/CIT
10	B19IT3X10	Soft Skills-1	HC	0	0	2	0	2	2	Placement
Total								**26**	**28**	

Note: (1) Awareness workshop on free and open source tools and commercial tools for Computer Science and Engineering application development has to be conducted. (2) Industrial visits may be organized for a day to Public/Private Sectors in Bengaluru. (3) MOOCs/Global Certification on Java Programming which will be considered as an assignment for Programming with Java-(B19IT3030)

FOURTH SEMESTER :

1	B19IT4010	Design and Analysis of Algorithms	HC	3	0	0	0	3	3	CIT
2	B19IT4020	Information and Communication Theory	HC	3	0	0	0	3	3	CIT
3	B19IT4030	Database Management System	HC	3	0	1	0	4	5	CIT
4	B19IT4040	Operating Systems	HC	3	0	1	0	4	5	CIT
5	B19IT405X	Soft core -1 (SC-1)	SC	-	-	-	-	3	3	CIT
6	B19IT4060	Unix Programming Lab	HC	0	0	2	0	2	2	CIT
7	B19IT4070	IoT Lab	HC	0	0	2	0	2	2	CIT
8	B19IT4080	Skill Development-4	HC	0	0	0	1	1	2	UIIC/CIT
9	B19IT4X10	Soft Skills-2	HC	0	0	2	0	2	2	Placement
Total								**24**	**27**	

Note: (1) All students must participate in a Miniproject Exhibition and Hackathon; Synopsis of the project must be submitted before IA 1. (2) Industrial visits may be organized for a day to Public/Private Sectors in Bengaluru. (2) MOOCs/Global Certification on Data Structures and Algorithms or DAA which will be considered as an assignment for Design and Analysis of Algorithms (B19IT4010).

FIFTH SEMESTER										
1	B19IT5010	Computer Networks	HC	3	0	0	0	3	3	CIT
2	B19IT5020	Cloud Computing and Big Data	HC	3	0	0	0	3	3	CIT
3	B19IT5030	Web Application Development	HC	3	0	0	0	3	3	CIT
4	B19IT5040	Machine Learning	HC	3	0	0	0	3	3	CIT
	B19IT505X	Softcore - 2 (SC-2)	SC	-	-	-	-	3	3	CIT
5	B19IT506X	Softcore - 3 (SC-3)	SC	-	-	-	-	3	3	CIT
6	B19IT5070	Web Application Development Lab	HC	0	0	2	0	2	2	CIT
7	B19IT5080	Machine Learning Lab	HC	0	0	2	0	2	2	CIT
8	B19IT5090	Skill Development -5	HC	0	0	0	1	1	2	UIIC/CIT
9	B19IT5X10	Soft Skills-3	HC	0	0	2	0	2	2	Placement
Total								**25**	**26**	

Note:
(1) Industrial visits may be organized for a day to Public/Private Sectors in Bengaluru. (2) MOOCs/Global Certification on cloud computing which will be considered as an assignment for Cloud Computing and Big Data (B19IT5020). (3) Miniproject should be done by a group of 3-4 members; Synopsis must be submitted before IA 1.

SIXTH SEMESTER										
1	B19IT6010	Artificial Intelligence	HC	4	0	0	0	4	4	CIT
2	B19IT6020	Business Intelligence and Process Management	HC	4	0	0	0	4	4	CIT
3	B19IT6030	Information and Network Security	HC	4	0	0	0	4	4	CIT
4	B19IT604X	Softcore - 4 (SC-4)	SC	-	-	-	-	4	4	CIT
5	B19IT605X	Softcore - 5 (SC-5)	SC	-	-	-	-	4	4	CIT
6	B19IT606X	Softcore - 6 (SC-6)	SC	-	-	-	-	4	4	CIT
7	B19IT607X	Softcore - 7 (SC-7)	SC	-	-	-	-	4	4	CIT
8	B19IT6080	Skill Development-6	HC	0	0	0	1	1	2	UIIC/CIT
9	B19IT6090	Soft Skills-4	HC	0	0	1	0	1	2	Placement
Total								**30**	**33**	

Note:
(1) All students must participate in a Mini-project exhibition and Hackhathon: Synopsis to be submitted in fifth semester.
(2) Industrial visits may be organized for a day to Public/Private Sectors in Bengaluru. (3) MOOCs/Global Certification on AI (or Relevant Titles) which will be considered as an assignment for Artificial Intelligence (B19IT6010)

SEVENTH SEMESTER										
1	B19IT7031	Open Elective	OE	3	-	-	-	3	3	CIT
2	B19IT704X	Softcore - 8 (SC-8)	SC	4	-	-	-	4	4	CIT
3	B19IT705X	Softcore - 9 (SC-9)	SC	4	-	-	-	4	4	CIT
4	B19IT8010	Internship/Skill Development /Global Certification Program / MOOC	HC	-	-	-	-	6	6	CIT/others
5	B19IT7080	Project Work and Dissertation Phase 1	HC				1	5	5	CIT
Total								**22**	**22**	
Note: (1) The project work phase-1 of project dissertation of 8th semester will begin in 7th semester, where student has to form a project group and perform literature survey and define the problem, identify tools and technologies to be used. (2) Options for 8th semester must be selected in 7th semester. (3) Open Electives, namely 'Internet Computing & Applications' and 'Data Structures with C' are offered for students belonging to Schools other than Computing and Information Technology. The students of B.Tech in Computer Science and Engineering shall have to choose one of the Open Electives offered by any other School.										
EIGHTH SEMESTER:										
1	B19IT803X	Softcore-10 (SC-10)	SC	4				4	4	CIT
2	B19IT8020	MOOC	HC	4				4	4	CIT
3	B19IT8040	Project Work and Dissertation Phase-2	HC	-	-	-	10	10	10	CIT
Total								**18**	**18**	
Total Credits for all Eight Semesters:								**192**	**192**	
Note: (1) Internship must be for atleast 2 months to be considered for 6 credits. Internships abroad will also be considered for the credits. (2) Global certification program students must obtain a certificate to attain 85 to 100% marks based on relative performance. If not eligible for certificate, they will have to undergo examination at school level for 80% marks, and marks will be awarded based on examination performance; such a program will be considered as Skill Development Program. (3) SC-12: It may be covered as a crash course before the commencement of 8th semester to pave the way for internship and project work.										

Total Credits = 192

Code for the representation of the Softcore /Specialization Groups

A: Communication Infrastructure and Networking, B: Web Technologies, C: Systems and Software Development, D: Artificial Intelligence and Data Analytics, E: Other

SOFTCORES LIST:

Soft-Core Group	Sem	Specialization				
		Communication Infrastructure and Networking(A)	Web Technologies(B)	Systems and Software Development(C)	Artificial Intelligence and Data Analytics(D)	Others(E)
SC-1	IV	Digital Communications B19IT4051 (3:0:0)		System Software B19IT4053 (3:0:0) Advanced Unix Programming B19IT4052 (3:0:0)	Advanced IoT Programming B19IT4054 (3:0:0)	
SC-2	V		Mobile application development B19IT5051 (3:0:0)	Object Oriented Analysis and Design B19IT5052 Embedded System Design B19IT5053 (3:0:0)	Operation Research B19IT5054 (3:0:0)	Microcontroller and Interfacing B19IT5055 (3:0:0)
SC-3	V	Digital Signal Processing B19IT5061 (3:0:0)		Parallel Processing and Algorithms, B19IT5062 (3:0:0) Object Oriented Programming with C++, B19IT5063 (3:0:0) Principles of Programming languages B19IT5064 (3:0:0)		
SC-4	VI	Cyber Security B19IT6041 (4:0:0)	Advanced Web Technology, B19IT6042 (4:0:0) Advanced Java Programming B19IT6043 (4:0:0)	Real Time Systems, B19IT6044 (4:0:0) Advanced DBMS B19IT6045 (4:0:0)		
SC-5	VI			Finite Automata and Formal Languages, B19IT6051 (4:0:0) System Modeling	Computer Vision, B19IT6053 (4:0:0) Data Mining and Warehousing B19IT6054	

				and Simulation B19IT6052 (4:0:0)	(4:0:0)	
SC-6	VI	Wireless and Mobile Networks B19IT6061 (4:0:0)		High Performance Computing B19IT6062 (4:0:0)	Pattern Recognition, B19IT6063 (4:0:0) Web & Text Mining B19IT6064 (4:0:0)	Research Methodology B19IT6065 (4:0:0)
SC-7	VI	Advanced Computer Networks B19IT6071 (4:0:0)		UI/UX Design B19IT6072 (4:0:0)	Computer Graphics and Animation B19IT6073 (4:0:0)	Project and Risk Management B19IT6074 (4:0:0)
SC-8	VII	Advanced Storage Area Networks B19IT7041 (4:0:0) Network Programming B19IT7042 (4:0:0)	Multimedia System B19IT7043 (4:0:0)	C# and. Net B19IT7044 (4:0:0)		
SC-9	VII		Multimedia Computing and Networks B19IT7051 (4:0:0)		Data Analytics using R B19IT7052 (4:0:0) Deep Learning B19IT7053 (4:0:0)	Introduction to Genomic Sciences B19IT7054 (4:0:0)
SC-10	VIII	Software Defined Networks and Network Function Virtualization B19IT8031 (4:0:0)	Augmented and Virtual Reality B19IT8032 (4:0:0)		Natural Language Processing B19IT8033 (4:0:0)	Human Computer Interaction B19IT8034 (4:0:0)

B Tech (Computer Science & Information Technology) Program

Detailed Syllabus

(effective from Academic Year 2019-2020)

FIRST SEMESTER

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/Wk
B19IT1010	**Multivariable Calculus and Linear Algebra**	**HC**	**4**	**0**	**0**	**0**	**4**	**4**

Prerequisites:

Knowledge of limits, continuity, differentiation, integration, matrices, determinants, and geometry.

Course Description:

This course covers basic concepts of calculus and linear algebra particularly in power series expansion of functions, techniques to solve undefined forms, angle between the polar curves, solving system of equations and to find the inverse of matrix.

Course Objectives:

Objectives of this course are to:

1. Explain the scalar product and vector product of two or more vectors
2. Illustrate how to find angle between polar curves with a suitable example.
3. Demonstrate the use of Radius of curvature of the curves that can be best suited for machine learning techniques with big data analytics.
4. Describe the concepts of Linear algebra and calculus theory

Course Outcomes (Cos):

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

CO1: Outline the applications of scalar product and vector product of two or more vectors.

CO2: Estimate the angle between polar curves that can be applied for any programming instructions related to graphical representations.

CO3: Apply the radius of curvature of the curves that can be best suited for machine learning techniques with big data analytics.

CO4: Develop larger applications of Industry strength using algebra and calculus theory.

Course Content:

UNIT- 1

Introduction to Vector Calculus: Definition and types of vectors, algebra of vectors, scalar (or dot) product of two vectors, scalar product of three vectors and vector product of three vectors.

Differential Calculus-1:Successive differentiation- nth derivatives of standard functions (no proof) simple problems, Leibnitz Theorem (without proof) and problems, Taylors series and McLaurin's series expansion for function of one variable(only problems), Polar curves- Angle between the radius vector and the tangent, angle between two curves, Pedal equation for polar curves. Applications in computer science.

UNIT -2

Differential Calculus-2: Derivative of arc length – concept and formulae (without proof), Radius of curvature-Cartesian, parametric, polar and pedal forms (with proof) problems.

Indeterminate forms and solution using L'Hospital's rule. Analysis of Randomized algorithms using Differential Calculus. Applications in computer science.

UNIT- 3

LinearAlgebra-1: Basic concepts, Echelon form, normal form of a matrix, Rank of Matrix, Gauss-Jordon method to find inverse of a matrix, consistency of linear system of equations, Gauss elimination and Gauss-Jordon method to solve system of equations. Linear Algebra for statistics. Applications in computer science.

UNIT- 4

Linear Algebra-2: Linear Transformations, orthogonal transformation, Eigen values and Eigen Vectors. Complex matrices, Similarity of Matrices, Diagonalization. Rayleigh power method to determiner largest Eigen value and the corresponding Eigen vector. Analysis of Randomized algorithms using Linear Algebra. Applications in computer science.

Self-Learning Components:

Vectors in Space, Generalized Leibniz Rules, Mean Value of Derivatives, Powers of a matrix, Testing of Linear Dependence and Independence and multivariate calculus. Introduction to differential equations.

Text books:

1. *Theodore Shifrin, "Multi-Variable Calculus and Linear Algebra with Applications", Wiley, 1st Edition, Volume 2, 2018.*
2. *B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43nd edition, 2015.*
3. *Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Publications, 9th edition,2013.*
4. *Ron Larson, "Multivariable Calculus, Cengage Learning", 10th Edition, 2013.*

Reference books:

1. *B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publications, 19th Reprint edition, 2013.*
2. *R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House, 4th edition, 2016.*
3. *Stanley I. Grossman, "Multivariable Calculus, Linear Algebra, and Differential Equations", 2nd Edition, Academic Press 1986.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1	H				M			H						
CO2	H				M			M			L			
CO3	H				M			M			L			
CO4	H				M			M			L			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Solve the following System of Linear Equations using Octave Software Tool.
2W+5X-Y+4Z=0, W+X+Y+Z=0, 4W-3X+6Y+Z=0, 2W-5X-3Y-Z=7

2. Solve the following system of equations by SCILAB Software Tool
3x+2y+7z=4; 2x+3y+z=5; 3x+4y+z=7

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT1020	**Chemistry**	**HC**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

Pre University Chemistry, Physics and Mathematics.

Course Description:

This course provides the fundamental knowledge of basic principles of Engineering chemistry which is required for basic foundation in Engineering Education irrespective of branch. The course also provides the introduction to the electrochemistry concepts like Cell reactions, Fuel cells and its applications, Battery technology, Polymer materials and Nano-materials.

Course Objectives:

The objectives of this course are to:

1. Explain the basic concepts of Electrons with respect to Atomic, Molecular Structure and Periodicity
2. Describe the concepts of electro chemical cells, fuel cells and factors that influence Batteries and applications of semiconductors and P-N junction modelling of PV-Cell.
3. Discuss the mechanism of corrosion, types of corrosion, controlling and metal finishing
4. Illustrate the use of some of the engineering materials like Nano, Polymers in various applications.

Course Outcomes:

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

CO1. Acquire the knowledge about the concepts of chemistry in respect to Atomic and Molecular structure.

CO2. Assess the knowledge of band theory conductors, semiconductors, super conductors for electronic devices and chip design

CO3. Apply the knowledge of corrosion science and metal finishing which is essential for the construction of PCBs and Circuits.

CO4. Make use of engineering materials like Nano, Polymers to develop various applications.

Course Content:

UNIT-1:Electrons in Atomic, Molecular Structure and Periodicity : Electrons in Atomic, molecular structure: Classical to quantum mechanical transition, Origin of quantum mechanics, dual nature of light and matter, concept of quantization – Max Planck, Einstein, de Broglie, Schrödinger wave equation, particle in a box (1D)-Energy solutions, wave nature and quantum states of electron, orbital wave functions in bond formation (H2).

Periodic Properties: Effective nuclear charge, penetration of orbital, atomic and ionic sizes, ionization energies, electron affinity and electro negativity.

UNIT-2: Energy Storage and Conversion Devices : Battery: Introduction to electrochemistry, Basic concepts of Cells and Battery, Battery characteristics –primary (Leclanche Cell), secondary (Lead-Acid), Lithium batteries, Advantage of use of Li as electrode material (Lithium & Lithium ion), Electrochemical Capacitor.

Fuel cells: Difference between battery and fuel cell, types of fuel cells- construction working, applications, advantages& limitations of Solid oxide fuel cells and phosphoric acid fuel cell. Photovoltaic cell: Band structure of solids and the role of doping on band structures. Properties of Silicon, advantages, P-N Junction diode, antireflective coatings. Construction, working of photovoltaic cells, applications, advantages and disadvantages.

UNIT-3: Science of Corrosion and its Control: Corrosion: Electrochemical theory of corrosion, Types of Corrosion- Differential metal corrosion, Differential aeration corrosion (Pitting & water line),

Boiler corrosion, and Grain boundary corrosion, Factors affecting rate of corrosion-Primary, secondary. Corrosion control: Galvanizing & tinning, cathodic protection & Anodic Protection. Metal Finishing: Theory of electroplating. Effect of plating variables on the nature of electro deposit- electroplating process, Electroplating of gold. Electro less plating of Copper and PCB.

UNIT 4: Chemistry of Engineering Materials: Semiconducting and Super Conducting materials: Principle and some example.Magnetic material: Principle and types of magnetic materials-applications of magnetic materials in storage devices. Polymers-Introduction, Polymer composites (carbon fiber and Kevlar, synthesis, advantages, applications).Conducting polymers: Mechanism, synthesis and applications of polyacetyline, polyaniline. Liquid Crystals: Introduction, classification and applications.

Nanomaterials-Introduction – Definition, classification based on dimensionality (1D, 2D and 3D), quantum confinement (electron confinement). Size dependent properties- surface area, magnetic properties (GMR phenomenon) and thermal properties (melting point). Properties of Carbon Nanomaterials (mention of - Fullerenes, Graphene, Carbon nanotubes).

Self-learning component: Molecular orbitals of diatomic molecules. Alkaline Fuel Cell, Introduction to Electromagnetic spectrum, Czocharlski method, Pourbaix diagram (Al, Fe). Inorganic Coatings and aromaticity, Crystal field theory and transition metal ions and their magnetic properties, HSAB Concepts, molecular geometries Inhibitors, Types of polymerization, Applications of nano materials- in various fields, Glass transition temperature (tg) - definition, significance. Structure and Property relationship – tensile strength and plastic and elastic deformation.

Text books:

1. SS Dhara, "A Text book of Engineering Chemistry" , S. Chand Publications, New Delhi, 12th Edition, 2014.
2. Shashichawla, "Text Book of Engineering Chemistry", Dhanapath Rai & Co Publications, Reprint Edition 2013.
3. P.W. Atkins, "Physical Chemistry", Oxford university press, 11thEdition, 2017.
4. Shikha Agarwal, "EngineeringChemistry: Fundamentals and Applications", Cambridge University Press, 2016
5. O.G.Palanna,"Engineering Chemistry", Tata McGraw Hill, 1stEdition, 2009.
6. M.G.Fontana., "Corrosion Engineering", Tata McGraw Hill, 3rd Edition, 2017.

Reference books:

1. *V.R. Gowrikar, N.N. Vishwanathan and J. Sreedhar, "Polymerchemistry", Wiley eastern ltd.*
2. *Charles P. Poole Jr., Frank J. Owens, "Introduction to Nanotechnolog"y, Wiley India Publishers.*
3. *Krishan K Chawla," Composite materials: Science and Engineering", Springer International edition, 2nd edition.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1	L							M			H			
CO2	L							M			H			
CO3			L					M			H			
CO4			L					M			H			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT1030	**Problem Solving with Programming**	**HC**	**3**	**0**	**0**	**0**	**3**	**3**

Course Description:

The objectives of this course is to make students learn basic principles of problem solving, present the syntax and semantics of the "C" language, implement through C language using constructs offered by the language.

Course Objectives:

Objectives of this course are to:

1. Explain the different programming constructs of C to be used for a given application.
2. Illustrate the use of structures and unions for solving the real world problems.

3. Demonstrate the use of pointers and file operations for solving the real world problems.
4. Describe the basic concepts of computer graphics that can be used to solve a given problem using command line arguments.

Course Outcomes (CO's):

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

CO 1: Identify the constructs of C to be used for a given application.

CO 2: Develop a C program to solve a given problem using structures and unions.

CO3: Design a C program to solve a given problem using pointers and file operations.

CO 4: Demonstrate the use of basic concepts of computer graphics for a given problem using command line arguments.

Course Content:

UNIT -1:

Fundamentals of problem solving and introduction to C-language: Algorithm and flowchart & advantages of algorithm (pseudo code),basic flow chart symbols**,** structure of C program with example**, C** language & its features, C tokens, data types in C **,**variables, constants, input / output functions
Operators:(unary operator, assignment operator, arithmetic operator, relational operators, logical operators &bitwise operator, conditional operator, increment and decrement operator, special operator).
Expressions &statements: Postfix, primary, prefix, unary, binary, ternary & assignment

UNIT-2:

Branching constructs
Conditional statements: if statement, if-else statement, nested if, switch statement.
Unconditional statements: break and continue statement, Goto statement, return statement
Iterative statements (loops): while loop, do while, difference between while and do while for loop.
Arrays: one dimensional array, two dimensional array, searching techniques, sorting.

UNIT -3:

Functions: function definition, types of functions, location of function in a program, structure of a function, parameter passing mechanisms, call by value & call by address.
Strings: string operations with and without using inbuilt string functions (string length, string compare, string copy, string concatenation, string reverse).

UNIT -4:

Structures & Union: Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, union, typedef.

Pointers: Introduction to pointers.
File Operations: Formatted Input & Output, Character Input and Output Functions, Direct Input and Output Functions, File Positioning Functions,Error Functions.

Self Learning Component:

Fundamentals of computer graphics: output primitives – Line, Circle and Ellipse drawing algorithms - Attributes of output primitives, Two dimensional Geometric Transformation.
Inline Assembly Language Program: Simple inline assembly, Extended Assembly Syntax Microsoft C Compiler.
Command Line Arguments: argc, argv with simple examples.

Text books:

1. *B.W. Kernighan & D.M. Ritchie, "C Programming Language", 2nd Edition, PRENTICE HALL SOFTWARE SERIES,2005.*
2. *Herbert Schildt, C: The Complete Reference, 4th edition, TATA McGRAW Hill,2000.*
3. *B.S. Anami, S.A. Angadi and S. S. Manvi, "Computer Concepts and C Programming: A Holistic Approach", second edition ,PHI,2008.*
4. *NanjeshBennur, Dr. C.K.Subbaraya, "Programming in C", 2nd Edition, Excellent Publishing House, 2015.*

Reference books

1. *E. Balaguruswamy,"Programming in ANSI C", 4th edition, TATA MCGRAW Hill, 2008.*
2. *Donald Hearn, Pauline Baker, "Computer Graphics C Version", second edition, PearsonEducation, 2004.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1	M													
CO2				M										
CO3	M													
CO4		H									H		H	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. What will be the value of the variables at the end in each of the following code statements:
   int a=4^4
   int a=23.34
   a = 10 b = a + a++
   a=-5 b=-a
2. Write a C program to find the area and perimeter of a circle.
3. Write a C program that accepts the salary and age from the user and displays the same on the screen as output.

4. For the following values, write a program to evaluate the expression
   z = a*b+(c/d)-e*f;
   a=10
   b=7
   c=15.75
   d=4
   e=2
   f=5.6
5. Write a program to evaluate the net salary of an employee given the following constraints: Basic salary : $ 12000 DA : 12% of Basic salary HRA : $150 TA : $120 Others : $450 Tax cuts – a) PF :14% of Basic salary and b) IT: 15% of Basic salary Net Salary = Basic Salary + DA + HRA + TA + Others – (PF + IT)
6. Approximately what is the line #include <stdio.h> at the top of a C source file for?
7. What is the difference between the constants 7, '7', and "7"?
8. What is the difference between the constants 123 and "123"?
9. What is the function of the semicolon in a C statement?
10. Write a program to print this triangle:

```
*
**
***
****
*****
******
*******
********
*********
**********
```

11. Write a program for the following
    a) A file name is command line argument. Display the contents of the file where each word will be displayed on a new line. Display proper message if file does not exist.
    b) Display no. of ovals stored in the file.
    c) Display no. of “the” stored in the file.
    d) Copy contents of the file to another file.
12. Following is the menu to be displayed to the user. On selecting a choice display appropriate result. Number should be accepted from the user. Menu
    a. Prime Factors
    b. Leap Year
    c. Sum of all digits
    d. Number in reverse order
13. Accept any string from the user. Convert case of the string to lower / upper using pointers. (if entered string is in lower case convert it to uppercase and vice versa.)
14. Match the following:

Column A	Column B
8	Invalid Identifier Names
10.34	Integer Constants
A B C	Character Constants
abc	Double
23	Floating Point Numbers
12112134.86868686886	Valid Identifier Names
_A1	
$abc	
'A'	

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT1040	**Basic Electrical and Electronics Engineering**	**HC**	**4**	**0**	**1**	**0**	**5**	**6**

Prerequisites:

Fundamentals in Engineering, Mathematics and Physics.

Course Description:

This course in Electrical Engineering covers basic concepts of electrical engineering and electromagnetism. The course also introduces the student to the working AC and DC Circuits. The course also helps the student understand basics in digital electronics by applying the knowledge of logic gates and learning the applications of diodes in rectifiers, filter circuits. Further, it has a self-learning component on BJT's.

Course Objectives:

The objectives of this course are to:

1. Explain the basics of electrical and electronics engineering terminologies.
2. Demonstrate the use of single and three phase systems.
3. Illustrate the applications of simple logic functions using basic universal gates.
4. Discuss the applications of diode in rectifiers, filter circuits and wave shaping.

Course Outcomes:

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

CO1: Describe the basics of electrical engineering terminology and the usage.

CO2: Differentiate between single and three phase systems and learn the working of the same.

C03: Make use of basic universal gates to implement the simple logical functions.

CO4: Analyse the use of diodes in rectifiers, filter circuits and wave shaping.

Course Content:

UNIT-1:

Introduction to Basic Concepts & Single-Phase AC Circuits: A. Basic Concepts: Ohm's Law and Kirchhoff's Laws; Analysis of series, parallel and series-parallel circuits excited independent voltage sources; Power and energy. Electromagnetism*:* Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamicallyinduced EMF; Concepts of self-inductance, mutual inductance and coefficient of coupling; Energy stored in magnetic fields. Introduction to DC Circuits.

Single Phase AC Circuits: Generation of sinusoidal voltage- definition of average value, root mean square value, form factor and peak factor of sinusoidal voltage and current and phasor representation of alternating quantities; Analysis with phasor diagrams of R, L, C, RL, RC and RLC circuits; Real power, reactive power, apparent power and power factor, series, parallel and series-parallel circuits.

UNIT-2:

Three Phase AC Circuits and Transformers: A. AC Circuits:; Three Phase A.C. Circuits covering, Necessity and Advantages of three phase systems, Generation of three phase power, definition of Phase sequence, balanced supply and balanced load; Relationship between line and phase values of balanced star and delta connections; Power (Expression for Power in Star and Delta, No numerical)

B. Transformers: Principle of operation and construction of single-phase transformers (core and shell types). EMF equation, losses, efficiency and voltage regulation;

UNIT-3:

Digital Electronics: Introduction, Switching and Logic Levels, Digital Waveform (Sections 9.1 to 9.3). Number Systems: Decimal Number System, Binary Number System, Converting Decimal to Binary, Hexadecimal Number System: Converting Binary to Hexadecimal, Hexadecimal to Binary, Converting Hexadecimal to Decimal, Converting Decimal to Hexadecimal, Octal Numbers: Binary to Octal Conversion. Complement of Binary Numbers. Boolean Algebra Theorems, De Morgan's theorem.

Digital Circuits: Logic gates, NOT Gate, AND Gate, OR Gate, XOR Gate, NAND Gate, NOR Gate, X-NOR Gate. Algebraic Simplification, NAND and NOR Implementation, NAND Implementation, NOR Implementation. Half adder, Full adder.

UNIT 4:

Semiconductor Diodes and Applications: p-n junction diode, Characteristics and Parameters, Diode approximations, DC load line analysis, Half-wave rectifier, Two-diode Full-wave rectifier, Bridge rectifier, Capacitor filter circuit (only qualitative approach), Zener diode voltage regulators: Regulator circuit with no load, Loaded Regulator. Numerical examples as applicable.

Self-Learning Components:
Bipolar Junction Transistors: BJT operation, BJT Voltages and Currents, BJT amplification, Common Base, Common Emitter and Common Collector Characteristics, Electromagnetism: Electromagnetic Induction, Electromagnetic Pulse and Electromagnetic Radiation.

Text books:

1. *Nagrath I.J. and D. P. Kothari), Basic Electrical Engineering, Third Edition Tata McGraw Hill, 2009.*

2. *Hayt and Kimberly, Engineering Circuit Analysis, 8th Edition, Tata McGraw Hill, 2013.*
3. *Kulshreshtha D.C., Basic Electrical Engineering, Tata McGraw Hill, 2009.*
4. *Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall, India, 2009.*
5. *Hughes, E., Electrical Technology, Pearson, 2005.*
6. *David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5th Edition, 2008.*
7. *D.P. Kothari, I. J. Nagrath, "Basic Electronics", McGraw Hill Education (India) Private Limited, 2014.*

Reference books:

1. *Theodore Wildi, "Electrical Machines, Drives, and Power, 5thSystems", Pearson Edition, 2007.*
2. *Hughes, "Electrical Technology", International Students 9th Edition, Pearson, 2005.*
3. *International Journal of Electrical Power and Energy Systems (https://www.journals.elsevier.com/international-journal-of-electrical-power-and-energy-systems)*
4. *Journal of Electrical Engineering (https://link.springer.com/journal/202)*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1	H	M			H		M		H		M			
CO2	M	M			H		M		H		M			
CO3	H	M			M		M		H		M			
CO4	M	M	L		M		M	L	H	L	M			

where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. With different scenarios, identify the ways by which electricity is generated using natural water sources. Describe in detail the working of the same. (Task based)
2. Illustrate in detail, the working of a DC Motor. (Assignment)

List of Experiments: (For integrated course)

Introduction to Simulation tools: PSPICE 9.1 Student Version- Design and simulate analog and digital circuits, Digital Simulator -Digital Simulator has a toolbar of digital circuit elements, including logic gates, flip-flops, switches, and indicators.

SL. NO.	EXPERIMENT	CO	PO
1.	Electrical Safety Training. To Study the importance of Earthing during accidental shorting of line wire and the body of equipment. To study the Importance and mechanism of FUSE.	1	b, g, i
2.	Home Electrical Wiring Demonstration 1. To study the Importance and mechanism of MCB.	1	b, g, i

3.	Home Electrical Wiring Demonstration 2. To study & verify the connection procedure for fluorescent lamp wiring. To study the connection of Fan with switch and regulator.	1	b, a, g, i
4.	Two-way switch/ staircase wiring. To study & verify the connection procedure for two-way switch or staircase wiring.	1	b, a, g, i
5.	Behaviour of current and voltage in series and parallel circuits. To study and verify the behaviour of current and voltage in series circuit. To study and verify the behaviour of current and voltage in parallel circuit.	1	b, a, g, i
6.	Polarity test on single phase transformer. To determine the additive polarity of a single-phase transformer. To determine the subtractive polarity of a single-phase transformer.	2	b, a, g, i
7.	Polarity test on single phase transformer. To determine the subtractive polarity of a three-phase transformer.	2	b, a, g, i
8.	Determination of VI characteristics of Zener Diode	4	b, a, g, i
9.	Determination of VI characteristics of Silicon Diode	4	b, a, g, i
10.	Design and Analysis of a Half Wave rectifier using Diode	3,4	b, a, g, i
11.	Characteristics of BJT in Common Emitter Configuration	4	b, a, g, i
12.	Characteristics of JFET in Common Source Configuration	4	b, a, g, i
13.	Half Wave and Full Wave Rectifier Without Filter	4	b, a, g, i
14.	Half Wave and Full Wave Rectifier with Filter	4	b, a, g, i

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT1050	**Environmental Science**	**FC**	**2**	**0**	**0**	**0**	**2**	**2**

Prerequisites:

Basic knowledge of Environmental Science studied at higher secondary & school level.

Course Description:

Environmental Science is a multidisciplinary subject which includes various aspects from physics, chemistry, Ecology, Biology, Earth science & Engineering etc. Environmental Studies includes the introduction to environment, Objectives & guiding principles of Environmental education, environmental ethics, Components of Environment, Impacts of Engineering/human activities on environment, Sustainable

development, Role of individual and government in environmental Protection, and various topics related to environmental science imparted through this course.

Course Objectives:

The objectives of this course are to:

1. Describe Foster clear awareness and concern about economic, social, political and ecological interdependence in urban and rural area
2. Demonstrate the new patterns of behaviors of individuals, groups and society as a whole towards the environment
3. Discuss knowledge values, attitudes, commitment and skills needed to protect and improve the environment
4. Explain the evaluation of the environmental measures and education programs.

Course Outcomes:

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

CO1: Outline the environmental conditions and protect it.

CO2: Estimate the role of individual, government and NGO in environmental protection.

CO3: Interpret the new renewable energy resources with high efficiency through active research.

CO4: Analyze the ecological imbalances and protect it.

Course Content:

UNIT-1:

Multidisciplinary nature of environmental studies: Introduction to Environment, objectives and guiding principles of environmental education, Components of environment, Structure of atmosphere, Sustainable environment/Development, Impact of technology on the environment in terms of modern agricultural practices and industrialization, Environmental Impact Assessment, environmental protecttion
Role of Government-Assignments of MOEF, Functions of central and state boards, Environmental Legislations, Initiative and Role of Non-government organizations in India and world.

UNIT-2:

Environmental pollution, degradation & Waste management: Environmental Pollution – Definition, sources and types, Pollutant-Definition & classification, Concepts of air pollution, water pollution, Soil pollution, Automobile pollution-Causes, Effects & control measures.Environmental degradation – Introduction, Global warming and greenhouse effect, Acid rain-formation & effects,
Ozone depletion in stratosphere and its effect. Solid Waste management – Municipal solid waste, Biomedical waste, Industrial solid waste and Electronic waste (E-Waste).

UNIT-3:

Energy & Natural Resources: Energy – Definition, classification of energy resources, electromagnetic radiation-features and applications, Conventional/Non-renewable sources – Fossil fuels based(Coal, petroleum & natural gas), nuclear energy, Non-conventional/renewable sources – Solar, wind, hydro, biogas, biomass, geothermal, ocean thermal energy, Hydrogen as an alternative as a future source of energy.

Natural resources –water resource(Global water resource distribution, Water conservation methods, Water quality parameters, Uses of water and its importance), Mineral resources (Types of minerals, Methods of mining & impacts of mining activities),Forest wealth (Importances, Deforestation-Causes, effects and controlling measures)

UNIT 4:

Ecology and Ecosystem: Ecology-Definition, branches, objectives and classification, Concept of an ecosystem – Structure and functions, Characteristics of an Ecosystem-Ecosystem Resilience, Ecological succession and productivity, Balanced ecosystem, Components of ecosystem-abiotic and biotic, biological diversity.Biogeochemical cycles and its environmental significance – Carbon and nitrogen cycle, Energy flow in ecosystem, food chains –types, food web & Ecological Pyramids.

Self-Learning Component: Waste water treatment processes, hydrology and modern methods adopted for mining activities, remote sensing and its applications, disaster management, case studies of Bhopal gas tragedy, Chernobyl nuclear disaster, London smog.

Text books:

1.*R.J. Ranjit Daniels and JagadishKrishnaswamy, Co-authored & Customised by Dr.MS Reddy &Chandrashekar, "Environmental Studies", Wiley India Private Ltd., New Delhi (Authors from REVA University), 2017.*

2. Benny Joseph, "Environmental Studies" -Revised Edition, Tata McGraw – Hill PublishingCompany Limited, 2017.

3. Ashish Shukla, Renu Singh, Anil Kumar, Environmental Science, Revised Edition,IKInternational Publishing House Pvt.Ltd, 2018.

4. Dr.S.M.Prakash, Environmental Studies by Elite Publishers Mangalore, 2017.

5. R.J. Ranjit Daniels and JagadishKrishnaswamy, "Environmental Studies", Wiley India PrivateLtd., New Delhi, 2009.

6. G.Tyler Miller, Scott E.Spoolman, Environmental Sciences, Cengage Learning, 14th Edition, 2015.

Reference books:

1. BharuchaErach, "The Biodiversity of India", Mapin Publishing Pvt. Ltd., Ahmedabad, India, 2017.

2. RajagopalanR.,"Environmental Studies – from Crisis to cure", Oxford University Press, 2017.

3. Environmental Science by Arvind walia, Kalyani Publications, 2018.

4. Jadhav, H &Bhosale, V.M. Environmental Protection and Laws. Revised Edition, HimalayaPub.House, Delhi, 2018.

5. Sharma B.K., Environmental Chemistry. Goel Publ. House, Meerut, 2018.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO-1				M		M			H					
CO-2						M	L							
CO-3					L			M						
CO-4				M		M								

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Answer to questions uploaded in moodle software.(Assignment)
2. Skill tests based on the topics related to environmental aspects. (Seminar)
3. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.(Field work).
4. Attending the conferences based on Environmental and sustainable Energies.
5. Visiting the Labs and Organisations that maintain environmental protection and safety.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT1060	**Technical English - I**	**FC**	**0**	**0**	**2**	**0**	**2**	**4**

Prerequisites:

Fundamentals in Spoken English.

Course Description:

This course is aimed to develop basic communication skills in English in the learners, to prioritize listening and reading skills among learners, to simplify writing skills needed for academic as well as workplace context, to examine that the learners use the electronic media such as internet and supplement the learning materials used in the classroom.

Course Objectives:

The objectives of this course are to:

1. Develop basic communication skills in English.
2. Emphasize on the development of speaking skills amongst learners of Engineering and Technology
3. Impart the knowledge about use of electronic media such as internet and supplement the learning materials used in the classroom.
4. Inculcate the habit of reading and writing leading to effective and efficient communication.

Course Outcomes:

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

CO1. Interpret audio files and comprehend different spoken discourses/ excerpts in different accents (Listening Skills).

CO2. Demonstrate speaking ability with clarity, confidence and comprehension and communicate with one or many listeners using appropriate communicative strategies (Speaking Skills).
CO3. Make use of reading different genres of texts adopting various reading strategies (Reading Skills).
CO4. Develop the ability to write cohesively, coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic (Writing skills).

Course Content:

UNIT-1:

Functional English: Grammar: Prepositions; Modal Auxiliaries, Listening: Listening to audio (verbal sounds), Speaking: Debating Skills, Reading: Skimming a reading passage; Scanning for specific information, Writing: Email communication

UNIT-2:

Interpersonal Skills: Grammar: Tenses; Wh-questions, Listening& Speaking: Listening and responding to video lectures / talks, Reading: Reading Comprehension; Critical Reading; Finding key information in a given text, Writing: Process descriptions (general/specific); Recommendations

UNIT-3:

Multitasking Skills Grammar: Conditional Sentences, Listening & Speaking: Listening to specifictask; focused audio tracks and responding, Reading: Readingand interpreting visual material, Writing: Channel conversion (flowchart into process); Types of paragraph (cause and effect / compare andcontrast / narrative / analytical); Note Taking/ Note Making

UNIT 4:

Communication Skills Grammar: Direct and indirect speech, Listening & Speaking: Watching videos / documentaries and responding to questions based on them; Role plays, Reading: Making inference from the reading passage; predicting the content of a reading passage, Writing: Interpreting visual materials (line graphs, pie charts etc.); Different types of Essay Writing.

Text books:

1.Green, David. Contemporary English Grammar Structures and Composition. New Delhi: MacMillan Publishers, 2010.
2.Thorpe, Edgar and Showick Thorpe. Basic Vocabulary. Pearson Education India, 2012.
3.Leech, Geoffrey and Jan Svartvik. A Communicative Grammar of English. Longman, 2003.

Reference books:

1.Murphy, Raymond. Murphy's English Grammar with CD. Cambridge University Press, 2004.
2.Rizvi, M. Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill, 2005.
3.Riordan, Daniel. Technical Communication. New Delhi: Cengage Publications, 2011.
4.Sen et al. Communication and Language Skills. Cambridge University Press, 2015

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	E	f	g	H	i	j	k	l	m	n

CO1							H							
CO2							H							
CO3							H							
CO4							H							

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

Pick and Speak for two minutes, each student will have different topics to come prepared and speak on their topic

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT1070	**Problem Solving with Programming Lab**	**HC**	**0**	**0**	**2**	**0**	**2**	**2**

Lab Outcomes:

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

CO 1: Identify the constructs of C to be used for a given application.
CO 2: Develop a C program to solve a given problem using structures and unions.
CO3: Design a C program to solve a given problem using pointers and file operations.
CO 4: Demonstrate the use of basic concepts of computer graphics for a given problem using command line arguments.

List of Experiments:

Experiment Nos.	Programs	Course Outcome	Program Outcome
1	Design and develop an algorithm to find the reverse of an integer number NUM and check whether it is PALINDROME or NOT. Implement a C program for the developed algorithm that takes an integer number as input and output the reverse of the same with suitable messages. Ex: Num: 2014, Reverse: 4102, Not a Palindrome.	**1**	**a**
2	Design and develop a flowchart to find the square root of a given number N. Implement a C program for the same and execute for all possible inputs with appropriate messages. Note: Don't use library function sqrt (n).	**1**	**a**
3	Design and develop a C program to read a year as an input and find whether it is leap year or not. Also consider end of the centuries	**1**	**a**
4	Design and develop an algorithm for evaluating the polynomial f(x) = $a^4x^4 + a^3x^3 + {}^{a2x2} + a^1x + a^0$, for a given value of x and its coefficients using Horner's method. Implement a C program for the same and execute the program for different sets of values of coefficients and x.	**1**	**a**
5	Write a Program to calculate and display the volume of a CUBE	**1**	**a**

	having its height (h=10cm), width (w=12cm) and depth (8cm).		
6	a) People frequently need to calculate the area of things likerooms, boxes or plots of land where quadratic equation can be used. Write a program to find the coefficients of a quadratic equation and compute its roots. b) Consider the age of 3 persons in a family, Write a program to identify the eldest person among three of them. c) Consider student's marks in Computer Test. Write a Program display the grade obtain by student in Computer Test based on range.	1,2	a,b
7	a) A student has taken 10 books from the library. Every time he takes the book librarian reads its ISBN Number. Write a program to identify whether book is issued to him or not based on ISBN Number using linear search. b) Suppose students have registered for workshop, and their record is maintained in ascending order based on student id. Write a program to find whether a particular Student has registered for that particular workshop or not using binary search.	1,2	a,b
8	Calculator allows you to easily handle all the calculations necessary for everyday life with a single application. Write a program using switch statement to design a basic calculator that performs the basic operations and you want to give choice to user to perform b. Addition of two numbers c. Subtraction of two numbers d. Multiplication of two numbers. e. Division of two numbers. f. Wrong choice	1,2	a,b,d
9	In a stock market at the end of the day, summation of all the transactions is done. Write a program using array to i) Display transactions IDs from 1 to n. ii) Find the sum of n natural numbers.	2,3	a,b,d
10	a) In computer based applications, matrices play a vital role in the projection of three dimensional image into a two dimensional screen, creating the realistic seeming motions. Write a program using 2-dimensional array to perform matrix Multiplication and check compatibility of matrix.	2,3	b,m,n
11	a) Write a C Program to Store Information and Display it Using Structure. b) Write a C program using union to display the total memory size occupied by the data types.	2,3	m,n
12	In a memory game, you first enter a string wait for a time and again enter second string, Write a program to check both sting are same or not.		
13	In a CCP test you scored less marks compared to your friend, Write a program using pointers to swap your marks with your friend by passing address as a parameter.		
14	Write a C program to create a file called emp.txt and store information about a person, in terms of his name, age and salary and retrieve the contents and display it.	3,4	m,n
15	Write a c program to implement Digital Differential Analyzer line generating algorithm using command line arguments.	3,4	m,n

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/Wk
B19IT1080	Chemistry Lab	HC	0	0	2	0	2	2

Pre University level of Knowledge in Chemistry, Physics and Mathematics.

Course Description:

This course provides a solid foundation for practical implementation of fundamental concepts and to solve the engineering problems.

Course Outcomes:

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

CO1. Analyse the amount of material by different instrumental methods.

CO2. Evaluate the amount of oxygen demand, alkalinity, and hardness of the different water samples.

CO3. Estimate impurities in water.

CO4. Analyze the ions present in unknown substance/ores using titrimetric and instrumental metals

Lab Experiments:

Name of the Experiment	CO	PO
1. Potentiometric Estimation of Mohrs salt.	1,4	a,b,c
2. Colorimetric estimation of copper.	1,4	a,b,c
3. Conductometric estimation of acid mixture using standard NaOH.	1,4	a,b,c
4. Determination of pKa of given weak acid using pH meter.	1,4	a,b,c
5. Determination of viscosity co-efficient of a given organic Liquid.	1,4	a,b,c
6. Determination of total hardness of the given water sample.	2,3,4	a,b,c
7. Determination of calcium oxide in the given cement sample.	4	a,b,c
8. Determination of COD of the given waste water sample.	3,4	a,b,c
9. Determination of percentage of copper in the given brass sample.	4	a,b,c
10. Determination of iron in the given sample of Haematite ore using Potassium dicromate.	4	a,b,c
11. Estimation of Alkalinity of the given water sample using standard HCl solution	2	a,b,c

12. Flame photometric estimation of sodium in the given water sample.	4	a,b,c
13. Electroplating of Copper and Nickel.	4	a,b,c
14. Determination of Calcium in a milk sample.	4	a,b,c

Simulation based Chemistry Practical Assignments

Note: Student has login into the below mentioned link with their username and password and has to conduct the experiments in the simulator and note down the readings. Later they have to participate in the discussion mentioned below the experiment along with assignment.

List of experiments to be simulated:

1. To determine the absorbance of the sample at different wavelengths and to determine the concentration of the unknown sample.
2. To determine the EMF of the cell and to determine the Gibbs Free Energy change of the
    a. cell reaction.
3. Determination of viscosity of Organic Liquid 01.
4. Determination of viscosity of Organic Liquid 02.
5. To determine the physical parameters such as turbidity, pH and conductance of a water sample.
6. To determine the Hardness of given water sample using EDTA method.
7. To determine the alkalinity of given water sample.
8. To determine the COD of industrial waste water sample.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/Wk
B19IT1090	**Skill Development**	**RULO**	**0**	**0**	**0**	**0**	**1**	**2**

Note: Soft Skill Training courses are organised by the **Placement and Training Centre**. The students have to undergo Soft Skill Courses conducted by the said Centre.

SECOND SEMESTER:

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT2010	Probability and Statistics	HC	4	0	0	0	4	4

Prerequisites:

Knowledge of statistics – mean, mode, median, and knowledge of set theory, permutation and combination, basics of probability theory.

Course Description:

This course covers concepts of curve fitting, data interpretation, probability distributions and sampling analysis. This course provides an elementary introduction to probability and statistics with applications with basic combinatorics, random variables, probability distributions, Bayesian inference, hypothesis testing, confidence intervals and linear regression.

Course Objectives:

The objectives of this course are to:

1. Describe Curve fitting and regression in various problems in Computer Science & engineering fields
2. Illustrate the applications of Probability and statistics in various computer science engineering fields like data mining, classification problems etc
3. Discuss Sampling theory concepts to solve various engineering problems like structured and unstructured data models
4. Demonstrate Stochastic problem as Markov model as a problem solving methods for systematic model buildings.

Course Outcomes (Cos):

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

CO1. Solve the problems of Curve fitting and regression in various problems in Computer Science & engineering fields.

CO2. Apply the concepts of Probability and statistics in various computer science engineering fields like data mining, classification problems etc.

CO3. Relate the Sampling theory concepts to solve various engineering problems like structured and unstructured data models.

CO4. Develop a stochastic problem as Markov model as a problem solving methods for systematic model buildings.

Course Content:

UNIT- 1

Curve Fitting: Curve fitting by the method of least squares and fitting of the curves of the form, $y = ax + b$, $y = ax^2 + bx + c$, $y = ae^{bx}$ *and* $y = ax^b$

Statistical Methods: Measures of central tendency and dispersion. Correlation-Karl Pearson's coefficient of correlation-problems. Regression analysis- lines of regression, problems. Rank correlation. Applications in computer science.

UNIT -2

Probability Distributions: Recap of probability theory (definition, addition rule, multiplication rule, conditional probability). Random variables, Discrete and continuous probability distributions. Binomial, Poisson, exponential and normal distributions (derivation of mean and variance for all distributions). Applications in computer science.

UNIT- 3

Joint Probability Distribution: Joint Probability distribution for two discrete random variables (both discrete and continuous cases), expectation, covariance, correlation coefficient.
Stochastic processes- Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability-simple problems. Applications in computer science.

UNIT- 4
Sampling Theory:-Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. Applications in Computer Science.
Introduction to queuing systems: Single queuing nodes, service disciplines, M/M/1 Queuing system.

Self-learning Components:

Curve fitting for application problems, Regression analysis for a bivariate data, Probability distribution-Geometric, gamma- distributions, Joint probability distributions of continuous random variables, sampling analysis of real time problems.Applications to computer science: Data mining, classification problems etc

Text books:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43nd edition, 2015.
2. ErwinKreyszig, "Advanced Engineering Mathematics", Wiley Publications, 9th edition, 2013.
3.Seymour Lipschutz, John J. Schiller., "Schaum's Outline of Introduction to Probability and Statistics", McGraw Hill Professional, 1998, pp. 256.

Reference books:

1. *B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publications, 19th Reprint edition, 2013.*
2. *R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics", Narosa Publishing House, 4th edition, 2016.*
3. *V.Sundarapandian, "Probability, Statistics and Queueing theory", PHI Learning, 2009*
4. *Dr. B. Krishna gandhi, Dr. T.K.V. Iyengar, Dr. M.V.S.S.N. Prasad&S. Ranganatham., "Probability and Statistics" S. Chand Publishing, 2015.*
5. *J. K. Sharma "Operations Research theory and applications", Macmillan publishers, fifth edition, 2013.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1	H				H			H			H			
CO2	H				M			M			H			
CO3	H				H			M			M			
CO4	H				M			M			H			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

(Implement the following using MATLAB / SciLab/ Octave tool):

1. In a school, 60% of pupils have access to the internet at home. A group of 8 students is chosen at random. Find the probability that

a) exactly 5 have access to the internet.

b) at least 6 students have access to the internet.

2. The grades of a group of 1000 students in an exam are normally distributed with a mean of 70 and a standard deviation of 10. A student from this group is selected randomly.

a) Find the probability that his/her grade is greater than 80.

b) Find the probability that his/her grade is less than 50.

c) Find the probability that his/her grade is between 50 and 80.

d) Approximately, how many students have grades greater than 80?

3. In a group of 40 people, 10 are healthy and every person the of the remaining 30 has either high blood pressure, a high level of cholesterol or both. If 15 have high blood pressure and 25 have high level of cholesterol,

a) how many people have high blood pressure and a high level of cholesterol?
If a person is selected randomly from this group, what is the probability that he/she

b) has high blood pressure (event A)?

c) has high level of cholesterol(event B)?

d) has high blood pressure and high level of cholesterol (event A and B)?

e) has either high blood pressure or high level of cholesterol (event A or B)?

f) Use the above to check the probability formula: P(A or B) = P(A) + P(B) - P(A and B).

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT2020	**Physics**	**HC**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

The fundamental concepts in physics related to atomic physics, electricity and magnetism, mechanics, waves and optics.

Course Description:

This course introduces the basic concepts of Physics and its applications to Computer Science Engineering courses by emphasizing the concepts underlying four UNITs: Wave Mechanics, Lasers and optical fibres, Display Technology, superconductors, Quantum computation and Nano materials. The subject has basic laws, expressions and theories which help to increase the scientific knowledge to analyse upcoming technologies.

Course Objectives:

Objectives of this course are to:

1. Impart the knowledge about wave mechanics and its applications
2. Demonstrate the different applications of lasers, and optical fibers
3. Discuss different types of display technologies, superconductors and its applications
4. Explain the importance of quantum computation, nanomaterials , synthesis and applications

Course Outcomes (Cos):

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

CO1: Classify optical fibres and derive expression for NA, number of Modes and attenuation. (Analysis)

CO2: Summarize superconductivity with applications. (Comprehension)

CO3: Demonstrate capacitive and resistive Display Technologies. (Application)

CO4: Analyse synthesis of nonmaterial's and application of quantum computation (Analysis)

Course Content:

UNIT- 1

Wave mechanics: Introduction to Wave mechanics, De-Broglie hypothesis. Expression for de-Broglie wavelength of an electron in terms of accelerating potential. Phase velocity and group velocity, Relation between phase velocity and group velocity.

Quantum Physics**:** Heisenberg's uncertainty principle, its significance and its applications (nonexistence of electron inside the nucleus). Wave function, properties of wave function and physical significance. Probability density and Normalization of wave function, Schrodinger time- dependent and independent wave equation, Eigen values and Eigen functions. Applications of Schrödinger wave equation – energy Eigen values of a free particle, Particle in one dimensional infinite potential well with numerical examples. Application-Quantum computation.

UNIT -2

Lasers: Lasers Interaction between radiation and matter (induced absorption, spontaneous and stimulated emission). Expression for energy density at thermal equilibrium in terms of Einstein's coefficients. Characteristics of laser light, Conditions for laser operation (population inversion and Meta stable state). Requisites of laser system, Construction and working of Carbon Dioxide (CO2) laser &semiconductor laser and their applications. Applications: Holography (recording and reconstruction of images) and its applications.

Optical fibers: Construction and light propagation mechanism in optical fibers (total internal reflection and its importance), Acceptance angle, Numerical Aperture (NA), Expression for numerical aperture in terms of core and cladding refractive indices, Condition for wave propagation in optical fiber, V-number and Modes of propagation, Types of optical fibers, Attenuation and reasons for attenuation, Applications: Explanation of

optical fiber communication using block diagram, Optical source (LED) and detector (Photodiode)and their applications. Advantages and limitations of optical communications.

UNIT- 3

Superconductors: Zero resistance, Critical temperature (Tc), Critical field (Hc), Critical current density (Jc), Perfect diamagnetism, Meissner effect, Type I and Type II superconductors, Isotope effect, BCS theory of superconductivity, Applications-Superconducting magnets and Maglev vehicle. Display technology: Touch screen technologies: Resistive and capacitive touch screen and Displays: CRT, Field emission display, Plasma display, LED display, OLED display, LCD display.

UNIT- 4

Nanomaterials: Introduction to nanoscience, nanomaterials and their applications, Synthesis of nano materials using bottom-up method (arc-discharge method), top-down methods (ball milling method), Carbon Nanotubes: properties and applications. Quantum Computation: Quantum wires (one dimensional), Quantum dots (zero dimensional); the idea of "qubit" and examples of single qubit logic gates- Classical bits, Qubit as a two level system.

Self-learning component:

Introduction to haptics. Magnetic storage devices, solid state storage devices, optical storage devices, and characteristics of materials used in manufacture of laptops/desktops (body, internal circuit connection), heat sink cooling, liquid cooling, fan based cooling, laser printer working, accelerometers. Gold nano particles as storage devices

Text books:

1. *William T. Silfvast, Laser Fundamentals, Cambridge University press, New York, 2004*
2. *D. Halliday, R. Resnick and J. Walker, Fundamentals of Physics, John Wiley and Sons, New York, 10thedition 2013.*
3. *R. K. Gaur and S.L. Gupta, Engineering Physics, DhanpatRai Publications (P) Ltd, New Delhi. 53rd edition, 2014.*
4. *M.N. Avadhanulu and P.G. Kshirsagar, A text book of Engineering Physics, S. Chand and Company, New Delhi, 2014.*

Reference books:

1. *CharlsKittel, Introduction to Solid State Physics, Wiley, Delhi,8th Edition, 2004*
2. *Arthur Beiser, Concepts of modern Physics, Tata McGraw Hill publications, New Delhi, 8th Edition, 2011*
3. *S. O. Pillai, Solid State Physics, New Age International publishers, New Delhi, 2010*
4. *Janglin Chen, Wayne Cranton, Mark Fihn, Handbook of Visual Display Technology, Springer Publication, Second edition 2012.*

Mapping COs with POs (Program outcomes)

						Program Outcomes								
Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	m	N
CO1	L			L										
CO2	L			L						M				
CO3	L			L										
CO4	L			L										

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Discuss the merits and demerits of carbon dioxide laser
2. Discuss the construction and working principle of semiconductor diode laser with its applications
3. Explain the advantages and disadvantages of fibre optic communication
4. Distinguish between Phase velocity and Group velocity and derive the relation between them.
5. Formulate Schrodinger wave equation for a particle in 1 dimension
6. By applying Schrodinger wave equation determine Eigen values and Eigen functions for a particle in a box.
7. Describe the physical components of touch screen.
8. Discuss capacitive touch screen and resistive touch screen technologies.
9. What is quantum computing and distinguish between ‘bit’ and ’qubit’?

Additional assignments questions

Simulate Intensity variation of photocurrent w.r to distance in photodiode using spice Software.

Obtain interference pattern from superposition of waves using Matlab/Mathematics.

Using Matlab/mathematics obtain diffraction pattern for laser.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT2030	Python Programming	HC	3	0	0	0	3	3

Prerequisites:

Object Oriented Programming, Data Structures.

Course Description:

Python is a high level programming language which works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc). It has a simple syntax similar to the English language and it allows developers to write programs with fewer lines than other programming languages. Python is a language that can be treated in a procedural way, an object-orientated way or a functional way. It can be used on a server to create web applications, create workflows, connect to database systems, read and modify files, handle big data and perform complex mathematics. It can implement object oriented features, exception handling, It can parse the strings using regular expressions. It can be used for implementing the machine learning algorithms effectively.

Course Objectives:

The objectives of this course are to:

1. Explain the fundamentals of python statements like statements, functions, exceptions, errors, scripts, Data Types, Files and Dictionaries
2. Demonstrate the Parsing of regular expressions
3. Illustrate the features of Object oriented programming and files
4. Describe the features of NumPy.

Course Outcomes:

On successful completion of this course, the student is expected to be able to:

1. Make Use of fundamentals of python like statements, functions, exceptions, errors, scripts, Data Types, Files and Dictionaries in real world applications.
2. Develop a program to illustrate the parsing of given regular expressions
3. Apply object oriented features and files in real world applications.
4. Design programs using NumPy packages.

Course Content:

UNIT-1:

Your First Python Program: Diving in; Declaring Functions; Optional and Named Arguments, Writing Readable Code, Documentation Strings, The import Search Path, Everything Is an Object, What's an Object?, Indenting Code, Exceptions, Catching Import Errors, Unbound Variables

Native Data types: Booleans, Numbers, Coercing integers to Floats and Vice Versa, Numbers in a Boolean Context, Lists, Tuples, Sets, Dictionaries

Comprehensions: Working with Files and Dictionaries, List Comprehensions, Dictionary Comprehensions, Set Comprehensions

UNIT-2:

Strings: Unicode, Diving In, Formatting Strings, Compound Field Names, Format Specifiers, Other Common String Methods, Slicing a String, Strings versus Bytes, Character Encoding of Python Source Code.

Regular Expressions: Case Study: Street Addresses, Case Study: Roman Numerals, Checking for Thousands, Checking for Hundreds, Using the {n,m} Syntax, Checking for Tens and Ones, Verbose Regular Expressions, Case Study : Parsing Phone Numbers.

UNIT-3:

Classes and Iterators: Defining Classes, The init_() Method, Instantiating Classes, Instance Variables, A Fibonacci Iterator.

Advanced Iterators: Finding all occurrences of a Pattern, Finding the Unique items in a sequence, Making Assertions, Generator Expressions, Calculating Permutations, Other Fun stuff in the itertools Module, A new kind of string Manipulation, Evaluating Arbitrary Strings as Python Expressions.

Files: Reading from Text Files, Writing to text files, Binary Files, Streams Objects from Nonfile Sources, Standard Input, Output, and Error.

UNIT-4:

NumPy : Origin of NumPy, Object Essentials: Data type Descriptors, Basic Indexing, memory layout of ndarray, universal functions of arrays, summary of new features, The Array Object: ndarray attributes, ndarray methods, array special methods, array indexing.

Implementation of Machine Learning algorithms: Linear regression, Logistic regression, k-means clustering algorithms.

Self-Learning Components: C4.5**,** k-means, SVM, Apriori, expectation maximum, Page Rank, AdaBoost, Naïve Bayes and CART algorithms.

Text Books:

1. *Mark Pilgrim, Dive into Python 3, Apress special edition, second edition, 2015.*
2. *Travis E. Oliphant,Guide to NumPy, Trelgol publishers,2006.*

Reference books:

1. *Mark Lutz, Learning Python, Oreilly.*
2. *John M. Zelle, PYTHON Programming: An Introduction to Computer Science, Franklin, Beedle& Associates.*
3. *Michael Dawson, Python Programming for the Absolute Beginners, 3rd Edition, CENAGE Learning.*
4. *Wesley J. Chun, Core Python Programming, 2nd Edition, Prentice Hall.*
5. *Steve Holden and David Beazley, Python Web Programming, New Riders.*
6. *Springer, Kent D. Lee, Python Programming Fundamentals, 2nd Edition.*

7. *John V. Guttag, Introduction to Computation and Programming using Python, MIT Press.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1				L	M			M			M	L	M	M
CO2	M		H					L		H	H		H	M
CO3					H						H		M	
CO4	M		H					L		H	H		H	M

Sample Assignments:

1. List the various steps involved in installation of python packages on windows operating system.
2. Write a python script to perform various operations of dictionaries.
3. Write a python script to perform various operations of lists.
4. Write a python script to define and call functions with optional and named arguments.
5. Write a python script to demonstrate the use of str to coerce any arbitrary value into a string representation.
6. Write a python script to demonstrate the use of getattr to get references to functions and other attributes dynamically.
7. Write a python script to demonstrate the use of and−or operations.
8. Write a python script to demonstrate lambda function.
9. Write a python script to demonstrate importing modules using either import *module* or from *module* import.
10. Explain defining and instantiation of classes.
11. Explain __init__methods and other special class methods, and understanding when they are called.
12. List and explain various operators or symbols used in regular expressions.
13. Write a Python script to generate and print a dictionary that contains a number (between 1 and n) in the form (x, x*x).
    Sample Dictionary (n = 5) :
    Expected Output : {1: 1, 2: 4, 3: 9, 4: 16, 5: 25}
14. Write a Python program to iterate over dictionaries using for loops.

15.Write a Python program to print all unique values in a dictionary.
Sample Data : [{"V":"S001"}, {"V": "S002"}, {"VI": "S001"}, {"VI": "S005"}, {"VII":"S005"}, {"V":"S009"},{"VIII":"S007"}]
Expected Output : Unique Values: {'S005', 'S002', 'S007', 'S001', 'S009'}

16.Write a Python program to create and display all combinations of letters, selecting each letter from a different key in a dictionary.
Sample data : {'1':['a','b'], '2':['c','d']}
Expected Output:
ac
ad
bc
bd

17.Write a Python program to find the index of an item of a tuple.

18. Write a Python program to replace last value of tuples in a list.
Sample list: [(10, 20, 40), (40, 50, 60), (70, 80, 90)]
Expected Output: [(10, 20, 100), (40, 50, 100), (70, 80, 100)]

19. Write a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.

20. Write a Python program to reverse a string.
Sample String : "1234abcd"
Expected Output : "dcba4321"

21. Write a Python function to check whether a number is perfect or not. According to Wikipedia : In number theory, a perfect number is a positive integer that is equal to the sum ofits proper positive divisors, that is, the sum of its positive divisors excluding the number itself (also knownas its aliquot sum). Equivalently, a perfect number is a number that is half the sum of all of its positive divisors (including itself).*Example* : The first perfect number is 6, because 1, 2, and 3 are its proper positive divisors, and 1 + 2 + 3 =
6. Equivalently, the number 6 is equal to half the sum of all its positive divisors: (1 + 2 + 3 + 6) / 2 = 6. The next perfect number is 28 = 1 + 2 + 4 + 7 + 14. This is followed by the perfect numbers 496 and 8128.

22. Write a Python function to create and print a list where the values are square of numbers between 1 and 30 (both included).

23. Write a Python program to solve the Fibonacci sequence using recursion.

24. Write a Python program to calculate the geometric sum of n-1.
Note: In mathematics, a geometric series is a series with a constant ratio between successive terms.
Example :
$$\sum_{n=1}^{\infty} \frac{1}{n} = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} - \frac{1}{5} + \cdots.$$

25. Write a Python program to convert a list of numeric value into a one-dimensional NumPy array.
Expected Output:
Original List: [12.23, 13.32, 100, 36.32]
One-dimensional numpy array: [12.23 13.32 100. 36.32]

26. Write a Python program to reverse an array (first element becomes last).
Original array:
[12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37]
Reverse array:
[37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12]

27. Write a program to perform basic mathematical operations. Write a user defined function for each operation. Create a doc string for each function. Display the output of each mathematical operation
28. Create a list with the following elements 1,2,3,4,5. What are the different ways that are available where you can print the entire list(mention alteast 4) and also print the elements of list in reverse order. Give example for each by considering the above list.
29. Observe the following list where li = [“a”, ”b”, ”c”, ”exam”, ”b”, ”d”, ”a”, ”is”]. Write a program by considering the above list to display single occurrence of elements of the list, to display only the repetitive elements of the list, to display the elements whose length of the element is greater than 1.
30. Write the syntax for creating a class and also the instance of a class with example. Construct a

program to create a class called “student”, declare the attributes of class as SRN, name and college. Read and display student information.

31. Write the regular expression by considering the following string
    s=”Karnataka Bank Private Limited”

    a. replace PVT. for Private
    b. Substitute PVT. for Private considering the whole word.

32. Consider the following pattern s= '^M?M?M?(CM|CD|D?C?C?C?)$'

    Write the regular expression and also search the pattern for the following 'MMMCCC', 'MMMCCC'. Justify with output.

33. Write and search the pattern for an empty string. Justify with output. Write the regular expression by considering the following string
    s=”100 BROAD ROAD APT”

    a. replace RD. for ROAD
    b. Substitute RD. for ROAD by considering the whole word.

34. Consider the following pattern s=’^M?M?M?(CM|CD|D?C?C?C?)$’

    a. Write the regular expression and also search the pattern for the following numbers 1300, 1500, 1900. Justify with output.
    b. Write and search the pattern for an empty string. Justify with output.

    Search “MCMC” in the above pattern “s” and justify your output

35. Create a set of all English stopwords and then use it to filter stopwords from a sentence in NLTK with example.

36. Write a program to extract features in a given text

37. Write a program using NUMPY perform operations on matrices such as addition, multiplication, transpose, inverse

38. Write a program to illustrate record arrays.

Course Code	Course Title	Duration (Week)	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT2040	**Technical English - II**	**16**	**FC**	**0**	**0**	**2**	**0**	**2**	**4**

Prerequisites:

Fundamentals in Spoken English.

Course Description:

This course aims at utilizing the ability of using language skills effectively in real-life scenarios, to develop the learners’ competence in employability skills, to improve the habit of writing, leading to effective and efficient communication, to prioritize specially on the development of technical reading and speaking skills among the learners.

Course Objectives:

The objectives of this course are to:

1. Enable learners of Engineering and Technology develop their basic communication skills in English
2. Emphasize specially the development of speaking skills amongst learners of Engineering and Technology
3. Ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
4. Inculcate the habit of reading and writing leading to effective and efficient communication

Course Outcomes:

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

CO1: Organize their opinions clearly and meaningfully.
CO2: Demonstrate the ability to speak appropriately in social and professional contexts.
CO3: Build inferences from the text.
CO4: Take part in interviews confidently.

CO5: Develop accurate writing skills using different components of academic writing.

Course Content:

UNIT-1:

Language Acquisition: Grammar: Active and passive voice, Listening & Speaking: Listening to informal conversations and interacting, Reading: Developing analytical skills; Deductive and inductive reasoning, Writing: Giving Instructions; Dialogue Writing

UNIT-2:

Persuasive Skills Grammar: Compound words; Phrasal verbs, Listening: Listening to situation baseddialogues. Speaking:Group Discussions, Reading:Reading a short story or an article from newspaper; Critical reading, Writing:Formal letters (Accepting/ inviting/ declining); Personal letters (Inviting your friend to a function, congratulating someone for his / her success, thanking one's friends / relatives)

UNIT-3:

Cognitive Skills Grammar: Homonyms; homophones, Listening: Listening to conversations; Understanding the structure of conversations, Speaking: Presentation Skills, Reading: Extensive reading, Writing: Report Writing (Feasibility/ Project report - report format – recommendations/ suggestions - interpretation of data using charts, PPT); Precis Writing.

UNIT 4:
Employability Skills Grammar: Idioms; Single Word Substitutes, Listening: Listening to atelephone conversation; viewing model interviews (face-to-face, telephonic and video conferencing), Speaking: Interview Skills, Mock Interviews, Reading: Reading job advertisements and the profile of the company concerned, Writing: Applying for a job; Writing a cover letter with résumé / CV.

Text books

1.Thorpe, Edgar and Showick Thorpe. Objective English. Pearson Education, 2013.

2.Dixson, Robert J. Everyday Dialogues in English. Prentice Hall India Pvt Ltd., 1988.

3.Turton, Nigel D. ABC of Common Errors. Mac Millan Publishers, 1995.

Reference books

1.Bansal, R.K. and J.B. Harrison. Spoken English. Orient Blackswan, 2013.

2.Raman, Meenakshi and Sangeeta Sharma. Technical Communication. Oxford University Press, 2015.
3.Samson, T. (ed.) Innovate with English. Cambridge University Press, 2010.

4.Kumar, E Suresh, J. Savitri and P Sreehari (ed). Effective English. Pearson Education, 2009.

5.Goodale, Malcolm. Professional Presentation. Cambridge University Press, 2013.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	E	f	g	H	i	j	k	l	m	n
CO1							H							
CO2							H							
CO3							H							
CO4							H							
CO5							H							

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

Each student will have to choose different technical paper, prepare a PPT and give a presentation.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT2050	**Indian Constitution And Professional Ethics**	**FC**	**2**	**0**	**0**	**0**	**2**	**2**

Prerequisites:

Pre-university level Constitution of India and Professional Ethics.

Course Description:

The Constitution of India lays down in defining fundamental political principles, establishes the structure, procedures, powers and duties of government institutions and sets out fundamental rights, directive principles and duties of citizen.It helps to know and understand the human rights and human values. It also helps to know the meaning of ethics and need of ethics in personal and professional life.

Course Objectives:

The objectives of this course are to:

1. Explain basic knowledge required to understand Constitution of India.
2. Describe the Fundamental Rights, Duties and other Rights.
3. Discuss different types of ethics.
4. Explore ethical standards followed by different companies.

Course Outcomes:

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

CO1: Outline the Fundamental Rights, Duties and other Rights protected under Indian Constitution.

CO2: Demonstrate the practicality of Constitution perspective and make them face the world as a bonafide citizen.

CO3:Illustrate the professional ethics and human values.

CO4: Summarize ethical standards followed by different companies.

Course Content:

UNIT-1:

Indian constitution: Sailent features, fundamental rights and duties (Directive principle and statepolicy), Legislature (Loka Sabha &Rajya Sabha), Executive (President & Governor) and Judiciary (Supreme court & high court), Composition and function of parliament, Council of ministers, prime minister, Speaker, Passing of bills.

UNIT-2:

Human Rights: Nature and Scope of human rights, Universal protection of human rights (UDHR),Regional protection of human rights, National level protection of human rights, Human rights and vulnerable groups (children, women &oldage).

Human values: Truth, Honesty, Loyalty, Love, Peace with examples, Difference between ethics, beliefs and morals.

UNIT-3:

Ethics: Meaning, Definition, Evolution, Need of ethics, Aristotlean Ethics, Utilitarianism, Katianism,human values(Good conduct, respect for elders), ethical human conduct (Gender equality), Professional Ethics, Personal Ethics and Business Ethics, Ethical Standards, Duties of Employers and Employees.

UNIT 4:

Engineering Ethics: Definition Scope and needs, Ethics in Consumer Protection, Due Care theory,Environmental Ethics, Ethical Code of Conduct in ethics. Best Ethical Companies in India and Abroad; Corporate Social Responsibilities, Code of Conduct and Ethical Excellence

Self-learning component: Abuse of Technologies: Hacking and other crimes, addiction to mobile phone usage, video games and social networking websites

Text books:

1.Kapoor, S.K., Human rights under International Law and Indian Law, Prentice Hall of India, New Delhi, 2002.

2.Basu, D.D., Indian Constitution, Oxford University Press, New Delhi, 2002.

3.Chakraborty, S.K., Values and ethics for Organizations and Theory Practice, Oxford University Press, New Delhi, 2001.

Reference books:

1.Meron Theodor, Human Rights and International Law Legal Policy Issues, Vol. 1 and 2, Oxford University, Press, New Delhi, 2000.

2.M V Pylee, An Introduction to Constitution of India.

3.MGovindarajan, S Natarajan, V S Senthil Kumar, Engineering.

4.Dr. Durga Das Basu, Introduction to constitution of India.

5.M V Pylee, An introduction to constitution of India.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	E	f	g	H	i	j	k	l	m	N
CO1				M								H	M	
CO2				M			H					H		
CO3				H		H	M					M		
CO4				H		H							M	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

Each student will have to choose a topic in one of the following areas and give presentation.

- Fundamental Rights and Duties.
- Ethics
- Human Values

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT2060	Computer Aided Engineering Drawing Lab	HC	0	0	2	0	2	4

Lab Outcomes:

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

CO1: Apply various concepts to solve practical problems related to engineering drawing.
CO2: Express component descriptions as per the commonly practiced standards.
CO3: Draw Orthographic projections, development and Isometric views of solids.
CO4: Create computer models of 3D mechanical objects with a variety of Geometric types.

List of Experiments

Sl.No.	NAME OF THE EXPERIMENT	CO	PO	UNIT
1.	A point 30 mm above XY line is the front view of two points A and B. The top view of A is 40 mm behind VP and the top view of B is 45 mm infront of VP. Draw the projections of the points and state the quadrants in which the points are situated.	1,2	a,g,k,l	01
2.	Draw the projections of the following points on the same XY line, keeping convenient distance between each projectors. Name the Quadrants in whey they lie. E - 30 mm below HP and 25 mm behind VP. F - 35 mm below HP and 30 mm infront of VP. G - on HP and 30 mm infront of VP. H - on HP and 35 mm behind VP.	1,2	a,g,k,l	01
3.	A line has its end A 10 mm above HP and 15 mm infront of VP. The end B is 55 mm above HP and line is inclined at 30º to HP and 35º to VP. The distance between the end projectors is 50 mm. Draw the projections of the line. Determine the true length of the line and its inclination with VP.	1,2	a,g,k,l	01
4.	The front view of a 90 mm long line which is inclined at 45º to the XY line, measures 65 mm. End A is 15 mm above the XY line and is in VP. Draw the projections of the line and find its inclinations with HP and VP.	1,2	a,g,k,l	01
5.	A triangular plane lamina of sides 25 mm is resting on HP with one of its corners touching it, such that the side opposite to the corner on which it rests is 15 mm above HP and makes an angle of 30º with VP. Draw t6he top and front views in this position. Also determine the inclination of the lamina to the reference plane.	1,2	a,g,k,l	01
6.	A pentagonal lamina of edges 25 mm is resting on HP with one of its sides such that the surface makes an angle of 60 º with HP. The edge on which it rests is inclined at 45 º to VP. Draw its projections.	1,2	a,g,k,l	01
7.	A square prism 35 mm sides of base and 60 mm axis length rests on HP on one of its corners of the base such that the two base edges containing the corner on which it rests make equal inclinations with HP. Draw the projectionsof the prism when the axis of the prism is inclined to HP at 40º and to VP at 30º.	3,4	a,g,k,	02
8.	A hexagonal prism 25 mm sides of base and 50 mm axis length rests on HP on one of its edges. Draw the projections of the prism when the axis is inclined to HP at 45º and appears to be inclined to VP at 40º.	3,4	a,g,k	02
9.	A pentagonal pyramid 25 mm sides of base sand 50 mm axis length rests on	3,4	a,g,k	03

	HP on one of its edges of the base. Draw the projections of the pyramid when the axis is inclined to HP at 45º and VP at 30º.			
10.	A hexagonal pyramid 25mm sides of base and 50mm axis length rests on HP on one of its edges of the base. Draw the projections of the pyramid when the axis is inclined to HP at 45 º and VP at 30 º.	3,4	a,g,k	03
11.	A regular pentagonal pyramid of side of base 35mm and altitude 65mm has its base on HP with a side of base perpendicular to VP. The pyramid is cut by a section plane which is perpendicular to the VP and inclined at 30^0 to HP. The cutting plane meets the axis of the pyramid at a point 30mm below the vertex. Obtain the development of the remaining part of the pyramid.	3,4	a,g,k	04
12.	A right cone of 55mm diameter of base and 75mm height stands on its base on HP. It is cut to the shape of truncated cone with its truncated surface inclined at 45^0 to the axis lying at a distance of 40mm from the apex of the cone. Obtain the development of the lateral surface of the truncated cone.	3,4	a,g,k	04

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT2070	**Python Programming and Applications Lab**	**HC**	**0**	**0**	**2**	**0**	**2**	**2**

Course Outcomes:

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

1. Outline the fundamentals of python statements like statements, functions, exceptions, errors, scripts, Data Types, Files and Dictionaries
2. Develop the programs on Parsing of regular expressions
3. Make use of features of Object oriented programming and files for developing applications.
4. Apply the concepts of NumPy for developing applications.

List of Experiments:

Sl. No.	Name of the Experiment	CO	PO
1 a)	Running instructions in Interactive interpreter and a Python Script.	1	a, b
b)	Write a program to purposefully raise Indentation Error and correct it	1	a, b
2 a)	Write a program to compute distance between two points taking input from the user	1	a, b
b)	Write a program add.py that takes 2 numbers as command line arguments and prints its sum.	1	a, b
3 a)	Write a Program for checking whether the given number is an even number or not.	1	a, b
b)	Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . , 1/10	1	a, b

4 a)	Write a program using a for loop that loops over a sequence. What is sequence?	1	a, b
b)	Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.	1	a, b
5 a)	Find the sum of all the primes below two million.	1	a, b
b)	Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be: 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ... By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms	1	a, b
6 a)	Write a program to count the numbers of characters in the string and store them in a dictionary data structure	1	a, b
b)	Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure	1	a, b
7 a)	Write a program combine lists that combines these lists into a dictionary.	1	a, b
b)	Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?	3	a, b, d, e
8 a)	Write a program to print each line of a file in reverse order	3	a, b, d, e
b)	Write a program to compute the number of characters, words and lines in a file.	3	a, b, d, e
9 a)	Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.	2	a, b, d
b	Find mean, median, mode for the given set of numbers in a list.	2	a, b, d
10 a)	Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.	2	a, b, d
b	Write a function dups to find all duplicates in the list.	2	a, b, d
11 a	Write a function cumulative product to compute cumulative product of a list of numbers.	4	a, b, d, e , f
b	Write a function reverse to reverse a list. Without using the reverse function.	4	a, b, d, e , f
12 a	Write a program that defines a matrix and prints	4	a, b, d, e , f
b	Write a program to perform addition of two square matrices	4	a, b, d, e , f
13 a	Write a program to perform multiplication of two square matrices	4	a, b, d, e , f
b	Write a function unique to find all the unique elements of a list. Program: def	4	a, b, d, e , f

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT2080	Physics Lab	HC	0	0	2	0	2	2

Course Outcomes (Cos):

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

CO1: Develop skills to impart practical knowledge in real time solution.
CO2: Apply the knowledge of new technology and comparison of results with theoretical calculations.
CO3: Enumerate observed optical phenomena in nature.
C04: Design new instruments with practical knowledge

List of Experiments

Sl. No.	EXPERIMENT	CO	PO
1	To find the velocity of ultrasonic waves in non-conducting medium by piezo-electricmethod	1	g, h, i
2	To find the band gap of intrinsic semi-conductor using four probe method	1	g, h, i
3	To find the value of Planck's constant by using Light emitting diode	3	g, h, i
4	To study the V-I characteristics of a zener diode	1	g, h, i
5	To find the laser parameters–wavelength and divergence of laser light by Diffraction method	3	g, h, i
6	To study the photo diode characteristics and hence to verify the inverse square law	1,3	g, h, i
7	To determine capacitance anddielectric constant of a capacitor by charging and discharging a capacitor	1	g, h, i
8	Study of attenuation and propagation characteristics of	3	g, h, i

	optical fibre cable		
9	Determination of Particle size using laser	1,3,4	g, h, i
10	Construction and study of IC regulation properties of a given power supply	1	g, h, i
11	Study of electrical characteristics of a solar cell	3	g, h, i
12	Determination of numerical aperture of a given optical fibre	3	g, h, i
13	Determination of electrical resistivity of Germanium crystal and study the variation of resistivity with temperature by four probe method	1,2	g, h, i
14	To Study the characteristics of a given npn transistor and to determine current gain and amplification factor in CE mode	1	g, h, i
15	To determine the resonance frequency and bandwidth of a given LCR circuit (Series and Parallel)	1	g, h, i

Additional Experiments

1. Study forward and reverse characterisitics for a zener diode using the pspice software and find knee voltage and breakdown voltage
2. Study the frequnce response of series and parallel LCR circuits using pspice software
3. Determine current gain, input resistance and output resistance for a transistor by studying its input, output and transfer characteristics using pspice software.

Text Books:

1. *Thiruvadigal, J. D., Ponnusamy S. Sudha D. and Krishnamohan M. "Physics for Technologists", Vibrant Publication, Chennai, 2013*
2. *R.K.Shukla and Anchal Srivastava, Practical Physics, 1st Edition, New Age International (P) Ltd, New Delhi, 2006.*

Reference Books:

1.G.L.Souires, Practical Physics, 4th Edition, Cambridge University, UK, 2001

2.D. Chattopadhyay, P. C. Rakshit and B. Saha, An Advanced Course in Practical Physics, 2nd Edition, Books & Allied Ltd., Calcutta, 1990.

3.B.L. Worshnop and H.T. Flint, Advanced Practical Physics (KPH)

4.S.L.Gupta and V.Kumar, Practical Physics (PragatiPrakashan).

5. Chauhan and Singh, Advanced Practical Physics Vol.I & II (PragatiPrakashan).

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1		L									L			
CO2		L									L			
CO3		L												
CO4														
CO5										L	L			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT2090	**Skill Development -2**	**HC**	**0**	**0**	**0**	**0**	**1**	**2**

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT2X10	**Sports / Yoga / Music / Dance / Theatre**	**RULO**	**0**	**0**	**2**	**0**	**2**	**2**

Note: Music, Dance, and Theater courses are offered by the School of Performing Arts, whereas the Sports and Yoga courses are offered by the Department of Physical Education. The students shall choose any **ONE** of these courses.

A. YOGA FOR HEALTH

Course Objectives:

Following are the Course Objectives.

- To prepare the students for the integration of their physical, mental and spiritual faculties;
- To enable the students to maintain good health;
- To practice mental hygiene and to attain higher level of consciousness;
- To possess emotional stability, self control and concentration; and
- To inculcate among students self discipline, moral and ethical values.

Course Outcomes:

On completion of the course learners will be able to:

- Practice yoga for strength, flexibility, and relaxation.
- Learn techniques for increasing concentration and decreasing anxiety
- Become self disciplined and self-controlled
- Improve physical fitness and perform better in studies
- Gain self confidence to face the challenges in the society with commitment to serve the society

Course Content:

UNIT-I:

Yoga: Introduction ; **Surya Namaskara:-** 12 counts

UNIT-II:

Asanas: Sitting- Vajrasana, Dandasana, Padmasana, Matsyasana, Paschimottasana, Shirasasana.

Asanas: Standing- Tadasana, Trikonasana, Parshwa konasana, Veerabadrasana.

UNIT-III:

Asanas: Prone Position- Bhujangasana, Dhanurasana.

Asanas: Supine Position- Sarvangasana, Halasana.

Mudras- Dhyana mudra, , Namaste mudra, Nasika mudra

UNIT-IV:

Pranayams:- Anuloma – Viloma, Basthrika, Bhramari.

Dhyana & its types: Competition format, Rules and their interpretations

B. VOLLEYBALL

Course Objectives:

To learn the rules, fundamental skills, and strategies of volleyball

1. To develop skills in passing, setting, serving, spiking, and blocking.
2. To learn basic offensive and defensive patterns of play.

3. To develop a positive attitude towards volleyball as a lifetime sport and to improve physical fitness through participation in volleyball.

Course Outcomes:

On completion of the course learners will be able to:

1. Learn basic skills and knowledge associated with volleyball.
2. Apply these skills while playing volleyball and exhibit improved performance
3. Improve physical fitness and practice positive personal and lifestyle.
4. Gain an understanding of the value of sports in attaining wellness, maintaining good health and developing spirit of teamwork.

Course Content:

UNIT-I

- Introduction about Volleyball
- Players Stance, Receiving and passing
- The Volley (Overhead pass), The Dig (Underhand pass), Service Reception

UNIT-II

- Service- Under Arm Service, Tennis Service, Side Arm Spin Service, Round Arm Service, High spin service, Asian serve / American serve (floating)
- Setting the ball- Set for attack, Back set, Jump set

UNIT-III

- Smash/Spike- Straight smash, Body turn smash, Wrist outward smash, Wrist inward smash
- Block- Single block, Double block, Three-man block
- Rolls- Overhead pass & back rolling, One hand underhand pass with side rolling, Forward dive

UNIT-IV

- Attack Combination, Defense Systems, Libero play
- Court marking, Rules and their interpretations and Duties of officials

C. BASKETBALL

Course Objectives:

1. To learn the rules, fundamental skills, and strategies of Basketball
2. To develop technical skills in passing, in ball handling, individual offense, individual defense, rebounding, screen, team offense, team defense and fast break.

3. To learn basic offensive and defensive strategies of play.
4. To develop a positive attitude towards Basketball as a lifetime sport and to improve physical fitness through participation in Basketball.
5. To develop positive understanding and appreciation of the basketball game.

Course Outcomes:

On completion of the course learners will be able to:

1. Learn basic skills and knowledge associated with basketball.
2. Apply these skills while playing basketball and exhibit improved performance
3. Improve physical fitness and practice positive personal and lifestyle.
4. Gain an understanding of the value of sports in attaining wellness, maintaining good health and developing spirit of teamwork.

Course Content:

UNIT-I

- Basketball: Introduction
- Grip; Player stance- Triple threat stance and Ball handling exercises
- Passing (Two hand/one hand)- Chest pass, Bounce Pass, Over head pass, Underhand pass, Hook Pass, Behind the back pass, Baseball pass, Side arm pass and passing in running.
- Receiving-Two Hand receiving, One hand receiving, Receiving in stationary position, Receiving while jumping, Receiving while running.

UNIT-II

- Dribbling- How to start dribble, How to stop dribble, High / Low dribble with variations
- Shooting- Layup shot and its variations, One hand set shot, One hand jump shot, Free throw, Hook shot, Tip-in shot.
- Stopping- Stride/Scoot, Pivoting and Faking /Feinting footwork.

UNIT-III

- Rebounding- Defensive rebound, Offensive rebound, Box out, Rebound Organization.
- Individual Defensive- Guarding the man with the ball and without the ball.
- Offensive drills, Fast break drills, Team Defense/Offense, Team Tactics

UNIT-IV

- Court marking, Rules and their interpretations

D. FOOTBALL

Course Objectives:

1. To learn the rules, fundamental skills, and strategies of football.
2. To develop skills in passing, receiving, controlling the ball, dribbling, shielding, shooting, tackling, beating a defender and heading in football.
3. To learn basic offensive and defensive patterns of play
4. To use different parts of the body in utilizing the above skills while playing football
5. To develop a positive attitude towards football as a lifetime sport and to improve physical fitness through participation in football.

Course Outcomes:

On completion of the course learners will be able to:

1. Learn basic skills and knowledge associated with football.
2. Apply these skills while playing football and exhibit improved performance
3. Use the knowledge and understanding to perform, refine and adapt the above skills and related skills with precision, accuracy, fluency and clarity in any situation.
4. Improve physical fitness and practice positive personal and lifestyle.
5. Gain an understanding of the value of sports in attaining wellness, maintaining good health and developing spirit of teamwork.

Course Content:

UNIT-I

Football: Introduction

- Kicks- Inside kick, Instep kick, Outer instep kick, Lofted kick, Chipping, Volley, Half Volley
- Trapping- Trapping rolling the ball, Trapping bouncing ball with sole

UNIT-II

- Dribbling- With instep and outer instep of the foot.
- Heading- From standing, running and jumping.
- Feinting- With the lower limb and upper part of the body.

UNIT-III

- Tackling- Simple tackling, Slide tackling.
- Throw-in- Standing and Sliding
- Goal Keeping- Collection of balls, Ball clearance, throwing and deflecting.

UNIT-IV

- Ground marking, Rules and their interpretations

E. ATHLETICS (TRACK AND FIELD)

Course Objectives:

1. To teach students the skilled techniques in sprints, relay running, hurdles, long jump, high jump, and shot put and practice them.
2. To develop competence among students in demonstrating all the techniques covered in the course.
3. To make students understand some of the scientific and empirical principles and their rationale underlying the development of skilled performance.
4. To inculcate among students the habit of team work and cooperative learning and develop competence in detecting / correcting technique errors.
5. To develop a positive attitude towards sports in general and athletics in particular and to improve physical fitness through participation in various athletic games / sports activities.

Course Outcomes:

On completion of the course learners will be able to:

1. Display competencies in executing basic techniques and skills associated with select track and field events.
2. Develop basic skills and techniques to improve one's running posture and take-off position for different jumps.
3. Learn regular practice of select track and field events and improve physical fitness
4. Appreciate track and field events by applying sports science knowledge to explain the execution of the events.

Course Content:

UNIT-I

- Athletics: Introduction
- Track Events - Steeple Chase, Race Walking, Middle and Long distance races
- Race walking - Technique, Faults and Officiating.
- Middle and Long distance races – Technique and Training

UNIT-II

- Jumping Events - High Jump and Triple Jump: Basic Skills and techniques
- High Jump - Straddle Roll & Flop Technique, Approach, Take-off, Technique in the air, Clearance over the bar & Landing
- Triple Jump – Hop, Step and Jump Technique, Approach, Take-off & Landing

UNIT-III

- Throwing Events - Discus Throw and Hammer Throw: Basic Skills and techniques
- Discus Throw - Standing and Rotatory techniques, Grip, Stance, Rotation Technique, Power stance, Release and Reverse (Follow through)
- Hammer Throw - Grip, Swings, Rotation foot work, Release and Follow through

UNIT-IV

- Rules, Officiating and Marking - Ground / Sector Marking, Interpretation of Rules.

Reference Books

1. Arthur E. Ellison (ed) (1994). Athletic Training and Sports Medicine.
2. Ballisteros, J.M. (1998). Hurdles Basic Coaching Manual, IAAF.
3. Bosen K.O. (1993). Teaching Athletics Skills and Technique.
4. Bosen K.O. (1990). Study Material on Hurdles for the Regular Course Students.
5. Doherty K. (1995). Track and Field Omni book.
6. Martin, David E. Peter N. Coe (1991). Training Distance Runner.
7. Howard S. (1981). Science of Track and Field Athletics.
8. Briggs Graeme (1987). "Track and field coaching Manual", Australian Track and Field Coaches Association. Rothmans Foundation National Sports Division.
9. Carr, Gerry (1999). "Fundamentals of Track and Field. Track Athletics Title G.V. 1060 5.e. 368.
10. I.A.A.F. Level-II (2001). Text Book on Jumping Event.
11. Jarver, Jesse (1987). "The Jumps", Track and Field Coaching Manual Australia.

F. DRAMATICS

Pre-requisites: Students with background in Theatre Arts/ Keen interest in Dramatics.

Course Objectives:

- To imbibe the acting skills.
- To understand the broader applications of theatre studies in allied arts forms.
- To be able to use body language for better communication.
- Students shall also be able to understand voice modulation and Navarasas.

Course Outcomes:

On successful completion of this course, students should be able to:

- Freely express improvisation in non-verbal communication.
- Shall hone good acting skills and be able to emote better.

- Be able to put up a theatre act and play a key role.
- Be able to differentiate good acting and understand the importance of good lyrics, stage crafting, music, dance, costume and lighting.

Course Content:

UNIT – 1

Working on Body:

Body and its analysis. Understanding physical abilities (Anga, Pratyanga and Upanga). Challenges of the body. Using body as metaphor and language. The class's bodies as a collective, an ensemble, a collaborative team.

UNIT – 2

Sound and Movement:

Awareness of creating sound patterns, voice modulations, rhythm in speech and diaologues. Understanding the rhythm and patterns of movements like walking, framing, shaping, primitive and animal movements.

UNIT – 3

Characterization and Improvisation:

Observation of people around. Getting into the role and living it. Developing a character from establishment (pace and rhythm). Improvisation techniques of body and mind.

UNIT – 4

Group work and Production:

Develop a theme, concept or a play and include all the theatre skills, stage craft, costuming and put up an act. Choosing theme and characters.

Reference Books:

1. All about Theatre – Off stage – Chris Hogget.
2. Rangadalli Anataranga – K V Subbanna
3. The Indian Theatre – Hemendranath Das Gupta.
4. A Practical handbook for an Actor – Milisa Bruder, ee Milchel Cohn, Madeleine Oliek et al, Zigler Publisher.

G. INDIAN CLASSICAL DANCE FORMS (Bharatanatyam, Kuchipudi ,Mohiniyattam)

Prerequisites: Background of classical dance training or any other dance forms.

Note: Non-classical dancers can also join.

Course Objectives:

- To develop an understanding about the Indian classical dance forms and its universal application.

- To be able to understand the fine nuances of Classical dance.
- To understand the importance of health through Indian classical dance, strengthen the body capacity.
- To understand mythology and its characters in Indian classical dance form through lessons of Abhinaya.

Course Outcomes:

- To be able to identify and appreciate the classical dance forms.
- To be able to execute basics of Adavus with finesse.
- To be able to express through abhinaya.
- To be able to perform to perform the fundamentals in the chosen dance form.

Course Content:

UNIT – 1

An introduction to Indian classical dance forms

Bharatanatyam, Kuchipudi, Mohiniyattam

UNIT - 2

Learning of Fundamentals

Exercises and Adavus- I (Bharathanatyam, Kuchipudi, Mohiniyattam)

UNIT - 3

Adavus –II (Bharathanatyam, Kuchipudi, Mohiniyattam)

UNIT - 4

Learn a basic composition in the chosen dance form.

Reference Books:

1. Indian classical dance forms –U S Krishna Rao,U K Chandrabhaga Devi
2. Classical Dances –Sonal Mansingh, Avinash Parischa
3. Kuchipudi – Sunil Kothari
4. Bharatanatyam An in depth study- Saroja vydyanathan
5. Mohiniyattam – Bharathi Shivaji

H. PERCUSSION INSTRUMENT (TABLA AND MRIDANGAM)

Pre-requisites: Students with background in Percussion instruments and knowledge of Rhythm/ Keen interest in studying Mridagam / Tabala.

Course Objectives:

•To understand the Rhythmology.

•To understand the importance of Laya, Taala.

•To be able to understand the fine finger techniques of playing the instrument.

Course Outcomes:

On successful completion of this course, students should be able to:

• To be able to set instrument to Sruthi.

• To be able to play the fundamentals on instrument.

• To be able to learn and perform a particular taala.

Course Content:

UNIT - 1

1. Introduction to Musical Instruments; 2. Percussion Instruments; 3. Mridangam and its History

UNIT - 2

1. Introduction to Tala System; 2. Definitions of five jaathis and their recitation; 3. Adi Talam and its various forms; 4. Definitions and recitation of different gathis

UNIT - 3

1. Tisra Jaathi; 2. Khanda Jaathi; 3. Misra Jaathi; 4. Sankeerna Jaathi

UNIT - 4

1. Learning of Jathi Formation; 2. Basic jathis; 3. Jathis for Dance forms ; 4. Some Basic Definitions of Korvai, Teermanam etc.

Reference Books:

1. Mridangam- An Indian Classical Percussion Drum – Shreejayanthi Gopal
2. Theory and practice of Tabala – Sadanand Naimpally.
3. Theory and practice of Mridangam – Dharmala Rama Murthy
4. The Art of the Indian Tabala – Srdjan Beronja.

THIRD SEMESTER:

Course Code	Course Title	Course Type	Credit Pattern & Credit Value					Hrs/ Wk
			L	T	P	J	C	
B19IT3010	Digital Logic Design	HC	3	0	1	0	4	5

Prerequisites:

Knowledge of Basic Electrical and Electronics Engineering [B19IT1040]

Course Description:

This course covers basic concepts and techniques of combinational and sequential digital logic circuits, notably basic building blocks such as different types of latches, flip flops, registers, synchronous and asynchronous counters.

Course Description:

This course covers basic concepts and techniques of combinational and sequential digital logic circuits, notably basic building blocks such as different types of latches, flip flops, registers, synchronous and asynchronous counters.

Course Objectives:

The objectives of this course are to:

1. Explain the construction of K-maps to simplify Boolean expressions.
2. Demonstrate the working of combinational and sequential circuits based on the input conditions.
3. Describe characteristic equations of various types of Flip-Flops and types of shift registers.
4. Illustrate circuit implementation using flip flop based approach and ROM based approach.

Course Outcomes:

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

CO1. Construct the K-map from a Boolean expression and to find the minimal SOP/POS forms;
CO2. Design combinational and sequential digital logic circuits;
CO3. Make use of the operations of basic building blocks, such as different types of latches, flip-flops, registers and counters;
CO4. Implement various types of flip-flops in creating sequential circuits and their uses in synchronous and asynchronous counters.

Course Content:

UNIT-1:

Principle and Minimization Techniques of combinational Circuits: Introduction to combinational logic; Minimization Techniques: Minterm, Maxterm, Sum of Products (SOP), Product of Sums (POS); 3 and 4 Variable Karnaugh map; Quine-McCluskey method. Application study1**:** Logical Function UNIT

UNIT-2:

Analysis and Design of Combinational Circuits: Half adder; full Adder; half subtractor; full subtractor; Serial Adder/Subtractor; Carry Look Ahead adder; BCD adder; encoder and decoder; multiplexers and demultiplexers; cascading of Mux; Boolean function implementation using Mux and decoders.Application study2:Calculator

UNIT-3:

Introduction to Sequential circuits: The S R Latch; edge and level triggering, flip-flops: SR, JK, D, T, and Master-Slave; Characteristic tables and equations; registers, shift register, universal shift register
Application sudy3: Digital combinational lock

UNIT 4:

Sequential Design: Counters: Analysis of Binary ripple Up/Down counter, Analysis and design of synchronous and asynchronous mod-*n* counter using flip-flop, state machine notation, Introduction to Mealy and Moore model, Sequence detector. Application study: Vending machine

Self-learning component:
Memory devices (ROM, RAM), Elevator, Digital clock.

Text books:

1. *D P Leach, A P Malvino, and GouthamSaha, "Digital Principles and Applications", Tata McGraw-Hill, 7th edition, 2006.*
2. *Moshe Morris Mano, "Digital Design", Prentice Hall, 3rd edition, 2004.*

Reference books:

1. *Samuel C Lee, "Digital Circuits and Logic Design", PHI Course Pvt. Ltd., 2008.*
2. *Charles H Roth Jr., "Fundamentals of Logic Design", Cengage Course, 5th edition, 2014.*
3. *John M Yarbrough, "Digital Logic Applications and Design", Thomson Course, 2001.*
4. *Donald D Givone, "Digital Principles and Design", Tata McGraw-Hill 2002.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	E	f	g	H	i	j	k	l	m	N
CO1	H							H					H	
CO2			M	M								M		
CO3			H	H										
CO4	H							H					H	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Obtain NOT, NAND, AND, OR, X-OR and X-NOR gates using only NOR gates.
2. Design 4-to-1 multiplexer using basic gates.
3. Design a 32-to-1 multiplexer using two 16-to-1 multiplexer and one 2-to-1 multiplexer
4. Find out characteristic equations of J-K flip-flop and D flip-flop.
5. List the application of flip-flops.
6. Draw the shift sequence of a ring/Johnson counter to shift 1001 in the register
7. Convert JK flip-flop into T and D-flip-flop.
8. Design a MOD-8 synchronous counter and realize using MSJK flip-flop.
9. Design a sequence detector to detect the sequence 101 using Moore model.
10. Draw the ASM chart for the vending machine problem.
11. Design of Digital Circuits using EDA tools.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT3020	**Computer Organization and Architecture**	**HC**	**3**	**0**	**0**	**0**	**3**	**3**

Pre-requisites:

Basic Electrical and Electronics Engineering (B19IT1040)

Course description:

The course provides students with an understanding of the design of fundamental blocks used for building a computer system and interfacing techniques of these blocks to achieve different configurations of an "entire computer system". The course also gives introduction to Multi-core architecture and parallel programming

Course Objectives:

The objectives of this course are to:

1. Explain the concepts such as microprocessor, microcontroller and microcomputer, ARM processor.

2. Demonstrate the use of instruction set of ARM processor in developing real world application.
3. Describe different addressing modes used in developing applications.
4. Discuss Memory architecture and Advanced Computer architecture concepts

Course Outcomes:

On successful completion of this course; the student will be able to:
1. Define microprocessor, microcontroller and microcomputer and ARM processor.
2. Write simple programming assignments using instruction set of ARM processor
3. Make use of different addressing modes for developing real world applications.
4. Apply the concepts of Advanced Computer architecture for solving real world problems.

Course Content:

UNIT- 1

Introduction: Microprocessor, Microcontroller, Micocomputer, IOT, ARM Processor

Introduction to architecture and features of Microprocessor, Microcontroller, Microcomputer, and IOT (block diagram based). History of microprocessors and microcontrollers. IOT based boards.

Introduction to ARM, ARM architecture, Instruction set of ARM Processor, Addressing modes, programs for data movement, logic operations, and loop operations.

UNIT -2

Basics: Computer Arithmetic
Computer arithmetic - integer addition and subtraction, ripple carry adder, carry look-ahead adder, multiplication - shift-and-add, Booth multiplier, carry save multiplier, etc. Division - restoring and non-restoring techniques, floating point arithmetic.

Addressing Modes, Instruction Set
Instruction set architecture of a CPU - registers,

UNIT- 3

Instruction Execution Flow

Instruction execution cycle, RTL interpretation of instructions, addressing modes;

Hardware and Micro-program based control UNIT Design
CPU control UNIT design: hardwired and micro-programmed design approaches: ARM pipelines

UNIT- 4

Memory Architecture, Peripherals and Input-Output
Memory system design: semiconductor memory technologies, memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions.

Peripheral devices and their characteristics: Input-output subsystems, I/O transfers - program controlled, interrupt driven and DMA

ARM cortex memory

Advanced Computer architecture concepts

Parallelism, SIMD architectures, MIMD architectures , Processor interconnection ,

Multicore systems - structure, performance, complexity, power consumption, memory utilization, software development issues for multicore systems

Self-learning component:

More Recent Applications: Data-level parallelism - motivation, challenges, applications

Text books:

1. *Carl Hamacher, Zvonko Vranesic and Safwat Zaky. "Computer Organization", McGraw Hill, 2011.*
2. *William Stallings. "Computer organization and architecture: designing for performance". Pearson Education India, 2000.*
3. *David A. Patterson, John L. Hennessy. "Computer organization and design: the hardware/software interface". Elsevier, 2011.*
4. *Peter Knaggs , "ARM Assembly Language Programming " Available online: http://www.rigwit.co.uk/ARMBook/ARMBook.pdf*

Reference books:

1. *Heuring, V. P. & Jordan, H. F., Computer Systems Design and Architecture, Pearson Education, 2008*
2. *Shen, J. P. & Lipasti, M. H., Modern Processor Design: Fundamentals of Superscalar Processors, Tata McGraw-Hill, 2013*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	N
CO1	M	L						L		L				
CO2	M	L						L		L				
CO3	M	L						L		L				
CO4	M	L						L		L				

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. The digital computer is a fast electronic calculating machine that accepts digitized input information and processes it and produces the resulting output information. Explain the various functional UNITs involved in this process.
2. Assume that the processor has Load, Store, Multiply and add instruction and that all values fit in the accumulator. Write a sequence of instructions that can fit in a single accumulator processor for an expression. i. E X F +G X H
3. Give a short sequence of machine instructions for the task: "Add the contents of memory location A to those of Location B and place the answer in location C". Use different instruction types available

in the computer.
4. Assuming the length of the Register R0 as 8 bit and the content of R0 as 16 bit . Discuss the following operations. Rotate R #2, R0 Rotate LC #2, R0 LshiftR #2, R0
5. Represent the decimal values 5,-2,14,-10,26,-19 as Signed ,7 bit numbers in the following binary formats: a) 1's-Complement b)2's -Complement
6. Registers R1 and R2 of a computer contain the decimal values 1200 and 4600. What is the effective address of the memory operand in each of the following instructions? a. Load 20(R1),R5 b. Move #300, R5 c. Add –(R2),R5 iv) Sub (R1)+,R5
7. The program execution time T is to be computed for a certain high level language program. The program can be run on a computer. The number of instruction executions of a program is15 and average number of basic steps needed is 25 and the Clock Rate of computer is 6 Cycles per Second.
8. Consider a computer that has byte addressable memory organized in 32-bit words according to the big-endian scheme and little-endian scheme. A program reads ASCII characters entered at a keyboard and stores them in successive byte locations, starting at location 1000. Show the contents of the two memory words at locations 1000 and 1004 after the name "Computer" has been entered.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs./Wk.
B19IT3030	**Object Oriented Programming with Java**	**HC**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

Problem Solving with Programming (B19IT1030)

Course Description:

Java's unique architecture enables programmers to develop a single application that can run across multiple platforms seamlessly and reliably. In this course, students gain extensive experience with Java, object-oriented features and advance Java programming skills. Students learn to create robust object-oriented applications with Java.

Course Objectives:

1. Explain the basic data types and control structures of the Java language.
2. Illustrate the creation of classes and objects in Java.
3. Demonstrate the extending a class (inheritance) and use proper program anomaly handling structures.
4. Discuss the use of Java generics and collections

Course Outcomes (Cos):

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

CO1: Develop simple programs using Java language concepts such as variables, conditional and iterative execution methods.

CO2: Apply OOP principles and proper program structuring to develop programs.

CO3: Design an application using inheritance concept exception handling.

CO4: Build applications using Java generic types, generic operations and java collections.

Course Content:

UNIT -1:

FUNDAMENTAL PROGRAMMING STRUCTURES

Dissecting the "Hello, World" Program; Compiling and Running a Java Program; Primitive Types; Variables; Arithmetic Operations; Strings; Input and Output; Control Flow; Arrays; Functional Decomposition

UNIT- 2:

OBJECT-ORIENTED PROGRAMMING

Working with Objects; Implementing Classes; Object Construction; Static Variables and Methods, Packages; Nested Classes; Documentation Comments; Interfaces; Static, Default, and Private Methods in interface; Lambda Expressions; Method and Constructor References; Local and Anonymous Classes

UNIT- 3:

INHERITANCE AND EXCEPTIONS

Extending a Class; Object: The Cosmic Superclass; Enumerations; Runtime Type Information and Resources; Exception Handling: Throwing Exceptions; The Exception Hierarchy; Declaring Checked Exceptions; Catching Exceptions; the Try-with-Resources Statement; The finally Clause; Rethrowing and Chaining Exceptions; Uncaught Exceptions and the Stack Trace.

UNIT -4:

GENERIC PROGRAMMING AND COLLECTIONS

Generic Classes; Generic Methods; Type Bounds; Type Variance and Wildcards; Restrictions on Generics; an Overview of the Collections Framework; Iterators; Sets; Maps

Self-learning component:

The Eclipse IDE; Streams; Processing Input and Output; Concurrent Programming; Swing and JavaFX; Networking; JDBC Database Access

Text books:

1. *Cay S. Horstmann; Core Java® SE 9 for the Impatient, Addison Wesley, Second Edition, 2018.*
2. *Herbert Schildt; Java™: The Complete Reference, McGraw-Hill, Tenth Edition, 2018.*
3. *David Gallardo, Ed Burnette, Robert Mcgovern; Eclipse in Action a guide for java developers, Manning Publications*
4. *Ed Burnette; Eclipse IDE Pocket Guide : Using the Full-Featured IDE, O'Reilly Media, Inc, USA*

Reference books:

1. *Cay S. Horstmann; Core Java™ Volume I—Fundamentals, Prentice Hall, Tenth Edition, 2015*
2. *Joshua Bloch; Effective Java, Addison-Wesley Professional, Third Edition, 2017*
3. *Ken Kousen; Modern Java Recipes, O'Reilly Media, Inc., 2017*
4. *Oracle Java Documentation. (https://docs.oracle.com/javase/tutorial/)*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	N
CO1							L			H	H		H	
CO2	H	L	H		H		L			H	H		M	

CO3	H				H		L						M	
CO4	H	L	H		H		L			H	H		M	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

Use Java Programming Language to complete the assignment.

Assignment	Description	Concepts
SCIENTIFIC COMPUTING		
Global Sequence Alignment	Compute the similarity between two DNA sequences.	dynamic programming, strings
Particle Collision Simulation	Simulate the motion of N colliding particles according to the laws of elastic collision.	priority queue, event-driven simulation
Root Finding	Compute square roots using Newton's method.	loops, numerical computation
Cracking the Genetic Codes	Find the genetic encoding of amino acids, given a protein and a genetic sequence known to contain that protein.	strings, file input
COMBINATORIAL OPTIMIZATION		
Traveling Salesperson Problem	Find the shortest route connecting 13,509 Indian cities.	linked list, heuristics
TEXT PROCESSING		
Word Searching	Search for words horizontally, vertically and diagonally in a 2D character array	Tries
Redundancy Detector	Find the longest repeated sequence in a given text.	suffix sorting, strings
Text Indexing	Build an inverted index of a text corpus and find the position of query strings in the text.	suffix sorting or binary search tree
COMMUNICATION		
Prefix Free Codes	Decode a message compressed using Huffman codes.	binary trees, data compression
Burrows-Wheeler	Implement a novel text compression scheme that out-compresses PKZIP.	suffix sorting, arrays, data compression
RSA Cryptosystem	Implement the RSA cryptosystem.	big integers, repeated squaring, analysis of algorithms

DISCRETE MATH		
Linked List Sort	Shellsort a linked list.	linked list, shellsort
Factoring	Factor large integers using Pollard's rho method.	big integers, Euclid's algorithm
Deques and Randomized Queues	Create deque and randomized queue ADTs.	abstract data types, generics
Stock Market	Predict the performance of a stock using Dilbert's rule.	Loops

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT3040	**Data Structures**	**HC**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

Programming for Problem Solving (B19IT1030)

Course Description:

This course covers basic data structures techniques and their implementation in Java. Familiarize the concept of Abstract Data Types (ADT), stacks, Queues and Trees. The course also introduces applications of these data structures in solving problems. Students are expected to use these data structure concepts to write simple programs.

Course Objectives:

1. Discuss the basic Concepts of java and Data Structures
2. Illustrate the creation and use of singly and doubly Linked list in Java.
3. Demonstrate the use of Stacks and Queues in real world applications.
4. Discuss the concept and applications of Binary trees.

Course Outcomes (Cos):

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

CO1: Make use of Java Arrays for generation of random numbers.

CO2: Develop a java program for implementing the process scheduling algorithms using linked list.

CO3: Design a program in Java to use stacks/queues for a given application.

CO4: Implement Trees for storing files on disk.

Course Content:

UNIT 1

Introduction to JAVA: base types, "hello universe" java program, classes and objects, Strings, Wrappers, Arrays and Enum types, type conversion
Fundamental Data Structure: Arrays – definition, sorting an array- insertion sort, java methods for array operations, random number generation

UNIT 2

Linked list: Singly linked list definition, illustration- insert and deleting at beginning and end of list, implementation in java. Circular linked list – implementation in java; Doubly linked list- illustration of insertions and deletions.
Application : Round robin scheduling using linked list.

UNIT 3

Stacks: definition, stack ADT, Array implementation of stack, linked list implementation, implementation of stack class in java.
Application: java implementation for reversing an array using stack; illustration of infix to post fix conversion, evaluation of postfix expression.
Queue: definition, Queue ADT, array implementation, linked list implementation
Application: printer job assigning using circular queue

UNIT 4

Trees : general trees- definitions and properties; Binary Tree ADT, Binary Tree properties, Binary Tree interface in java, Abstract BinaryTree base class in java, linked list representation of Binary Tree, Java implementation of linked binary tree structure.
Application: Tree traversal – illustration of preorder, postorder traversal.

Text books:

1. *Michael T. Goodrich, Roberto Tamassia, Michael H.Goldwasser, Data Structures and Algorithms in JAVA , Wiley, 6th Edition, 2014*
2. *Herbert Schildt, The Complete reference Java, 7th edition , 2007*

Reference books:

1. Richard Gilberg, BehrouzForouzan, "Data Structures: A Pseudo code Approach with C", Cengage Learning, 2004.

2. DebasisSamanta, "Classic Data Structures", second edition, PHI Learning Private Limited, 2011.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	N
CO1	M	H					H					L		
CO2	H	H		M						M				
CO3	H										M		M	M
CO4	H	H		M						M	M			

Sample Assignments:

1. Write a java program to search for a protein sequence in the DNA string sequence.(CO1,CO2)
2. Write a program to perform check the performance of linear search and binary search on sorted 'n' randomly generated number. (CO2)
3. Select and implement a suitable data structure for demonstrating printing jobs assigned for a printer(CO3,CO4)
4. Write a java program to read infix arithmetic expressions as input, evaluates all of the expressions, and writes the resulting answers to the standard output. (CO4)
5. Design an algorithm which takes a preorder and inorder expression and produces the binary tree.(CO3).
6. Write a java program to implement variable length array.(CO1)
7. Write a program to check for balanced parenthesis by using stacks.(CO3)
8. Write a program to solve Tower of Hanoi problem using Stacks(CO3)
9. Write a program to convert from decimal number to binary number using stacks(CO3)
10. Write a program to add two large numbers using linked list.(CO2).

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT3050	**Discrete Mathematics and Graph Theory**	**HC**	**3**	**0**	**0**	**0**	**3**	**3**

Course Description:

The main objective of this course is to provide an understanding of the concepts and application of set theory, logic, relations and functions, principles of counting and to know the algebraic structure with one binary operation and two binary operations.

The main objective of this course is to provide an understanding of the concepts and application of graph theory.

Course Objectives:

The objectives of this course are to:

1. Explain mathematical arguments using logical connectives and quantifiers
2. Illustrate the operations on discrete structures such as sets, relations and functions.
3. Describe the theory and applications of graphs, fundamental theorems and their proofs.
4. Demonstrate the use of graphs to model many types of relations and processes in physical, biological, social and information systems.

Course Outcomes (COs):

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

CO1: Construct mathematical arguments using logical connectives and quantifiers.

CO2: Apply the operations like union and intersection on discrete structures such as sets, relations and functions.

CO3: Make use of graphs and fundamental theorems in real world application.

CO4: Develop a model using advanced concepts of graphs for the given real world application.

Course Content:

UNIT- 1 Set Theory and Logic

Fundamentals of sets, Sub sets, Venn diagrams, Operations on sets, Laws of set theory, Countable and uncountable sets, Addition- principle, Extended Addition Principle. Propositions, Logical connectives and truth tables (illustrative example), Logical equivalence , Laws of logic, Duality, NAND and NOR connective(Circuits), Converse ,Inverse and Contra positive, Rules of inference , Open statements, Quantifiers, Logical implication involving quantifiers, Statement with more than one variable, Methods of proofs and disproof.

UNIT -2 Relations and Functions

Cartesian product of Sets (illustrative example), Matrices and Digraphs of relations, Operations on relations, Properties of relations, Equivalence relations, Partial ordered relations, Posets, Hasse diagrams, External elements in posets. Types of Functions, Properties of Functions, The pigeon hole principle, Composite functions, Invertible functions, Floor and ceiling function, Sterling numbers of second kind.

UNIT- 3 Introduction to Graph Theory

Konigsberge's Bridge problem, Utilities problem, Seating Problems, graphs, Representation of graphs, Directed graphs, incidence, adjacency, degree, In degree , out degree, regular graphs, complete graphs, Null graphs, Bipartite graphs, Isomorphism, Directed graphs, Sub graphs, Walk, Trail, Path, Cycle, Connected and Disconnected graphs, Weakly Connected and Strongly Connected, Components, Complement of Graph, Partition , Decomposition.

UNIT- 4 Eulerian and Hamiltonian Graph and Graph colouring

Operation on graphs, Definition of Euler Trail, Euler graph, Standard theorems on Euler graphs Hamiltonian Path, Hamiltonian Cycle and Hamiltonian Graph, Standard theorems on Hamiltonian Graph, Planar graph, Detection of Planarity, Geometric dual, Euler formula, Graph colouring, Chromatic polynomial, Map colouring, Four colour theorem, Five Colour theorem, Matching, Network flow and its applications, Cut set, Cut vertex, Chord, Properties of Cut set, Max flow Min cut theorem.

Text books:

1. *Ralph P Grimaldi, Discrete and Combinatorial Mathematics,Pearson Education, 5th Edition, 2014*
2. *NarsinghDeo, "Graph Theory with Applications to Engineering and Computer Science", Prentice-Hall, 2014.*
3. *Ralph P Grimaldi, Discreteand Combinatorial mathematics, Pearson Education, 5th edition, 2014.*

Reference books:

1. *Kenneth H. Rosen, Discrete Mathematics and its Applications, 5thedition,Tata McGraw-Hill, 2014.*
2. *C. L. Liu, Elements of Discrete Mathematics, 4th edition, Tata McGraw-Hill, 2014.*
3. *ThomasKoshy, Discrete Mathematics with Applications, Elsevier, 2012.*
4. *Ralph P. Grimaldi, Discrete and Combinatorial Mathematics, Pearson Education, Asia,2015.*
5. *Frank Harary, "Graph Theory", Narosa, 2013.*
6. *J.A Bondy and U.S.R Murthy, Graph Theory with applications, Macmillan, 2013*
7. *GeirAgnarsson and Raymond Geenlaw ; Graph Theory modeling, Applications and algorithms, Pearson Education, 2007.*
8. *Douglas B, "Introduction to Graph Theory", Prentice Hall of India, 2nd edition, 2015.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	N
CO1									H					
CO2	H													
CO3										H				
CO4	H													

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Discuss the applications of Graph theory in the following:

A. Computer Networks
B. Structure of websites
C. Electronic chip design
D. Language processing
E. Semantic Search Engine
F. Modern Coding theory

G. Register allocation methods in compilers
H. Model molecule structures
I. In analysis of Biological networks –
    a. Protein – protein interaction networks
    b. Regulatory networks (GRNs)
    c. Signal transduction networks
    d. Metabolic and biochemical networks
J. Network flow in operation research

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT3060	**Software Engineering**	**HC**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

Any Programming language

Course Description:

The course provides students with a knowledge on the basic principles of software development life cycle, activities involved in software requirements engineering, software development, testing, evolution and maintenance. It introduces concepts such as software processes and agile methods, and essential software development activities

Course Objectives:

1. Discuss the importance of the software development process.
2. Explain the workflow of Automating process.
3. Illustrate with case study, the importance of DevOps.
4. Describe the software life cycle using a case study.

Course Outcomes (Cos):

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

CO1. Outline the importance of the software development process.

CO2. Design the workflow of Automating process.

CO3. Make use of DevOps.

CO4. Develop an application using software life cycle.

Course Content:

UNIT- 1

Introduction

Defining the Software Development Process: Goals of Defining the Software Development Process , Why Is Defining the Software Development Process Important? , Where Do I Start?, Explaining the Software Development Lifecycle , Systems versus Software Development Lifecycle, Defining Requirements, Managing Complexity and Change, Validity of Requirements, Testing Requirements ,Functional Requirements, Nonfunctional Requirements, Epics and Stories, Planning for Changing Requirements , Workflow for Defining Requirements ,Test-Driven Development , Designing Systems ,Software Development ,Testing , Testing the Application ,Testing the Process Itself , Continuous Integration , Continuous Delivery and Deployment , Defining Phases of the Lifecycle ,Documentation Required , DevOps , Communicating with All Stakeholders, Production Support ,Maintenance and Bugfixes, Lifecycle in the Beginning ,Maintenance of the Lifecycle ,Creating the Knowledge Base.

UNIT- 2

Agile Application Lifecycle Management: Goals of Agile Application Lifecycle Management, Why Is Agile ALM Important? Where Do I Start? Understanding the Paradigm Shift, Rapid Iterative Development, Remember RAD? , Focus on 12 Agile Principles, Agile Manifesto, Fixed Timebox Sprints, Customer Collaboration, Requirements, and Documentation.

UNIT- 3

Automating the Agile ALM: Goals of Automating the Agile ALM, Why Automating the ALM Is Important, Where Do I Start? Tools, Do Tools Matter? Process over Tools, Understanding Tools in the Scope of ALM, Staying Tools Agnostic, Commercial versus Open Source, What Do I Do Today? ,Automating the Workflow , Process Modeling Automation ,Managing the Lifecycle with ALM, Broad Scope of ALM Tools ,Achieving Seamless Integration ,Managing Requirements of the ALM, Creating Epics and Stories, Systems and +Driven Development ,Environment Management ,Gold Copies ,Supporting the CMDB, Driving DevOps ,Supporting Operations ,Help Desk ,Service Desk ,Incident Management , Problem Escalation ,Project Management, Planning the PMO ,Planning for Implementation, Evaluating and Selecting the Right Tools ,Defining the Use Case ,Training Is Essential, Vendor Relationships, Keeping Tools Current.

UNIT- 4

DevOps: Goals of DevOps, Why Is DevOps Important? Where Do I Start? How Do I Implement DevOps? Developers and Operations Conflicts, Developers and Operations Collaboration, Need for Rapid Change, Knowledge Management, the Cross-Functional Team, Is DevOps Agile? The DevOps Ecosystem, Moving the Process Upstream, Left-Shift, Right-Shift, DevOps in Dev, DevOps as Development, Deployment Pipeline,

Dependency Control, Configuration Control, Configuration Audits, QA and DevOps, Information Security, Infrastructure as Code, Taming Complexity, Automate Everything, Disaster Recovery and Business Continuity, Continuous Process Improvement.

Self-learning component:

Case study on Critical system; Case study on ATM using agile method;

Text books:

1. *Bob Aiello and Leslie Sachs, "Agile Application Lifecycle Management Using DevOps to Drive Process Improvement", Addison Wesly, First printing, June 2016.*

Reference books:

1. *Roger S, "Software Engineering – A Practitioner's Approach", seventh edition, Pressman, 2010.*
2. *Roger Pressman, Ian sommerville, "Software Engineering", 9th edition, 2010.*
3. *Hans Van Vliet, "Software Engineering: Principles and Practices", 2008.*
4. *Richard Fairley, "Software Engineering Concepts", 2008.*
5. *ACM Transactions on Software Engineering and Methodology (TOSEM).*
6. *IEEE Transactions on Software Engineering.*

Mapping COs with POs (Program Outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	N
CO1	M			L		H								
CO2	M			L		L					H			
CO3	M		M	L				L			L			
CO4	L		H							L	H			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Consider a scenario where you need to develop software for defense management system. Collect all functional and non-functional requirements and document a detailed report for the same.
2. Design test cases for validity and non-validity data, in a student management system for a university.
3. Consider a census System in India, illustrate the Planning done for Implementation, Evaluating and Selecting the Right Tools for Implementation.
4. Discuss and compare git pull and git fetch.
5. Describe the branching strategies used in devops

Course Code	Course Title	Duration (Weeks)	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT3070	**Data Structures Lab**	**14**	**HC**	**0**	**0**	**2**	**0**	**2**	**2**

Lab Outcomes:

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

CO1: Implement complex array operations on given data. (PO:a,b,m)
CO2: Choose appropriate data-structures for specific problems. (PO:a,b,c,m)
CO3: Develop applications based on different data structures for sorting, searching and computing. (PO:a,e,b,k)

Sl.No.	List of experiments	COs	Pos
1.	Write a Java program using the data structure arrays to multiply two given matrices of same order.	CO1	a,b,m
2.	Develop a program in java to read a **sparse matrix**of integer values in the 2D array format and convert the sparse matrix to <*row, column, value*> format and search for an element specified by the user. Print the result of the search appropriately.	CO1	a,b,m
3.	Write Java programs to implement the STACK ADT using an array.	CO1	a,b,m
4.	Write Java programs to implement the QUEUE ADT using an array.	CO1	a,b,m
5.	The compilers always convert infix expression into postfix to perform further operations like parsing, lexical analysis etc. Select an appropriate data structure and develop a program to convert an infix expression into postfix using **stack.**	CO2	a,b,c,m
6.	Write Java programs to implement the STACK ADT using a singly linked list.	CO2	a,b,c,m
7.	Evaluation of postfix expressions is done by compilers during the compilation process. Design and Develop a program to evaluate a postfix expression using **stack**.	CO3	a,e,b,k
8.	Write Java programs to implement the QUEUE ADT using a singly linked list.	CO3	a,e,b,k
9.	Write a java program that determines whether parenthetic symbols ( ), { } and [ ] are nested correctly in a string of characters (use stack ADT).	CO3	a,e,b,k
10.	Write a java program that uses both stack and queue to test whether the given string is a palindrome (Use Java Utility).	CO2	a,b,c,m
11.	Files are stored in memory in tree structure directory. Design and develop a program to create a directory having files with unique file-id in the hard disk and display the files in all three traversal orders using Binary Search Tree (BST).	CO2	a,b,c,m
12.	Consider a class having 100 students where, the details of each student like name, roll number and marks of 3 subjects is to be stored. Design and develop a program to construct a singly linked list to enter records of different students in list, display the list and calculate the percentage of each student. Also count the number of students passed (scored >40 in all the subjects).	CO3	a,e,b,k

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT3080	**Object Oriented Programming with Java Lab**	**HC**	**0**	**0**	**2**	**0**	**2**	**2**

Lab Outcomes:

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

CO1: Select basic Java language constructs to build Java programs. (PO: g,j,k,m)

CO2:Apply OOP principles and proper program structuring to develop programs. (PO: a,b,c,e,g,j,k,m)

CO3:Demonstrate the concepts of inheritance and exception handling. (PO: a,e,g,m)

CO4: Build applications using Java generic types and collections. (PO: a,b,c,e,g,j,k,m)

Lab Experiments:

SNo.	Experiment Problem Statement	CO	PO
1	The sieve of Eratosthenes is one of the most efficient ways to find all primes smaller than n when n is smaller than 10 million. Given a number n, use JAVA to print all primes smaller than or equal to n.	**1**	**g,j,k,m**
2	The Gauss-Jordan method is also known as Gauss-Jordan elimination method is very useful in solving a linear system of equations. It is a technique in which a system of linear equations is resolved by the means of matrices. Develop a JAVA program to solve a given set of linear equations.	**1**	**g,j,k,m**
3	To compute a square root of any positive number a, start with an initial guess $x = x_1$ for $\sqrt{a}$; we then calculate successive approximations $x_2, x_3 \ldots, \sqrt{a}$ using the formula: $$x_i = \frac{x_{i-1} + (a / x_{i-1})}{2}, i = 2, 3, \ldots$$ Develop a JAVA application that implements the above $SQRT$ function to compute the square root of any positive number	**1**	**g,j,k,m**
4	Model a lamp as a Java object. Make a Lamp class. This will contain at least one **instance variable** which will be of type Boolean and will hold the state of the lamp: i.e., whether it is on or off. In addition, add **methods** to do the following things: switch the light on and off, and check its current state, i.e., whether it is on or off. Maintain proper encapsulation mechanism. Next, write a launcher class with a main() method to carry out the following tasks: • create a lamp object; • turn it on and off; • print the the lamp's on/off status to the console.	**2**	**a,b,c,e,g,j,k,m**

5	Given the following functional interface:
	
	interface MathOperation {
	int operation(int a, int b);
	}
	Develop an application that would implement the above interface using lambda expressions as to perform the addition, subtraction, multiplication and division operations.
		2	**a,b,c,e,g,j,k,m**

6	The String class in JAVA has a static method compareToIgnoreCase, which compares two strings and the Arrays class has a static sort method. Build a JAVA program that creates an array of strings, use the sort function from Arraysclass to sort the strings by passing the compareToIgnoreCase function as a parameter to the sort function using method reference. Print the sorted array.	**2**	**a,b,c,e,g,j,k,m**
7	XYZ technologies is firm that has 5 employees with 1 manager, and 4 technicians. XYZ wants to digitize its payroll system, the following requirements: Dearness Allowance is 70% of basic for all employees. House Rent Allowance is 30% of basic for all employees. Income Tax is 40% of gross salary for all employees. The annual increments to the employees are to be givenof the following criteria: - Manager 10% of the basic salary, and Technicians 15% of basic. Develop the payroll for XYZ. Implement a class hierarchy using inheritance, where *Employee* is an abstract class and *Manager and Tec□nician* are derived from *Employee*. Demonstrate a polymorphic behavior for giving the annual increments.	**3**	**a,e,g,m**
8	Define a new Exception class named OddException. Create a new class named EvenOdd. Write a method called halfOf(), which takes an int as parameter and throws an OddException if the int is odd or zero, otherwise returns (int / 2). Write a main method that calls halfOf() three times (once each with an even int,an odd int, and zero), with three try/catch blocks, and prints either the output of halfOf() or the caught OddException.	**3**	**a,e,g,m**
9	Implement a class named Fraction that represents fractions with numerator and denominator always stored reduced to lowest terms. If fraction is negative, the numerator will always be negative, and all operations leave results stored in lowest terms. Implement the addition, subtraction, multiplication and division operation for the Fraction class and also handle divide by zero using java exception handling mechanism.	**3**	**a,e,g,m**
10	Create a class Student that has instance variables as Name, Age, Address and accessor and mutator methods to access the instance variables along with display method to print the details of student. Next write a main() function that will create a collection of 10 students and reverse the list. Print the details before andafter reversing the collection.	**4**	**a,b,c,e,g,j,k,m**
11	Use generics to build a class Sort. Implement the bubble sort algorithm to sort an array of any type.	**4**	**a,b,c,e,g,j,k,m**
12	Write a generic method to count the number of elements in a collection that have a specific property (for example, odd integers, prime numbers, palindromes).	**4**	**a,b,c,e,g,j,k,m**

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT3090	**Skill Development-3**	**HC**	**0**	**0**	**0**	**1**	**1**	**2**

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT3X10	**Soft Skills – 1**	**RULO**	**0**	**0**	**2**	**0**	**2**	**2**

Note: Soft Skill Training courses are organised by the **Placement and Training Centre**. The students have to undergo Soft Skill Courses conducted by the said Centre.

FOURTH SEMESTER:

Course Code	Course Title	Course Type	L	T	P	J	C	Weekly Contact Hours
B19IT4010	**Design and Analysis of Algorithms**	HC	3	0	0	0	3	3

Prerequisites:

Problem Solving with Programming [B19IT1030], Object Oriented Programming with JAVA [B19IT3030], Data Structures [B19IT3040]

Course Description:

In this course the study of fundamental algorithms to solve a variety of problems, including sorting, searching and graph algorithms are discussed. Techniques for analyzing time and space complexity of algorithms are discussed and hence evaluation of tradeoffs between different algorithms are done.

Course Description:

In this course the study of fundamental algorithms to solve a variety of problems, including sorting, searching and graph algorithms are discussed. Techniques for analyzing time and space complexity of algorithms are discussed and hence evaluation of tradeoffs between different algorithms are done.

Course Objectives

The objectives of this course are to:

1. Describe basics of algorithms in various domains.
2. Explain design of algorithms using the dynamic programming; greedy method, Backtracking, Branch and Bound strategy, and recite algorithms that employ this strategy;
3. Illustrate the use of appropriate algorithmic design techniques for a given problem;
4. Discuss various design approaches based on time and space efficiency.

Course Outcomes (Cos):

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

CO 1: Explain the mathematical foundation for the analysis of algorithms.

CO 2: Formulate the solution for any computational problem using the appropriate algorithm design technique.

CO 3: Analyze the efficiency of algorithms.

CO 4: Compare the various algorithm design approaches based on time and space efficiency for any given computational problem.

Course Content:

UNIT- 1

Introduction-Notion of an Algorithm; Fundamentals of Algorithmic Problem Solving; Fundamentals of the Analysis of Algorithm Efficiency- The Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive Algorithms, Mathematical Analysis of Recursive Algorithms.

UNIT -2

Brute Force: Bubble Sort, Selection Sort, Sequential Search and Brute-Force String Matching, Exhaustive Search, Depth-First Search and Breadth-First Search, Divide-and-Conquer: Merge sort, Quick sort, Multiplication of Large Integers, Decrease-and-Conquer- Insertion Sort, Topological Sorting.

UNIT- 3

Greedy Technique-Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm Dynamic Programming-Fibonacci numbers, Binomial coefficient, The Knapsack Problem and Memory Functions, Warshall's and Floyd's Algorithms

UNIT- 4

Space and Time Trade-Offs- Sorting by Counting, Input Enhancement in String Matching,, Coping with the Limitations of Algorithm Power- Backtracking-n-Queens Problem, Subset-Sum Problem, Branch-and-Bound, Assignment Problem, Travelling Salesman Problem

Self-learning component:
Decrease-and-Conquer: Algorithms for Generating Combinatorial Objects, Divide-and-Conquer: Strassen's Matrix Multiplication, Space and Time Trade-Offs: Hashing, Greedy Technique: Knapsack Problem, Huffman Trees and Codes, Coping with the Limitations of Algorithm Power: Hamiltonian Circuit Problem, Knapsack Problem

Text books:

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Pearson, 3rd Edition, 2012.
2. Ellis Horowitz, Satraj Sahni and Rajasekaran,Computer Algorithms/C++, Universities Press, 2nd Edition, 2014.
3. Kleinberg, Algorithm Design, Pearson Education, 1st Edition, 2013.
4. Michael Goodrich, Roberto Tamassia, Algorithm Design and Applications, Wiley Publishers, 1st Edition, 2014

Reference books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, Introduction to Algorithms, PHI, 3rd Edition.
2. The design and analysis of computer algorithms, 4th Edition Addison-Wesley
3. ACM Transactions on Algorithms.
4. ACM Journal of Algorithms and Computational Technology.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1	H		L		M					L	M			
CO2			L					L						
CO3					M									
CO4	H	H						L		L				

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Lab Experiments:

1. Search for a given pattern in a text string using Brute Force String Matching.
2. Sort a set of elements in ascending order using Quick Sort algorithm.
3. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's and Prim's algorithms. Differentiate the methods.
4. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra's algorithm
5. Design and Implement 0/1 Knapsack problem using Dynamic Programming.
6. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm
7. Obtain the DFS ordering of vertices in a given digraph.
8. Implement Horspool's algorithm for String Matching and find the number of key comparisons in successful search and unsuccessful search
9. Sort a given set of elements in ascending order which has duplicate entries. Use the sorting by counting algorithm
10. Implement N Queen's problem using Back Tracking.
11. Write a program to find network of people of same location in Linkedin social network.
12. Write a program to sort all transactions of Big Mall by quantity of sales.

Sample Assignments:

1. Old World puzzle: A peasant finds himself on a river bank with a wolf, a goat, and a head of cabbage. He needs to transport all three to the other side of the river in his boat. However, the boat has room for only the peasant himself and one other item (either the wolf, the goat, or the cabbage). In his absence, the wolf would eat the goat, and the goat would eat the cabbage. Solve this problem for the peasant or prove it has nosolution. (Note: The peasant is a vegetarian but does not like cabbage and hence can eat neither the goat northe cabbage to help him solve the problem. And it goes without saying that the wolf is a protected species.)

2. Huffman coding is a lossless data compression algorithm. The idea is to assign variable-length codes to input characters; lengths of the assigned codes are based on the frequencies of corresponding characters. The most frequent character gets the smallest code and the least frequent character gets the largest code. Give a brief report on the Huffman coding algorithm and name the design paradigm it follows.

3. Kosort the nigsberg bridges The Konigsberg Bridge puzzle is universally accepted as the problem that gave birth to graph theory. It was solved by the great Swiss-born mathematician Leonhard Euler (1707–1783). The problem asked whether one could, in a single stroll, cross all seven bridges of the city of Konigsberg exactly once and returns to a starting point. a. State the problem as a graph problem. b. Does this problem have a solution? If you believe it does, draw such a stroll; if you believe it does not, explain why and indicate the smallest number of new bridges that would be required to make such a stroll possible.
4. Design and Develop program to search documents based on text query (Use string matching algorithm).
5. Build Google map application for REVA that finds the shortest route between source and destination

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT4020	**Information and Communication Theory**	**HC**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

Probability and Statistics (B19IT2010), Discrete Mathematics and Graph Theory (B19IT3050)

Course Description:

This course covers basic concepts of Information theory is the mathematical theory that deals with the fundamental aspects of communication systems. The purpose of this course is to develop the fundamental ideas of information theory and to indicate where and how the theory can be applied.

Course Objectives:

The objectives of this course are to:

1. Explain the concepts of information source and entropy.
2. Demonstrate the working of various Encoding Techniques.
3. Discuss various source encoding algorithms.
4. Illustrate the use of Cyclic and convolution codes.

Course Outcomes (Cos):

On successful completion of this course; the student shall be able to:
CO1: Summarize the basic concepts of information source and measure of information.
CO2: Implement different Encoding Schemes for given applications
CO3: Develop the different Source Encoding Algorithm for given applications.
CO4: Make use of Cyclic and convolution codes in real world applications.

Course Content:

UNIT- 1

INFORMATION THEORY: Introduction, Measure of information, Information content of message, Average Information content of symbols in Long Independent sequences, Average Information content of symbols in Long dependent sequences, Markov Statistical Model of Information Sources, Entropy and Information rate of Markoff Sources.

UNIT -2

COMMUNICATION THEORY: A Data Communication Model, Concepts of Frequency, Spectrum and Bandwidth, Analog and Digital data, Analog and Digital Signals, Channel capacity- Nyquist Bandwidth, Shannon capacity formula, the expression E_b/N_o, Digital Data, Analog Signals Encoding Techniques- Amplitude Shift Keying(ASK), Frequency Shift Keying(FSK), Phase Shift Keying(PSK).

UNIT- 3

SOURCE CODING: Source coding theorem, Prefix Codes, Kraft McMillan Inequality property – KMI. Encoding of the Source Output, Shannon's Encoding Algorithm. Huffman codes, Extended Huffman coding, Arithmetic Coding, Lempel – Ziv Algorithm.

UNIT- 4

BINARY CYCLIC CODES: Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction.
Convolution Codes: Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, The Viterbi Algorithm.

Self-Learning Concepts:

Methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single Error Correcting hamming Codes, Table lookup decoding using Standard Array.

Text books:

1. *Digital communication, Simon Haykin, John Wiley India Pvt. Ltd, 2008.*
2. *Digital and analog communication systems, K. Sam Shanmugam, John Wiley India Pvt. Ltd, 2005.*
3. *Data and Computer Communications, William Stallings, PEARSON Ed Inc, 9th edition, 2011*
4. *Information Theory and Coding, Muralidhar Kulkarni, K.S. Shivaprakasha, Wiley India Pvt. Ltd, 2015.*

Reference books:

1. *ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007.*
2. *Principles of digital communication, J. Das, S. K. Mullick, P. K. Chatterjee, Wiley, 1986 - Technology & Engineering*

3. *Digital Communications – Fundamentals and Applications, Bernard Sklar, Second Edition, Pearson Education, 2016.*
4. *Information Theory and Coding, K.N.Haribhat, D.Ganesh Rao, Cengage Learning, 2017.*

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	A	B	c	d	e	F	g	h	i	j	k	l	m	n
CO1									H					
CO2	H								M					
CO3					H		M							
CO4								H						

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. A Binary Source produces symbols 0 and 1 with probability P and 1-P. Determine Entropy of the source. Sketch the variation of Entropy with P and comment on the result.

2. In a Facsimile picture transmission of pictures, there is about 3.25 M-pixels per frame. For a good reproduction, 15 brightness leve1s are necessary. Assuming that all the levels are equallylikely to occur, lind the rate of transmission if one picture istransmited in every 3 minutes.

3. Apply Shannon encoding algorithm and generate binary codes for the set of symbols given in table below. Also find efficiency.

Sym	A	B	C	D	E	F	G
P	9/32	9/32	3/32	3/32	3/32	3/32	2/32

4. Derive an expression for the Data Transmission Rate of Binary Erasure Channel.

5. An analog source has a bandwidth of 4KHz. The signal is sampled at 2.5 times the Nyquist Rate and each sample is quantized into 256 equally like1y levels. Assume that the successive samples are statistically independent. Find the information rate of the source. Can the output of this source be transmitted without error over an analog channel of Bandwidth 50Khz and S/N = 20db. If the output of the source is to be transmitted without error over an analog channel having S/N = 10, compute the bandwidth required.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT4030	Database Management System	HC	3	0	1	0	4	5

Prerequisites:

Basics of Database Systems

Course Description:

This course introduces topics such as conceptual data modelling, relational data model, relational query languages, and relational database design. It helps the students to gain fundamental concepts, techniques and applications in database.

Course Objectives:

The objectives of this course are to:

1. Explain the basics of Database Management System.
2. Demonstrate the use of Relational model and Relational algebra.
3. Illustrate the use of different SQL statements.
4. Discuss the topics such as Database Design and Normalization.

Course Outcomes (Cos):

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

CO1: Design database schemas for the different Database applications.

CO2: Make use Relational model and Relational algebra in a given real world application.

CO3: Develop an application for using different SQL commands for managing the database.

CO4: Implement Normalization for database applications.

Course Content:

UNIT - 1

Introduction to databases and Conceptual Modelling : Introduction to database, characteristics of the database approach, data models, schemas, instances, database languages and interfaces, Using high-level conceptual data models for database design, a sample database application, entity types, attributes, keys, relationship types, weak entity types, ER diagrams, naming conventions, design issues. Introduction to various database tools and framework (commercial and open source)

UNIT - 2

Relational Data Model and Relational algebra: Relational model concepts, relational model constraints and relational database schemas, update operations, transactions, dealing with constraint violations, unary relational operations, select and project, relational algebra operations from set theory, binary relational operations, join and division, additional relational operations, examples of queries in relational algebra.

UNIT - 3

SQL: SQL data definition and data types, specifying constraints in SQL, basic retrieval queries in SQL, insert, delete, update statements in SQL, additional features of SQL, schema change statements in SQL, Retrieving data using the SQL Select Statement, Restricting and sorting data, Using Single row functions, Joins, More complex SQL retrieval queries, views in SQL.

UNIT – 4

Database Design Theory and Normalization: Informal design guidelines for relation schemas, Functional dependencies, and Normal forms based on primary keys, General definitions of second and third normal forms, Other Normal forms.

Self –Learning Component:

Sequences, synonyms, Triggers and Procedures and Introduction to Transaction Management Systems.

Text books:

1. *Elmasri and Navathe, Fundamentals of Database Systems, Pearson Education, 5th Edition, 2007.*
2. *Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw-Hill, 2003.*
3. *Phill Pratt, Concepts of Database Management, Cengage Learning, 8th Edition, 2014*
4. *Jeffrey A Hoffer, Modern Database Management, Pearson, 12th Edition, 2015*

Reference books:

1. *Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 6th Edition, McGraw Hill, 2010.*
2. *C J Date, Database Design and Relational Theory: Normal Forms and All that Jazz, O 'Reilly, April 2012.*
3. *James Martin, "Principles of Database Management Systems", 1985, Prentice Hall of India, New Delhi*
4. *IEEE Transactions on Knowledge and Data Engineering*
5. *Elsevier Data and Knowledge Engineering*
6. *ACM Transactions on Database Systems*

Mapping Cos with POs (Program outcomes)

							Program Outcomes								
Course Outcomes	a	b	c	d	e	f		g	h	i	j	k	l	m	n
CO1	M	H	H											M	

CO2	H	H	M	M	H								M	M	H
CO3	H		H	M	H						H	M		H	
CO4	H		M	H	H	M					H	M		M	M

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

List of Lab Experiments:

1. Product - Order System

In recent years, most of the grocery items are available online; hence people are doing online transactions for purchase. There are lot of discounts and benefits through the online orders. Since everyone in the life is busy with one or other works, such applications will save their time.
These online transaction based applications require many databases to be built for storage and transaction management. Design a product-order database which can store the details of customers, agents and the products. All the details of sold products along with commission from different agents across different cities will get stored in this database and utilized for transactions.

Customer (cid, cname, city, discount)
Agent (aid, aname, city, commission)
Product (pid, pname, city, quantity, price)
Orders (ordno, month, cid, aid, pid, qty, amount)

Queries

a. Retrieve the customer ids of any product which has been ordered by agent "a06".
b. Retrieve cities in which customers or agents located.
c. List product ids which have been ordered by agents from the cities “Dargeling” or “Srinagar”.
d. Retrieve customer ids whose discounts are less than the maximum discount.
e. Retrieve product ids ordered by at least two customers.
f. For each (aid, pid) pair get the sum of the orders aid has placed for pid.
g. Retrieve product ids and total quantity ordered for each product when the total exceeds 1000.
h. List the names of the customers and agent who placed an order through that agent.
i. Retrieve order numbers placed by customers in "Dargeling" through agents in "New Delhi".
j. Retrieve names of the customers who have the same discount as that of any (one) of the customers in "Dargeling" or "Bangalore".
k. Retrieve customer idswith smaller discounts than every customer from " Srinagar”
l. Retrieve names of the customers who have placed an order through agent "a05". (using exists)
m. Retrieve names of the customers who do not place orders through agent "a05". (using not exists)
n. Retrieve customer ids whose orders placed through all the agents in "New Delhi".
o. Retrieve agent ids either from "New Delhi" or "Srinagar" who place orders for ALL products priced over one dollar.

p. Retrieve names and ids of the customers and agents along with total dollar sales for that pair. Order the result from largest to smallest total sales. Also retain only those pairs for which total dollar sales is at least 9000.00.
q. Increase the percent commission by 50% for all agents in "New York".
r. Retrieve the total quantity that has been placed for each product.

2. Employee Database System

The storage of digital data is increasing day by day. Every big / small organization started storing their Employee details like name, salary, address, Department under which they are working in their own database. Design a company database which can store the details of Departments, projects, their Employee and his / her dependent details of a particular organization

Employee (ssn, name, salary, sex, super_ssn, address, dno)
Department (dname, dnumber,mgr_ssn)
Dept_Loc (dnumber, dloc)
Project (pname, pnumber, plocation, dnum)
Works_On (essn, pno, hours)
Dependent (essn, depen_name, address, relationship, sex)

Queries

a. Retrieve the names of the Employees who works on all the projects controlled by dept no 3.
b. Retrieve the names of the Employees who gets second highest salary.
c. Retrieve the names of the Employees who have no dependents in alphabetical order.
d. List the names of all Employees with at least two dependents.
e. Retrieve the number of Employees and their average salary working in each Department.
f. Retrieve the highest salary paid in each Department in descending order.
g. Retrieve the SSN of all Employees who work on atleast one of the project numbers 1, 2, 3.
h. Retrieve the number of dependents for an Employee named RAM.
i. Retrieve the names of the managers working in location named xyz who has no female dependents.
j. Retrieve the names of the Employees who works in the same Department as that of RAM.
k. Retrieve the names of the Employees whose salary is greater than the salary of all the Employees working in Department no 3.
l. Retrieve the names of the Employees who work for dept no 3 and have a daughter as dependent.
m. Retrieve the names of the Employees who paid highest salary from each Department.
n. Retrieve the names of the Employees who are paid the same salary as that of Anil.
o. Retrieve the total the number of Employees in the 'Research' Department.
p. For each project, retrieve the project number, the project name, and the number of Employees who work on that project.

3. Car rental agency database systems

The application that can be used for booking a vehicle online from his / her place is very much needed in mobile devices. The main aim of this system is to illustrate a database application for booking vehicles online. Design a car rental agency database which can store customer details, vehicle details like vehicle id, size, transmission and reservation details like who had booked from one date to other.

Customers(cid, firstname, lastname, address)
Vehicle(vid, mileage, location, vsize, transmission)
Reservations(cid,vid, start_date, end_date)

Note :
->Vehicle.transmission can have two values 'manual' and 'automatic'.
->Vehicle.vsize can have following values. 'compact', 'mid-size', 'full-size', 'premium' and 'luxury'. The default size is compact.

Queries

a. Display both the first name and last name in uppercase as "Name of the customer " as column name.
b. Display vehicles size which is having maximum mileage.

c. Find location and total mileage of all vehicles specific to each respective location.
d. Find average mileage of vehicles for each location, which has at least five vehicles.
e. Display the customer names whose reservation start date is before Feb 18th 2016.
f. Display the vehicles which has been reserved between the dates Nov 5th 2015 and Jan 16th 2016.
g. Display the names of the customers whose lastname starts with 'D' and who has reserved more vehicles than the customer with cid as '101'.
h. Retrieve the customers who have reserved vehicles from all the locations.
i. Retrieve the locations that have at least one vehicle with manual transmission that has lower mileage than any luxury vehicle at that location.
j. Delete all the reservations for customer whose last name starts with 'S'.

Sample Assignments:

1. Design and draw the ER Diagram for any of the two following database application with minimum 4/ 5 entities and also specify the proper key and structural constraints:

2. Design a college library management project that manages and stores books information electronically according to students needs. The system helps both students and library manager to keep a constant track of all the books available in the library. It allows both the admin and the student to search for the desired book.

3. Develop a Hostel Management system for the computerization of the Hostel. The common transactions of the hostel includes the maintenance of mess bills, information about students in the hostel, enrolling of new students and their payments and dues etc are stored into the databases and reports are generated according to the user requirements

4. Develop a Hospital Management system that includes registration of patients, storing their details into the system, and also computerized billing in the pharmacy, and labs. The software should have the facility to give a unique id for every patient and stores the details of every patient and the staff automatically.

5. Bank Management creation of a secure Internet banking system. This will be accessible to all customers who have a valid User Id and Password. This is an approach to provide an community to the customers to have some important transactions to be done from where they are at present without moving to bank

6. Super Market Information Management automation .This software should help salespersons in managing the various types of Records pertaining to his/her customer. The product should help the user to work in a highly effective and efficient environment.
7. Insurance Management a complete solution for organization which needs to manage different type of insurance. Organization can track insurance, premium and policies with this application.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT4040	Operating Systems	HC	3	0	1	0	4	5

Prerequisites:

Problem Solving with Programming [B19IT1030], Computer Organization and Architecture [B19IT3020]

Course Description:

This course starts with a brief historical perspective of the evolution of operating system and then covers the major components of most of the operating systems. The operating system provides a well-known, convenient, and efficient interface between user programs and the bare hardware of the computer on which they run. The operating system is responsible for allowing resources (e.g., disks, networks, and processors) to be shared, providing common services needed by many different programs (e.g., file service, the ability to start or stop processes, and access to the printer) and protecting individual programs from one another.

Emphasis is given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping) and file systems.

Course Objectives:

The objectives of this course are to:

1. Discuss the history, basics and structure of Operating System.
2. Demonstrate the process and threading concepts.
3. Illustrate the different scheduling and deadlock techniques
4. Explain the physical, virtual memory management techniques and file structure of UNIX operating system

Course Outcomes (Cos):

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

CO1: Develop applications that use files data source with suitable system calls.

CO2: Implement process management and scheduling schemes.

CO3: Apply synchronization and deadlock techniques in real time applications.

CO4: Design memory management techniques for a given machine architecture.

Course Content:

UNIT – 1:

Operating System Principles: Evolution of Operating Systems, Structural overview, Types of Operating System and operations, Computing environments, Operating System Services, User - Operating System interface, System calls and system programs, Operating System structure.

UNIT – 2:

Process Management: Process concept, process scheduling, Operations on processes, Inter process communication. Multi-Threaded Programming, Overview, Multithreading models, Thread Libraries, threading issues. Process scheduling: Basic concepts, scheduling criteria, Scheduling algorithms, Multiple Processor scheduling, thread scheduling.

UNIT-3:

Synchronization and Deadlock Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization: The Bounded-Buffer Problem, The Readers–Writers Problem, The Dining-Philosophers Problem; Monitors.

Deadlock: Definition, Deadlock characteristics, Deadlock Prevention, Deadlock Avoidance: banker's algorithm, Deadlock detection and Recovery.

UNIT – IV:

Memory Management: Memory Management Strategies, Swapping, contiguous memory allocation, Paging, structure of page table, Segmentation. Virtual Memory Management: Background, Demand paging, copy-on-write, Page replacement, Allocation methods, Thrashing.
File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection.

Self-learning component:
Virtual machines and Introduction to Linux Operating System, Introduction to Distributed computing, Parallel computing, grid computing, cloud computing.

Text books

1. *Abraham Silberschatz, Peter Bear Galvin, Greg Gagne, Operating System Principles, Wiley Asia Student Edition, 2009.*
2. *William Stallings, Operating Systems: Internals and Design Principles, Prentice Hall of India, seventh edition, 2011.*
3. *D. M. Dhamdhere; Operating Systems: A Concept-Based Approach; Tata McGraw-Hill, Third edition 2012.*

Reference books

1. *Frederic Magoules, Jie Pan, Kiat-An Tan, Abhinit Kumar, Introduction to Grid Computing, CRC Press, Second Edition, 2014*
2. *Andrew Tanenbaum & Albert Woodhull, Operating Systems: Design and Implementation. Prentice-Hall, Third edition, 2014.*
3. *Charles Crowley; Operating System: A Design-oriented Approach; Tata McGraw-Hill, First edition 2017.*
4. *Gary J. Nutt; Operating Systems: A Modern Perspective; Addison-Wesley, Second edition 2011.*
5. *Harvey M. Deitel, An introduction to operating systems. Addison-Wesley, Third edition, 2010.*
6. *Springer, Springer transaction for advance in Distributed computing and middleware.*
7. *IEEE transaction for Real time operating system.*

8. ACM transaction for embedded operating system.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	A	b	c	D	e	F	g	h	i	j	k	l	m	n
CO1	H									H				
CO2		H	M	M	H					H				
CO3										H	H			
CO4			H	H	M					M	M			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Lab Experiments: (Implement following using C-language on Unix/Linux)

Sl. NO.	Experiments	CO	PO
1	A child process in computing is a process created by another process (the parent process). This technique pertains to multitasking operating system and sometimes called a sub-process or subtask. Now, use C language to create a child process to read commands from the standard input and execute them.	1	a, j
2	Fibonacci series is one of the optimal searching techniques. Multi-threaded program is used to execute multiple process or threads concurrently by the central processing UNIT. Now, run a Multi-threaded program in C to generate and print the Fibonacci series in such a way that one thread has to generate the numbers up to the limit specified by the user and another thread to print them.	1	a, j
3	In multiprogramming environment, several processes execute at the same time sharing the processor time. It is required to understand the performance of the policies FCFS and SJF in proper utilization of CPU time. Therefore write program to compare their performance metrics in terms of average waiting time and average turnaround time.	1	a, j
4	To design and develop operating system, it is necessary to develop variousmodules like, Process Manager, Memory Manager, Input-Output Manager and Network Manager and many more. The process manager is one of the important modules of OS. It deals with creation and execution of multiple processes sharingthe processor time. The process manager uses various scheduling policies. Hence,there is a need to understand the various scheduling policies. Hence, given the listof processes and their CPU burst times, display/print the Gantt chart for Priority. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.	2	b, c, d ,e, j
5	Given the list of processes and their CPU burst times, display/print the Gantt chart	2	b, c, d ,e, j

	for Round Robin Algorithm. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.		
6	Producer-Consumer Problem also known as bounded-buffer problem is an example of multi-process synchronization problem. This problem arises when the producer and consumer share a common, fixed size buffer. The solution can be obtained by means of inter–process communication typically using Semaphores. Now, implement a process with a produces thread and a consumer thread which makes use of bounded buffer. Use any suitable synchronization construct. (Implement producer-consumer problem using semaphores).	3	J, k
7	Banker's Algorithm is used for Deadlock Avoiding purpose. It is suitable to resource allocation system with multiple instances of each resource type. Implement Banker's Algorithm which finds whether the state is safe or not.	4	c, d, e, j, k
8	The operating system manages the computer's memory. The OS allocates required memory for the task and deallocates memory after execution of task. There are many allocation strategies. Write a C program to simulate the Multi Programming with Variable number of Task (MVT) memory strategy.	4	c, d, e, j, k
9	The operating system replaces the page of a old process whenever a new process page has to be loaded in memory. To select the page for replacement there are many methods. Write a C program to implement LRU page replacement algorithm.	4	c, d, e, j, k
10	The operating system manages storage of information by creating and storing information in the file. There are many methods of creating file. Write a C program to implement any one of the file allocation techniques (Linked, Indexed or Contiguous).	4	c, d, e, j, k
	Take Home assignments		
1	Implement shared memory and semaphore concepts for inter process communication	1	a, j
2	Implement file organization strategies a) single level b) Two level c) Hierarchical	1	a, j
3	Write a C program to simulate the concept of Dining-Philosophers problem.	1	a, j
4	Write programs using the following system calls of UNIX operating system: exec, getpid, exit, wait, close, stat, opendir, readdir	2	b, c, d ,e, j
5	Write a C program to simulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit	4	c, d, e, j, k
6	Implement Memory management Scheme-II a) Segmentation Concept	4	c, d, e, j, k
7	Write a C program to simulate the First fit contiguous memory allocation technique.	4	c, d, e, j, k
8	Write a C program to simulate disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN	4	c, d, e, j, k
9	Design and develop a data recording system that receives data from LAN and records it in a file .Use threading and buffering & Synchronization Mechanisms.	4	c, d, e, j, k
10	Write a program that demonstrates the usage of the shared resources using semaphores	4	c, d, e, j, k

Sample Assignments:

1. Implement a process with a producer thread and a consumer thread which make use of a bounded buffer (size can be prefixed at a suitable value) for communication. Use any suitable synchronization construct. (Project)
2. List differences among short-term, medium-term, and long term scheduling. (Assignment)
3. Given six memory partitions of 300 KB, 600 KB, 350 KB, 200 KB, 750 KB, and 125 KB (in order), how would the first-fit, best-fit, and worst-fit algorithms place processes of size 115 KB, 500 KB, 358 KB, 200 KB, and 375 KB (in order)? Rank the algorithms in terms of how efficiently they use memory. (Assignment).
4. Write note on various scheduling algorithms (Assignment)
5. Develop a graphical package useful for teaching students to demonstrate how SJF scheduling algorithm works.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT4051	**Digital Communication**	**SC-1**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

Multivariable Calculus and Linear Algebra [B19IT1010], Probability and Statistics [B19IT2010]

Course Description:

Communication systems are at the heart of today's information driven economy and support our modern-day lifestyles and even our very existence. From the familiar telephone that was invented over a century ago, to modern day cell phones, wireless networks, and Internet, as well as radio, television, cable and satellite systems, we now rely on electrical communication systems in almost all aspects of our lives. The course focuses on the technologies underlying these systems, which constitute the field of digital communications. Topics include digital transmission and reception, signal space representations, spectral analysis of digitally modulated waveforms, design considerations for band limited channels, introductory concepts of information theory, and error correction coding. The course is intended for graduate/senior undergraduate level students. While the course is intended to serve as a introduction to digital communications, the pre-requisites/co-requisites listed are absolutely necessary.

Course Objectives

The objectives of this course is to:

CO1: Discuss the limitations of analog communications resources bandwidth and power to appreciate the effective use of such Resources

CO2: Illustrate the flow and processing of information from the source to various UNITs atthe transmitter side.

CO3: Explain the inverse operations at the receiver to facilitate the retrieval of transmitted information.

CO4: Describe various processing UNITs of a digital communication system.

Course Outcomes (COs):

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

CO1: Demonstrate the limitations of analog communications resources bandwidth and power to appreciate the effective use of such Resources

CO2: Analyze the flow and processing of information from the source to various UNITs atthe transmitter side.

CO3: Explain the inverse operations at the receiver to facilitate the retrieval of transmitted information.

CO4: Design various processing UNITs of a digital communication system.

Course Content:

UNIT- 1

Information Theory: Information and entropy, conditional entropy and redundancy, Shannon Fano coding, Mutual Information, Information loss due to noise, source codings - Huffman Code, variable length coding, Source coding to Increase average Information per bit, Lossy source coding.

UNIT -2

Digital Modulation Techniques: Introduction, ASK,ASK Modulator, Coherent ASK Detector, Non-Coherent ASK Detector, FSK, Bandwidth and Frequency Spectrum of FSK. Non coherent FSK Detector, Coherent FSK Detector, FSK Detection Using PLL, BPSK, Coherent PSK Detection, QPSK, Differential PSK.

UNIT- 3

Spread Spectrum Modulation Techniques: Use of Spread Spectrum, Direct Sequence Spread Spectrum (DSSS), Code Division Multiple Access, and Ranging using DSSS. Frequency Hopping Spread Spectrum, PN - sequences: Generation and Characteristics. Synchronization in Spread Spectrum Systems

UNIT- 4

Channel coding: Waveform Coding, Types of Error control, Structured Sequences, Matrix description of Linear Block Codes, Error detection and error Correction capabilities of linear block codes, Cyclic Codes, Algebraic structure, encoding.

Self-Learning Component:

Power spectra of digitally modulated signals, Performance comparison of digital modulation schemes, Signal space theory and various modulation schemes.

Text Books:

1. *Bernard Sklar, "Digital Communications - Fundamentals and Applications", Pearson Education (Asia) Pvt. Ltd, 2nd Edition, 2014.*
2. *Herbert Taub. Donald L Schiling, Goutam Sana, Principles of communication systems, 3rd Edition, McGraw-Hill, 2008.*
3. *Sam Shanmugam, Digital and Analog Communicator Systems, John Wiley, 2005.*

Reference Books:

1. *John G. Proakis . Masoud Salehi, Digital Communications, 5th Edition, McGraw-Hill, 2008.*
2. *Simon Haykin, Digital Communication, John Wiley, 2005.*
3. *Ian A. Glover, Peter M. Grant, Digital Communications, Edition, Pearson Edu., 2008.*
4. *B.P. Lathi, Communication Systems, BS Publication, 2006.*
5. *Elsevier Journal Digital Communications and Networks.*
6. *IEEE Transactions on Communications.*
7. Journal of Analog and Digital Communications.

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	a	b	c	d	e	F	g	h	i	j	k	l	m	n
CO1	H							M						
CO2	H		M	M								M		
CO3			H			H			H		H			
CO4	H			M										

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments: (Implement following using Mat lab)

1. A binary PSK signal is applied to a correlator filter supplied with a phase reference that differs from the exact carrier phase by pi radians. Determine the effects of phase error on the average probability of symbol error of the system.

2. An FSK system transmits binary data at the rate of 2.5*10^6 bites/sec. During the
   a. course of transmission a white Gaussian of zero mean and power spectral density 10^- 20 W/Hz is added to the signal in the absence of noise the amplitude of sinusoidal wave for digit 1 or 0 is 1 m/v. determine the average probability of symbol error assuming coherent detection .

3. In a coherent FSK system ,the signal S1(t) and S2(t) representing symbols 1 and 0
   a. respectively are defined by S1(t),S2(t)= Ac cos[2pi(fc+_del(f)/2)t} 0<_t(del F), show that the correlation co efficient of the signal S1(T) and S2(t) is approximately given by
      i. What is the minimum value of frequency shift del (F) for which the signal S1
      ii. (t) and S2(t) are Orthogonal?
      iii. Find the value of del (f) that minimizes the average probability of symbol error?
      iv. For the value of del(f) obtained in part(c), determine the increase in Eb/N0

      required so that this coherent FSK system has the noise performance as a coherent binding PSK system.

4. Binary data are transmitted over a microwave link at the rate of 10^6 b/s,and the power spectral density of noise at the receiver input is 10^-10W/HZ.Find the carrier power required to maintain an average Probability i.e.,Pe>=10^-14 for coherent binary FSK.What is the required channel value?

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT4052	**UNIX System Programming**	**SC-1**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

Problem solving with Programming (B19IT1030)

Course Description:

This course provides an introductory overview of UNIX operating systems and system programming, mainly focusing on system-level programming based on UNIX OS services and other APIs. Topics include system calls, file I/O, files and directories, memory management, process control, inter-process communication (IPC), socket-based network programming, remote procedure call (RPC) programming, and basic security mechanisms.

Course Objectives:

Objectives of this course are to:

1. Discuss the **UNIX, ANSI Standards** and POSIX API'S for files.
2. Illustrate the use of API's for implementing process control.
3. Demonstraate the use of Signals and Daemon process in UNIX.
4. Explain different API's and IPC methods.

Course Outcomes:

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

CO1: Outline POSIX API'S for files and to know the different UNIX standards.

CO2: Apply the API's for implementing UNIX commands, process control and process management.

CO3: Make use of Signals and Daemon process in UNIX.

CO4: Develop solutions for problems using appropriate API's, IPC methods and Sockets.

Course Content:

UNIT 1

UNIX and ANSI Standards: ANSI C standard, ANSI/ISO C++ standards, Difference between ANSI C and C++, POSIX standards, POSIX.1 FIPS standard, X/Open standards. UNIX and POSIX APIs: POSIX APIs, Unix and POSIX development Environment, API common characteristics

Files: File types, Unix and POSIX file system, Unix and POSIX file attributes, INODES in Unix System V, Application program interface to files, Unix kernel support for files, Relationship of C stream pointers and file descriptors, Directory Files, Hard and Symbolic links.

UNIX File APIs: General File APIs, File and Record locking, Directory File APIs, Device file APIs, FIFO file APIs, Symbolic Link File APIs.

UNIT 2

UNIX Processes: Environment of UNIX process: Introduction to main function, Process Termination, Command Line Argument, Environment list.

Process Control: Introduction, Process identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 functions, Race conditions, exec functions, changing Users IDs and Group IDs, Interpreter files, System function, Process accounting, User identification, Process times, I/O Redirection.

Process Relationship: Introduction, Terminal login, Network login, process groups, sessions, job control, Shell execution of programs, Orphaned process groups.

UNIT 3

Signals: Unix Kernel support for signals, signal, Signal mask, Sigaction, SIGCHLD signal and waitpid function, sigsetjmp and siglongjmp functions, Kill, Alarm, Interval Times, POSIX.lb timers,

Daemon processes: Introduction, Daemon characteristics, Coding Rules, Error logging, Client server model.

UNIT 4

Inter Process Communication: Overview of IPC methods, Pipes, Popen, Pclose functions, Co-processes, FIFOs system V IPC, Message Queues, Semaphores, Shared Memory, Client server properties, Stream pipes, Passing File descriptors, An open server version 1 and Client server connections functions. **Network IPC and**

Sockets: Introduction, Socket descriptors, Addressing, Connection establishment, Data Transfer Socket Options, Out of band data, Non- blocking, Asynchronous I/O.

Text books

1. Unix System Programming Using C++, by Terrence Chan - Prentice Hall India, 2011.
2. Advanced Programming in the UNIX Environment, by Stephen A. Rago, W. Richard Stevens, third edition,

Pearson Education / PHI, 2013.

Reference books

1. UNIX Systems Programming: Communication, Concurrency, and Threads by Kay A. Robbins and Steven Robbins, Prentice Hall; 2 edition, December 2015
2. UNIX Network Programming, Interprocess Communications (Paperback) (2nd Edition) by W. Richard Stevens, Addison-Wesley.

Mapping COs with POs (Program outcomes)

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Consider the last 100 bytes as a region. Write a C/C++ program to check whether the region is locked or not. If the region is locked, print pid of the process which has locked. Ifthe region is not locked, lock the region with an exclusive lock, read the last 50 bytes and unlock the region.
2. Write a C/C++ POSIX compliant program that prints the POSIX defined configuration options supported on any given system using feature test macros.
3. To Write a C/C++ POSIX compliant program to check the following limits:
(i) No. of clock ticks
(ii) Max. no. of child processes
(iii) Max. path length
(iv) Max. no. of characters in a file name
(v) Max. no. of open files/ process
4. Write a C/C++ program which demonstrates interprocess communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.
5. Write a C/C++ program thgat output the contents of its Environment list and Write a C / C++ program to emulate the unix ln command.
6. Write a C/C++ program to illustrate the race condition.
7. Write a C/C++ program that creates a zombie and then calls system to execute the ps command to verify that the process is zombie.
8. Write a C/C++ program to avoid zombie process by forking twice.
9. Write a C/C++ program to implement the system function.
10. Write a C/C++ program to set up a real-time clock interval timer using the alarm API.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs./ Wk.
B19IT4053	System Software	SC	3	0	0	0	3	3

Prerequisites:

Object Oriented Programming with Java [B19IT3030] , Data Structures [B19IT3040].

Course Description:

The course provides the architecture of SIC and SIC/XE machine to build the concepts of System Software, function of various system software: assemblers; loaders and linkers, and macro processors.

Course Objectives:

The objectives of the course are to;

1. Explain basics of system software and differentiate between system software and application software.
2. Describe assemblers design (pass1 and pass2) for the SIC and SIC/XE machine architecture.
3. Illustrate the working of the pass1 and pass2 algorithms of linkers and loaders.
4. Discuss functions and algorithms of macro-processor.

Course Outcomes (Cos):

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

CO1: Outline the system software and architecture of SIC and SIC/XE machines.

CO2: Apply suitable data structures to design and develop various system softwares.

CO3: Implement the 2 pass assembler for SIC & SIC/XE machine architectures and also design new algorithms for various machine architectures.

CO4: Develop loaders for absolute and re-locatable object programs for SIC/XE.

Course Content:

UNIT- 1:

Architecture of SIC; SIC\XE: Introduction: system software and machine architecture; Simplified Instructional Computer (SIC) – SIC; SIC/XE machine architecture; SIC and SIC/XE programming examples

UNIT- 2:
Assemblers: Basic assembler function; a simple SIC assembler; assembler algorithm and data structures; machine dependent assembler features - instruction formats; machine independent assembler features – literals symbol definition statements; expression; program blocks; control sections and programming linking

UNIT- 3:

Loaders and Linkers: Basic loader functions; design of an absolute loader; a simple bootstrap loader; machine-dependent loader features –relocation; program linking; algorithm and data structures for a linking loader; machine-independent loader features - automatic library search; loader options

UNIT- 4:

Macro Processor: Basic macro processor functions; macro definitions and expansion; macro processor algorithm and data structures; machine- independent macro processor features - concatenation of macro parameters; generation of unique labels; conditional macro expansion; keyword macro parameters

Self Learning Components:
Design of a micro preprocessor, Peep hole optimizer and Compile and GO loader.

Text books

1. Leland L Beck, System Software, 3rd Edition, Pearson Education, 2002.
2. Alfred V. Aho, Compilers: Principles, Techniques and Tools, Pearson, 2nd Edition, 2013.

Reference books

1. H. Dave, Compilers: Principles and Practice, Pearson, 1st Edition, 2012
2. Elsevier Journal of Systems and Software.
3. IEEE Transactions on Software Engineering

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes												
	a	b	C	d	e	f	g	i	j	k	l	m	n
CO1	H							H					
CO2			M	M								M	
CO3			H			H			H		H		
CO4			H	H									
CO5				H				H		M			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignment questions:

1. Suppose that ALPHA is an array of 100 words. Write a sequence of instructions for SIC/XE to set all 100 elements of the array to 0. Use immediate addressing and register –to-register instructions to make the process as efficient as possible.
2. Write a sequence of for SIC machine architecture to set ALPHA equal to 4*BETA-9. Assume that ALPHA & BETA has integers constants stored. Use immediate addressing for the constants.
3. Write SIC instructions to swap the values of ALPHA and BETA.

4. Generate the object program for the source program given below.

```
SUM       START    4000
FIRST     LDX      ZERO
LDA       ZERO
LOOP      ADD      TABLE,X
TIX       COUNT
JLT       LOOP
STA       TOTAL
RSUB
TABLE     RESW     2000
COUNT     RESW     1
ZERO      WORD     0
TOTAL     RESW     1
END       FIRST
```

Given that: LDX=04, LDA=00, ADD=18, TIX=2C, JLT=38, STA=0C, RSUB=4C.

5. Assembler is a system program that generates object program for an assembly language program in multiple pass to avoid forward reference problem. Develop a C program for the implementation of pass one of a two pass assembler.

6. Assembler, using in-built OPTAB & SYMTAB with contents entered during pass-1 generates object program of the given assembly program in pass-2. Develop a C program for the implementation of pass two of a two pass assembler

7. Develop C program for the implementation of an Absolute loader, which does not perform the functions as linking & program relocation and all functions are performed in a single pass.

8. Develop C program for the implementation of an Absolute loader, which is the first program to be loaded when the system is turned on and does the job of loading the operating system.
9. Loader that modifies the object program so that it can be loaded at an address different from the location originally specified is relocatable loader. Design a program to implement the functionality of such a loader.
10. Suggest appropriate ways of organizing and accessing the tables DEFTAB and NAMTAB.
11. With an example program, define macro definition, macro invocation and macro expansion.
12. List out the differences between macros and subroutines.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT4054	**Advanced IoT Programming**	**SC-1**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

Basic Electrical and Electronics Engineering [B19IT 1040], Digital Logic Design [B19IT 3010]

Course Description:

This course introduces the basics of building IoT applications and second section follows a project-based approach. At the end of each chapter a working prototype of an IoT application is being discussed. The various chapter covers programming based on Arduino board.

Course Objectives:

The objective of this course are to:

1. Explain how to use Arduino hardware, the Arduino IDE to write, upload, and execute basic Arduino programs.
2. Demonstrate the attachment of Ethernet and WiFi shield to Arduino and how to write the programs for connectivity.
3. Illustrate the basics of the HTTP protocol and Send an HTTP request to the server.
4. Discuss the basics of the MQTT protocol then Publish and subscribe to an MQTT broker.

Course Outcomes (COs):

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

CO1: Make use of Arduino hardware, the Arduino IDE to write, upload, and execute basic Arduino programs

CO2: Develop an Ethernet connectivity code using Ethernet shield and WiFi shield.

CO3: Design an application using HTTP protocol.

CO4: Apply the basics of the MQTT protocol for a real world application.

Course Content:

UNIT- 1

Building Blocks: Arduino Basics, Hardware Requirements, Software Requirements: Toolbar, Status Window, Serial Monitor Window; Arduino Programming Language Reference

Internet Connectivity: Arduino Uno Wired Connectivity (Ethernet), Hardware Required, Software Required, Circuit, Code (Arduino), Final Product; Arduino Uno Wireless Connectivity (WiFi), Hardware Required, Software Required, Circuit, Code (Arduino), Final Product

Communication Protocols: HTTP: Code (Arduino), Final Product; MQTT: Intrusion Detection System, Remote Lighting Control, Code (Arduino), Final Product

UNIT -2

Complex Flows: Node-RED: Hardware Required, Software Required, Circuit, Node-RED Flow, Code (Arduino), External Libraries, Internet Connectivity (Wireless), Read Sensor Data, Data Publish, Standard Functions and the Final Product.

IoT Patterns: Real-time Clients: Hardware Required, Software Required, Circuit, Code (Arduino): External Libraries, Internet Connectivity (Wireless), Read Sensor Data, Data Publish, Standard Functions, Code (Android): Project Setup, Screen Layout, Screen Logic, MQTT Client and the Final Product.

IoT Patterns: Remote Control: Hardware Required, Software Required, Circuit, Code (Android): Project Setup, Screen Layout, Screen Logic; MQTT Client, Code (Arduino): External Libraries, Internet Connectivity (Wireless), Data Subscribe, Control Lights, Standard Functions and the Final Product.

UNIT- 3

IoT Patterns: On-Demand Clients: Hardware Required, Software Required, Circuit, Database Table (MySQL), Code (PHP): Database Connection, Receive and Store Sensor Data, Get the Parking Spot Count; Code (Arduino): External Libraries, Internet Connectivity (Wireless), Read Sensor Data; Code (iOS): Project Setup, Screen Layout, Screen Logic and the Final Product.

IoT Patterns: Web Apps: Hardware Required, Software Required, Circuit, Database Table (MySQL), Code (PHP): Database Connection, Receive and Store Sensor Data, Dashboard; Code (Arduino): External Libraries, Internet Connectivity (Wireless), Read Sensor Data, Data Publish, Standard Functions and the Final Product.

IoT Patterns: Location Aware: Hardware Required, Software Required, Circuit, Database Table (MySQL), Code (PHP): Database Connection, Receive and Store Sensor Data, Map; Code (Arduino): External Libraries, Get GPS Coordinates, Data Publish, Standard Functions and the Final Product.

UNIT- 4

IoT Patterns: Machine to Human: Hardware Required, Software Required, Circuit, Code (Arduino): External Libraries, Internet Connectivity (Wireless), Read Sensor Data, Data Publish, Standard Functions, Effektif Workflow: Process Creation, Process Configurations; Node-RED Flow and the Final Product.

IoT Patterns: Machine to Machine: Light Sensor Device, Code (Arduino): Lighting Control Device, Code (Arduino) and the Final Product

IoT Platforms: Hardware Required, Software Required, Circuit, Xively Setup, Zapier Setup, Xively Trigger, Code (Arduino): External Libraries, Internet Connectivity (Wireless), Read Sensor Data, Data Publish, Standard Functions and the Final Product

Self-learning component:

Explore any one of the boards like Raspberry Pi, Intel Galileo, Beagle Bone Black, Dragon Board, UDOO DUAL/QUAD, ARM Boards, DIY Development boards for IoT prototyping (C.H.I.P, Mediatek Linkit One, Particle Photon, Tessel, Adafruit Flora, LightBlue Bean, Udoo Neo, Intel Edison)

Text books

1. *Adeel Javed, Building Arduino Projects for the Internet of Things: Experiments with Real-World Applications, 2015, apress.*

Reference books

1. *Agus Kurniawan, Smart Internet of Things Projects, 2016, Packt.*
2. *www.apress.com/source-code/*
3. *2.https://www.xively.com/*
4. *https://www.arduino.cc*
5. *https://nodered.org/*

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1									H					
CO2	H													
CO3										H				
CO4	H													

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Set up Arduino Yún to connect to WiFi
2. Build a smart temperature controller for your room
3. Build your own decision system based-IoT
4. Build a tracking vision system for moving objects
5. Build a your own car robot based on GPS
6. Make your IoT board speak
7. Make IoT application with data science-based cloud.
8. Explore architecture and programming of Raspberri Pi
9. Explore ESP8266 NodeMcu WiFi Development Board
10. Discuss decision system based on Bayesian
11. Discuss decision system based on fuzzy logic
12. Explore OpenCV library
13. Explore DIY robot platform, aluminium mobile smart robot car platform
14. Explore GPS module for navigation
15. Explore EasyVR shield3, voice recognition shield for Arduino boards
16. Explore Zapier for app integration

Course Code	Course Title	Course Type	Credit Pattern & Credit Value					HWrs/k
			L	P	T	J	C	
B19IT4060	Unix Programming Lab	HC	0	0	2	0	2	2

Prerequisites:

Problem solving with Programming [B19IT1030]

Course Outcomes:

CO1: Implement fundamental concepts of UNIX Operating system and the working of various commands in the operating system.

CO2: Formulate various filters to solve variety of applications and Develop and use of regular expression with pattern matching utilities like grep

CO3: Develop, Debug and execute SHELL scripts effectively.

CO4: Make use of AWK script.

Lab Exercise:

Question Number	Question
	Part – A
1	Write a shell script to generate a multiplication table: The program should accept an integer *n* given by the user and should print the multiplication table of *n*.
2	Write a shell script that copies multiple files to directory. Interactive version / Command line arguments version
3	Write a shell script which counts the number of lines and number of words present in a given file. Interactive version / Command Line arguments version
4	Write a shell script to print all the prime numbers within the given valid range.
5	Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.
6	Write a awk script to find the number of characters, words and lines in a file?
	Part – B
1	Write a C Program that makes a copy of a file using standard I/O and system calls.
2	Using an appropriate system calls Implement in C the following Unix commands using system calls "cat" and "mv".
3	a. An ls command in Unix is used to display the files present in the directory. Emulate this command using system calls in C programming language. b. Write a C program to list for every file in a directory, its inode number and file name.
4	a. Write a C program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen? b. Write a C program to create a Zombie process?
5	Write a program in C that illustrates how to execute two commands concurrently with a command pipe?

6	Write a C program to list for every file in a directory,its inode number and file name.?

Text books

1. *UNIX – Concepts and Applications, Sumitabha Das, Tata McGraw Hill, 2017.*

Reference books

1. *UNIX and Shell Programming, Behrouz A. Forouzan and Richard F.Gilberg, Thomson, 2005.*
2. *Meeta Gandhi, Tilak Shetty, Rajiv Shah, —"The 'C'Odyssey Unix – the open boundless C", BPB.*
3. *Mike Joy, Stephen Jarvis, Michael Luck, —"Introducing UNIX and Linux", Palgrave Macmillan.*
4. *UNIX & Shell Programming, M.G. Venkateshmurthy, Pearson Education, 2005.*
5. *STM Journals, "Journal of Advances in Shell Programming (JoASP)"*
6. *Elsevier, System An International Journal of Educational Technology and Applied Linguistics.*
7. *Inderscience, "International Journal of Services and Standards"*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
CO1	H	H			L		L			M	M	H		
CO2	H						L					H	M	
CO3	H						L					H		
CO4	H	H			M		L			L	M	H	H	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Lab Assignment Questions	
1	Develop an interactive shell script and awk that asks for a word and a file name and then tells how many lines present in it.
2	Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.
3	Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
4	Write a shell script that determines the period for which a specified user is working on the system
5	Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.
6	Write a shell script that computes the gross salary of a employee according to the following rules: i)If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic. ii)If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic The basic salary is entered interactively through the key board.
7	Write a shell script that accepts two integers as its arguments and computes the value of first number raised to the power of the second number.

8	a) Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the user for the necessary information, such as the file name, new name and so on. b)Write shell script that takes a login name as command –line argument and reports when that person logs in
9	Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.
10	Write a shell script to perform the following string operations: i)To extract a sub-string from a given string. ii)To find the length of a given string.
11	Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.
12	Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no:
13	Write a shell script that delete all lines containing a specified word.
14	Write a C program that illustrates how an orphan is created.
15	Implement Unix wc command using C programming language.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT4070	**IOT Lab**	**HC**	**0**	**0**	**2**	**0**	**2**	**2**

Course Outcomes

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

CO1: Design assembly language programs for the ARM microcontroller
CO2: Interface various environmental and human interfaces with ARM microcontrollers
CO3: Use modern system development tools in the design of a microcontroller-based system
CO4: Develop microcontroller-based embedded systems for real-world control applications

List of Experiments:

Sl. No.	List of experiments	COs	POs
1	Interface 8-bit LED and a Switch to an ARM microcontroller and demonstrate the ON/OFF status of LEDs depending on switch positions.	CO2	a,j,k,m
2	Design an interface for connecting a stepper motor to the microcontroller and rotate it clockwise/anti-clockwise.	CO2	a,c,e,j,k,m
3	Interface a 4X4 Matrix Keyboard and identify the key pressed	CO2	a,e,j,k,m
4	Develop and demonstrate a time delay program using built – in Timer / Counters.	CO2	a,e,j,k,m

5	Write a program to display a message in a 2 line x 16 characters LCD display.	CO2	a,e,j,k,m
6	Design an program to display data on 7-segment display using l2c interface.	CO3	a,c,e,j,k,m
7	Design and construct a module to build a RFID based Access Control System or an RFID based Door Lock using Arduino and display lock status on LCD.	CO3	a,c,e,k,m
8	Design a module to control an LED from Webserver using NodeMcu or Esp8266 programming with Arduino IDE.	CO4	c, e,k,m
9	Design a module for non-contact object detection using Arduino and proximity sensor (Car proximity alert).	CO4	c, e,k,m
10	Design an intelligent Garden Computer with Arduino and soil moisture sensor that lights an LED to alert the user when it is time to water a potted plant.	CO4	a,e,j,k,m

Additional Experiments:

1. *Demonstrate the working of ADC and Temperature sensor interfacing with the ARM.*
2. *Design and construct a module to drive DC motor clockwise and anti-clockwise using L293D with Arduino board.*

Recommended Learning Resources:

1. https://www.arduino.cc

2. Peter J Knaggs, "ARM Assembly Language Programming", 2016. (Available online at http://www.rigwit.co.uk/ARMBook/ARMBook.pdf)

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	a	b	c	D	e	f	g	h	I	j	k	l	m	n
CO1	M	H												
CO2		H			M									
CO3										M	H			
CO4				M				H						

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT4080	**Skill Development – 4**	**RULO**	**0**	**0**	**0**	**1**	**1**	**2**

Note: The Skill Development profram is conducted by the School in association with Skill Development Centre

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT4090	**Soft Skills – 2**	**RULO**	**0**	**0**	**2**	**0**	**2**	**2**

Note: Soft Skill Training courses are organised by the **Placement and Training Centre**. The students have to undergo Soft Skill Courses conducted by the said Centre.

FIFTH SEMESTER

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs./ Wk.
B19IT5010	**Computer Networks**	HC	3	0	0	0	3	3

Prerequisites:

Computer Organization and Architecture [B19IT3020]

Course Description:

The main emphasis of this course is on the organization and management of local area networks (LANs). The course description include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and about Open Systems Interconnection (OSI) communication model with TCP/IP protocol; This course provides knowledge of error detection and recovery; local area networks; bridges, routers and gateways; network naming and addressing; and local and remote procedures. This course also emphasis on User Datagram Protocol, TCP Congestion Control; DNS Message Formatting and Remote Login. Protocols:

Course Objectives:

The main objectives of this course are:

1. Explain the protocol stacks (OSI and TCP/IP) for data communication
2. Discuss the error detection & correction strategies for data transmission.
3. Design the connection establishment of network computing devices.
4. Illustrate the TCP, UDP protocols and explain Domain Name System.

Course Outcomes:

On successful completion of this course; student shall be able to:
CO1. Outline the protocol stacks (OSI and TCP/IP) used for data communication.
CO2. Apply error detection & correction strategies for data transmission.
CO3. Analyze the connection establishment of network computing devices.
CO4. Compare TCP, UDP protocols and explain Domain Name System.

Course Content:

UNIT – 1:

Introduction to Data Communication and Networking: Internet history and Internet today, DataCommunications, Networks, Network Topologies, Classification of Networks, Protocols & Standards, Introduction to Network Tools-(WireShark, Packet Tracer, NS3, etc), Layered Tasks, The OSI model, Layers in OSI model, TCP/IP Protocol suite, Addressing. Introduction to switching: Circuit Switched

Networks, Datagram Networks, Virtual Circuit Networks, Physical Layer – Periodic Analog signals, Digital signals, Request bit rate, shanon capacity, performance, PCM, DM, Parallel transmission, serial transmission, ASK, FSK, PSK, QAM, AM, FM, PM.

UNIT – 2:

Coding: Line Coding and block coding. Multiplexing: FDM, WDM, TDM, FHSS, DSSS, andTransmission Media. **Error Detection and Correction**: Introduction, cyclic Codes: Cyclic redundancy code generation forchecksum. Frames, Packets, Data Link Protocols: HDLC, Point-to-Point Protocol. **MAC Protocols**: classification of MAC protocols, Random access (ALOHA, CSMA/CD,CSMA/CA), Controlled Access(Reservation, Polling, Token passing), Channelization Protocols (FDMA, TDMA, CDMA) . **Introduction to Networking Devices**: Digital Subscriber Line Modems, Cable Modems, Repeaters,Hubs, Bridges, Routers, and High layered switches, Gateways, Virtual LAN.

UNIT-3:

Standards: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet. IEEE 802.11: Architecture, MAC Sublayer, Addressing Mechanism. Bluetooth Architecture.
Introduction to Wireless networks-Wifi, WiMAX, 4G, 5G, Satellite Networks, MPLS, VPN, ATM. **Network Layer**: IPv4 addresses, IP Datagram format, ICMP Messages, Mobile IP, IPv6 addresses,IPv6 Packet Format, Transition from IPv4 to IPv6, Routing algorithms (Distance Vector, Link State and Path vector), Unicast Routing protocols(RIP, OSPF), Introduction to BGP, Introduction to Multicasting protocols, brief introduction to multicast protocols such DVMRP, MOSPF, PIM, IGMP.

UNIT-4:

Transport Layer: Introduction to GoBack-N, Selective repeat N, Piggybacking. Services and port numbers, User Datagram Protocol (UDP): UDP Segment, Transmission Control. Protocol (TCP): TCP Segment, TCP Connection Set up, Application of TCP and UDP. TCP flow control, TCP error control, TCP Congestion Control and options. Introduction to SCTP services and features. **Application Layer**: Client server programming using UDP and TCP, Name/Address Mapping, DNSMessage Format.

Self Learning Component:

Remote Login. Protocols: TELNET Protocol and SSH Protocol. Electronic Mail (E-Mail), World Wide Web (WWW).

Text books

1. *Behrouz A Forouzan: Data Communications and Networking, 5th Edition, McGraw – Hill, 2016.*
2. *Nader F. Mir: Computer and Communication Networks, Pearson Education, 2009*

Reference books

1. *Alberto Leon-Garcia and Indra idjaja: Communication Networks – Fundamental Concepts and Key Architectures, 2nd Edition Tata McGraw – Hill, 2004.*
2. *Andrew S. Tanenbaum: Computer Networks, 4th Edition, Pearson Education, 2005.*
3. *Larry L. Peterson and Bruce S. Davie: Computer Networks- A system Approach, 5th Edition, Elsevier, 2012.*

4. *William Stallings: Data and Computer Communications, 10th Edition, Pearson Education, 2008.*
5. *Douglas E. Comer: Internetworking with TCP/IP Vol.1, 6th Edition, Pearson, 1995.*
6. *IEEE Transactions on Networking.*
7. *Elsevier Journal of Computer Networks*
8. *Springer Journal of communications and Information networks.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	H	i	j	k	l	m	n
CO1		L	L		L				L				M	
CO2		L	L		M				L	L	L			
CO3			M		M				M	L	M			
CO4			M		M			L		L	M		M	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO

Sample Assignments:

1. Write a Program in NS3 to implement star topology.
2. Write a Program in NS3 to implement a bus topology.
3. Write a Program in NS3 for connecting multiple routers and nodes and building a hybrid topology.
4. Write a Program in NS3 to implement FTP using TCP bulk transfer.
5. Write a Program in NS3 for connecting multiple routers and nodes and building a hybrid topology and then calculating network performance.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT5020	**Cloud Computing and Big Data**	HC	3	0	0	0	3	3

Prerequisites:

Computer Networks [B19IT5010]

Course Description:

This course provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). It gives insight into various cloud infrastructure and management mechanisms. The introduction to Azure App Service and Web Apps is given.

Course Objectives:

The objectives of this course are to:

1. Discuss the various Cloud computing service models like Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).
2. Explain the working of cloud computing technologies like data center technology, virtualization technology, web technology, multitenant technology and service technology.
3. Illustrate the use of various cloud computing mechanisms like load balancer, automated scaled listener, failover system and more in real world applications.
4. Describe development of web service and its hosting on Microsoft Azure

Course Outcomes (COs):

On successful completion of this course; the student will be able to:
CO1: Compare the cloud computing service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).
CO2: Make use of the cloud computing technologies like data center technology, virtualization technology, web technology, multitenant technology and service technology.
CO3: Interpret various cloud computing mechanisms like load balancer, automated scaled listener, failover system and more.
CO4: Develop applications using Bigdata concepts.

Course Content:

UNIT 1:
Introduction to Cloud Computing: Origins and Influences, Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges.
Fundamental Concepts and Models: Roles and Boundaries, Cloud Characteristics, Cloud Delivery Models and Cloud Deployment Models.

UNIT 2:

Cloud Enabling Technologies: Broadband Networks and Internet Architecture, Data Center Technology; Virtualization Technology; Web Technology; Multitenant Technology; Service Technology.
Cloud Infrastructure Mechanisms: Logical Network Perimeter; Virtual Server; Cloud Storage Device; Cloud Usage Monitor; Resource Replication; Ready-made environment

UNIT 3:

Specialized Cloud Mechanisms: Automated Scaling Listener; Load Balancer; SLA Monitor;
Pay-per-use Monitor; Audit Monitor; Failover System; Hypervisor; Resource cluster; Multi-device Broker; State Management Database
Cloud Management Mechanisms: Remote Administration System; Resource Management System; SLA Management System; Billing Management System.

UNIT 4:

Big Data: The Data Explosion, Why is big data special?, Storing Big Data, Big Data Analytics, Big data and medicine, big data & big business, big data security and big data & society.

Self-Learning Components:
Implementation of different Cloud Service Delivery and Deployment Models.

(Recommended Learning Resources)Text books:

1. *Thomas Erl , Ricardo Puttini , Zaigham Mahmood Cloud Computing: Concepts, Technology & Architecture PHI, 2013.*
2. *Dawn. E. Holmes, "Big Data- A short Introduction", Oxford University Press, 2017.*

(Recommended Learning Resources)Reference books:

1. *Dan C. Marinescu, Cloud Computing: Theory and Practice, MK*
2. *RajkumarBuyya, JamesBroberg, Andrzej Goscinski, Cloud Computing- Principles and Pradigms, Wiley.*
3. *Gautam Shroff, Enterprise Cloud Computing- Technology, Architecture, Applications, CAMBRIDGE.*
4. *Kai Hwang, Geoffrey C. Fox, Jack J Dongarra, Distributed and Cloud Computing,MK,2012*
5. *Michael Collier, Robin Shahan, Fundamentals of Azure-Microsoft Azure Essentials, Microsoft Press, 2nd Edition,2016.*
6. *Neil Peterson, Get started guide for Azure IT operators, Microsoft,2016.*
7. *Roberto Brunetti, Windows Azure-Step by Step, Oreilly Media,2011.*
8. *Journal of Cloud Computing -Advances, Systems and Applications, Springer Open.*
9. *International Journal of Cloud Computing, INDERSCIENCE Publishers.*
10. *IEEE Cloud Computing*
11. *International Journal of Cloud Applications and Computing (IJCAC), IGI Global.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	C	d	e	f	g	h	i	j	k	l	m	n
CO1	M	H												
CO2		H									M			
CO3	H	M												
CO4								M	H					

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Creating a private cloud using Open Stack.
2. Give a report on benefit of Cloud on Health Industry.
3. Give a report on benefit of Cloud on Farmers.
4. Execute some of the azure based projects available in github.
5. Write a note on azure virtual machines.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT5030	Web Application Development	**HC**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

Object Oriented Programming with Java (B19IT3030) and Basics of Database Management System (B19IT4030).

Course Description:

The basics of Web application tools such as HTML, XHTML and CSS are introduced. The course also provides knowledge about advanced research topics such as XML, Perl and PHP.

Course Objectives:

1. Explain the basic concepts of HTML code.
2. Illustrate the use of Cascading Style Sheets in web pages.
3. Demonstrate the use of Angular JS, Java Scripts and XML in real world applications.
4. Describe the principles of object oriented development using Perl and PHP.

Course Outcomes (Cos):

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

CO1: Build web pages using HTML syntax and semantics.

CO 2: Make use of Cascading Style Sheets in developing web applications.
CO 3: Develop Web based applications using Angular JS, Java Scripts and XML concepts.
CO 4: Apply the principles of object oriented development using Perl and PHP

Course Content:

UNIT- 1

Introduction to HTML, HTML Syntax, Semantic Markup, Structure of HTML Documents, HTML Elements, HTML Semantic Structure Elements, HTML Web Storage. HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Micro formats

UNIT -2

Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, CSS Text Styling. Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.

UNIT- 3

Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, Caching, JavaScript and jQuery, Angular JS, JavaScript Pseudo-Classes, XML Processing and Web Services, XML Processing, Overview of Web Services.

UNIT- 4

Introduction to Perl and PHP. Arrays and Superglobals, Arrays, GET and POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling.

Self-learning component:

HTML5,JQuery,XML, Ruby, Introduction to REST and RESTful API

Text books

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson Education India, 1st Edition, 2016
2. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 1st Edition, 2006.
3. Robert. W. Sebesta, "Programming the World Wide Web", Pearson Education, 4th Edition, 2007.

Reference books

1.Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", O'Reilly Publications, 4th Edition, 2015.
2. Luke Welling, Laura Thomson, "PHP and MySQL Web Development", Pearson Education, 5th Edition 2016.

3. Nicholas C Zakas, "Professional JavaScript for Web Developers", Wrox/Wiley India, 3rd Edition 2012.
4. David Sawyer Mcfarland, "JavaScript & jQuery: The Missing Manual", O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 1st Edition, 2014
5. Zak Ruvalcaba Anne Boehm, "Murach's HTML5 and CSS3", Murachs/Shroff Publishers & Distributors Pvt Ltd, 3rd Edition, 2016.
6. Gerardus Blokdyk, "Representational State Transfer: Practical Integration", CreateSpace Independent Publishing Platform, 1st Edition, 2018
7. Michael Fitzgerald, 'Learning Ruby", O'Reilly, 1st Edition, 2007

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	B	c	d	E	F	g	H	i	J	k	l	M	N
CO1	H							H			H			
CO2			M									M		
CO3			H			H			H		H			
CO4			H				H							

Where L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Create a static REVA University web page using HTML tags
2. Create a web page that will have separate links to show map of India and World. When user will open a map of India, create links to display the information of each state i.e. highlighted in the map in a separate window/document. (The information should be brief i.e. not more than 3-4 sentences.) When user will open a world map, show the list of countries on clicking the image in a new window.
3. Write an HTML page to display information of three products. The name of three products should be displayed at the top. The hyperlink should be provided to move to the details of the product like its features, size, price etc .alongwith its image. The link should be internal link.
4. Explain the following tags with the attributes that often required. Write suitable example for each. 1) SELECT 2) TEXTAREA
5. What is CSS and List out the properties of CSS.
6. Differentiate between java and JavaScript.
7. Explain with sample program perl.
8. Explain with sample program php.

Course Code	Course Title	Course Type	L	T	P	C	Hrs./ Wk.
B19IT5040	**Machine Learning**	HC	3	0	0	3	3

Prerequisites:

Students must have studied Data Structure, Algorithms and Mathematics

Course Objectives:

The objectives of the course are to:

1. Discuss the basic theory underlying machine learning.
2. Explain machine learning algorithms to solve problems of moderate complexity for data analysis.
3. Illustrate the concept of Genetic Programming and Artificial Neural Network.
4. Discuss the implementation of Machine learning algorithms and modules.

Course Outcomes:

On successful completion of this course, the student shall be able to:
CO1: Explain the basics of machine learning concepts.
CO2: Understand machine learning algorithms for intelligent applications.
CO3: Apprehend how to perform evaluation of learning algorithms and model selection.
CO4: Implement machine learning applications.

Course Content:

UNIT-1:

Introduction: Well-Posed Learning Problems, Designing a Learning System, Perspectives and Issues tin Machine Learning Examples of Machine Learning Applications, Learning Associations, Classification, Regression, Unsupervised Learning, and Reinforcement Learning. Supervised Learning. Concept Learning and the General-to-Specific Ordering: A Concept Learning Task, Concept Learning as Search, FIND-S.

UNIT-2:

Dimensionality Reduction: Subset Selection, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis. Classification.

UNIT-3:

Clustering: Introduction**,** kmeans, nearest neighbor, expectation maximization algorithm, Supervised learning after clustering, hierarchical clustering, choosing the number of clusters. Decision Tree Learning.

UNIT-4:

Artificial Neural Networks: Introduction, Perceptrons, Multilayer Networks and the Back propagation Algorithm.

Reinforcement Learning: Introduction, Learning task, Q-learning.

Design and Analysis of Machine Learning Algorithms and experiments using WEKA//Rapid Miner Tool

Recommended Learning Resources:

1. *Tom Mitchell: Introduction to Machine Learning Chapters 1, 2, 3, 4, 6, 8, 9.1 to 9.4, 13 2. 2.*
2. *EthemAlpaydin: Second edition MIT press McGraw-Hill Chapters 1, 2, 6, 7, 19*
3. *William W Hsieh Machine Learning Methods in the Environmental Sciences, Neural Networks, Cambridge University Press.*

Reference Books:

1. *EthemAlpaydin: Introduction to Machine Learning, Second edition MIT press, 2010. Chapters 1, 2, 6, 7, 19.*
2. *YoshuaBengio and Aaron Courville,Deep Learning -Ian Good fellow, , MIT Press book,2016*

3. *Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001*
4. *Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995*

The laboratory exercises will include use of various machine learning algorithm for data classification, data regression, clustering using WEKA Tools.

The list of experiments are:

The Weka tool should be taught to the students

1) Introduction to WEKA, installation of WEKA Tool and demonstration.
2) Perform data preprocessing.
3) Perform classification to the dataset.
4) Perform Clustering using k-means for the contact lens dataset.
5) Perform Logic Regression for Iris data set.
6) To Visualize the results usingthe Tool.
7) To Analyze the results using the Tool.
8) Apply ID3 decision tree algorithm to House database.
9) Apply CART decision tree algorithm To IRIS database.

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
B19IT5051	**Mobile Application Development**	SC	**3**	**0**	**0**	**3**	**3**

Prerequisites:

Object Oriented Programming with Java [B19IT3030]

Course Description:

This course introduces programming technologies, design and development tools related to mobile applications. Topics include accessing device capabilities, industry standards, operating systems, and programming for mobile applications using OS Software Development Kit (SDK).

Course Objectives:

1.Discuss mobile application models/architectures and patterns for development of a mobile software application
2 Demonstrate the installation of software and tools required for development of android applications.
3. Illustrate the use of fundamentals of android with graphics and animation APIs.
4. Describe an application with multimedia concepts of audio, video with entertainment services.

Course Outcomes:

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

CO1: Apply mobile application models/architectures and patterns for development of a mobile software application

CO2: Make us of different tools required for development of android applications.

CO3: Develop the programs using fundamentals of android with graphics and animation APIs.

CO4: Implement multimedia concepts of audio, video with entertainment services.

Course Content:

UNIT-1:

Introduction to mobile communication and computing: Introduction to mobile computing, Novelapplications, limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security, Smart phone operating systems and smart phones applications.

UNIT-2:

Fundamentals of Android Application Development: Introduction to Android., The Android 4.1Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator.

UNIT-3:

Layouts, Menus and Graphics in Android: Menus:Options menu and app bar,Context menu andcontextual action mode,Popup menu, Defining a Menu in XML, Creating an Options Menu, Changing menu items at runtime, Creating Contextual Menus, Creating Menu Groups, Adding Menu Items Based on an Intent, Activity, Service, BroadcastReceiver and Content Provider. Building Blocks for Android Application Design, Laying Out Controls in Containers. Graphics and Animation: Drawing graphics in Android, Creating Animation with Android's Graphics API.

UNIT 4:

Creating the Activity, Working with views: Exploring common views, using a list view, creatingcustom views, understanding layout. Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments. Multimedia: Playing Audio, Playing Video and Capturing Media. Advanced Android Programming: Internet, Entertainment, and Services.

Self-learning component:

More Recent Applications: Multimedia;2D graphics ; networking support in Android, Introduction to IoS, App. Development.

Text books

1. *Bill Phillips, Chris Stewart, and Kristin Marsican, Android Programming: The Big Nerd Ranch Guide pearson technology group,3rd Edition,2015*
2. *Barry Burd, Android Application Development All-in-One For Dummies ,wiley publisher,2nd Edition, 2012.*
3. *ZigurdMednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura,Programming Android: Java Programming for the New Generation of Mobile Devices,oiley,2nd Edition,2012.*

Reference books

1. *Greg Nudelman, Android Design Patterns: Interaction Design Solutions for Developer, wiley, 2013.*
2. *Jason Tyler, App Inventor for Android: Build Your Own Apps No Experience Required!, wiley,2011.*
3. *J.F.Dimarzio, Android programming with Android studio,wrox,4th edition ,2017*
4. *Maurice Sharp Erica Sadun Rod Strougo, Learning iOS Development-A Hands-on Guide to the Fundamentals of iOS Programming, Addison Wesley by Pearson Education, Inc.2014.*
5. *Wei-Meng Lee, Beginning Swift Programming, Wiley India Pvt. Ltd.,2018.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	C	d	E	f	g	H	i	j	k	l	m	n
CO1										H	M		M	
CO2		H	M		L						H	H		H
CO3		M	H								M	M		H
CO4		M	H									M	L	H

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. 1.Introduction to Android platform. Introduction to the tools used in the Android emulator. Create a simple application.
2. Create an Android UI with one text field, centered at the top of the screen, and one button. The text field display the text "**You tapped 0 times**" .For every user ‘s tap the button, will increment a counter and update the text field accordingly.
3. Program a "**<username>DemoSuite**" app that allows a user to retrieve and display an internet resource (an xkcd cartoon), trigger a simple custom animation, play video, convert text to speech, and enter text via speech.The main structure that developer must follow is that of a "TabLayout + ViewPager " skeleton, and five different fragments that are started from tabs in the TabLayout. The five fragments will implement the abovementioned functionalities, and they can be tested individually, and need not interact with each other, other than being started from the same framework.
4. The Developer can use skeleton code to get started with the development. Unzip the file and rename the "BoilerPlateHW3" folder to "**<username>DemoSuite**", which can then import to Android Studio. Refactor this code to rename the package name to your usual package name, and theapp name to "**<username>DemoSuite**" (as shown in class). The skeleton code displays a package name in the Activity's **onCreate method**. Include the code if app is created from scratch. The TAs

will rely on this Toast while grading.Fragments are added, using AndroidStudio menu actions. The app must handle orientation switches from Portrait to Landscape and back. State should be saved in all cases. The video player should have a special landscape layout. When the app is opened for the first time it should display a view of the first tab (the xkcd viewer), with an empty page and a text field to enter a number and a send button.

Sample Mini projects:

1. CHILD MONITORING SYSTEM APPLICATION PROJECT

The application uses two main services that is GPS and telephonic services. For location services is GPS and telephony services is SMS, call logs and contacts. Android is a widely used OS used by a lot of masses globally. Internet is used for communicating between children and parent side. The System can be designed in a simple way. The application developed to make user-friendly approach on both sides. The parents and children both should have GPS Based smart phones. The application is used to track the Child's location as well as call logs, messages and contact from their smartphone. Reason for choosing android OS is that to target more users.

2. CLASSROOM AUTOMATION USING ANDROID APP PROJECT

In this Classroom Automation project, we are using an android app by which the user can select the classroom or group multiple classrooms to announce script, with this system human effort and time is reduced. Announcement from control room is captured with mic and feeded into the amplified box, from thatamplifier box sound signal is sent into relay switching box, from relay switching box sound is switched intothe respective classroom based on user inputs from android app.

3. TIME TABLE ANDRIOD APPLICATION PROJECT

Class time table project main objective is to develop an android app which can help institutions, schools or colleges faculty members to plan and schedule classes and batches using their Smartphone. By using this app they can enter details of the batches and timings of the batches from starting and ending date with the scheduling the class. Whenever faculty wants to know about class timings he/she can find them using this android app. This is very simple and suitable app with all basic features for Time Table related information in the colleges and schools.

4. AGRICULTURE UPDATES PROJECT

Our Agriculture Updates project discuss everything about providing the SMS updates on various agriculture products as per the user requirements on his GSM or GPRS mobile phone.The updates may vary from pricing, availability, stocks and need of various products on the market. Basically this will be expected to be helpful for farmers around the state. Since it works everywhere with the mobile signal it does not require internet.We are also providing pricing details to the customers. This Agriculture Updates app is mainly concerned about

the specific group of customers which is farmers. It updates status on various products as per the user choice on daily or weekly basis.

5. ANDROID MULTI LAYER PATTERN LOCKING PROJECT

Most of the smart phone users use pattern locking application in order to lock the application which contains important information. But these pattern locking applications allows the user to open the mobile application only when the user enters the pattern at one go, user won't be able to open the application if he overlaps the pattern. So in our system user must specify the pattern while registering. He must specify the locking pattern twice for the confirmation. When the user registered successfully, he can use the pattern to open the application by specifying the registered pattern. This application allows the user to overlap the pattern. If the pattern matches with the registered pattern user will be allowed to access the application. If the user fails to match the pattern with the one registered within 5 attempts system will display an error message. Whenever user specifies the pattern each time pattern color will be changed. Multiple users can use this application

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT5052	**Object Oriented Analysis and Design**	SC-2	3	0	0	0	3	3

Prerequisites:

Programming for Problem Solving [B19IT1030]

Course Description:

This course introduces object models and designs from system requirements; use the modelling concepts provided by UML; identify use cases and expand them into full behavioral designs; expand the analysis into a design ready for implementation and construct designs that are reliable. The course begins with an overview of the object oriented analysis and design.

Course Objectives:

The objective of this course is to:

1. Explain the object oriented models for developing large applications
2. Describe the classes and objects.
3. Demonstrate the use of various UML diagrams in real world applications.
4. Discuss different case studies that make use of OOAD concepts.

Course Outcomes (Cos):

On successful completion of this course; the student will be able to:
CO1: Apply object oriented models for developing larger applications.
CO2: Identify classes and objects for a given problem.
CO3: Implement use-case and sequence diagrams for a given real world application.
CO4: Summarize the case studies that require Object oriented approach.

Course Content:

UNIT- **1**

Complexity: The Structure of Complex Systems, Inherent Complexity of Software, five Attributes of a Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos On Designing Complex Systems.

The Object Model: The Evolution of the Object Model, Foundations of the Object Model, Elements of the Object Model, Applying the Object Model.

UNIT -**2**

Classes and Objects: The Nature of an Object, Relationships among Objects, The Nature of a Class, Relationships among Classes, The Interplay of Classes and Objects, On Building Quality Classes and Objects. Classification: The Importance of Proper Classification, Identifying Classes and Objects, Key Abstractions and Mechanisms.

UNIT- **3**

Notation: The Unified Modelling Language, Package Diagrams, Component Diagrams, Deployment Diagrams, Use Case Diagrams, Activity Diagrams, Class Diagrams, Sequence

Diagrams, Interaction Overview Diagrams, Composite Structure Diagrams, State Machine Diagrams, Timing Diagrams, Object Diagrams, Communication Diagrams. Process: First Principles, The Macro Process: The Software Development Lifecycle, The Micro Process: The Analysis and Design Process.

UNIT- **4**

Case Study: Web Application: Vacation Tracking System: Inception, Elaboration, Construction, Transition and Post-Transition.

Self-learning components:

System Usability and Measuring User Satisfaction: Usability Testing, User Satisfaction Test, Analyzing User Satisfaction by Satisfaction Test Template, Developing Usability Test Plans and Test Cases.

Text books

1.Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen and Kelli A. Houston, Object-Oriented Analysis and Design with Applications, Third Edition, Addison Wesley, 2009.

Reference books

1. *Brett McLaughlin, Gary Pollice, David West, Head First Object-Oriented Analysis and Design: A Brain Friendly Guide to OOA&D, Oreilly Media Inc, 2007.*
2. *Brahma Dathan, Sarnath Ramnath, Object-Oriented Analysis, Design and Implementation: An Integrated Approach, Springer Universities Press, 2015.*
3. *James J. Odell, Advanced Object-Oriented Analysis and Design Using UML, SIGS Books and Mutimedia, 1998.*
4. *Elsevier Journal of systems and software.*
5. *Springer Journal of Object-Oriented Programming.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1	H						M							
CO2			M		H									
CO3					H									
CO4					M			H						

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Develop the system architecture for the hypothetical Satellite Navigation System (SNS) by logically partitioning the required functionality.
2. Develop the system architecture for the Train Traffic Management System (TTMS).
3. Design a solution to the cryptanalysis problem using the blackboard framework.
4. Design a data acquisition system for weather monitoring station.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT5053	**Embedded Systems Design**	SC-1	3	0	0	0	3	3

Prerequisites:

Digital Logic Design [B19IT3010]

Course Description:

Embedded systems have become the next inevitable wave of technology, finding application in diverse fields of engineering. Microprocessors, together with sensors and actuators, have become embeddable in almost everything. The purpose of the course is to provide the students with the basic information about embedded systems which can be defined as a control system or computer system designed to perform a specific task.

Course Objectives:

The Objectives of this course is to:

1. Demonstrate the optimal composition and characteristics of an embedded system.
2. Exaplin A/D conversion process.
2. Demonstrate the protocols and software tools employed in embedded system design.
3. Discuss Hardware/Software co□design techniques for microcontroller-based embedded systems.

Course Outcomes (Cos):

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

CO1: Outline the optimal composition and characteristics of an embedded system.

CO2: Develop an application using A/D conversion process.

CO3: Summarize the protocols and software tools employed in embedded system design.

CO4: Make use of Hardware/Software co□design techniques for microcontroller-based embedded systems.

Course Content:

UNIT- 1

Introduction to Embedded Systems: Application Domain of Embedded Systems; Desirable Featuresand General Characteristics of Embedded Systems; Model of an Embedded System; Microprocessor vs Microcontroller; Example of a Simple Embedded System; Figures of Merit for an Embedded System; Classification of MCUs: 4/8/16/32 Bits.

Embedded Systems – The Hardware Point of View:

Microcontroller UNIT (MCU); A Popular 8-bit MCU; Memory for Embedded Systems; Low Power Design; Pullup and Pulldown Resistors.

UNIT -2

Sensors, ADCs and Actuators: Sensors; Analog to Digital Converters; Actuators. Examples ofEmbedded Systems:Mobile Phone; Automotive Electronics; Radio Frequency Identification (RIFD); Wireless Sensor Networks (WISENET); Robotics; Biomedical Applications; Brain Machine Interface

UNIT- 3

Buses and Protocols: Defining Buses and Protocols; On-board Buses for Embedded Systems;External Buses; Automotive Buses; Wireless Communication Protocols.

Software Development Tools: Embedded Program Development; Downloading the Hex File to the Non-volatile Memory; Hardware Simulator.

UNIT- 4

Real-time Operating Systems: Real-time Tasks; Real-time Systems; Types of Real-time Systems;Real-time Operating Systems (RTOS); Real-time Scheduling Algorithms; Rate Monotonic Algorithm; The Earliest Deadline First Algorithm; Qualities of a Good RTOS.

Hardware Software Co-design and Embedded Product Development Lifecycle Management: Hardware Software Co-design; Modelling of Systems; Embedded Product Development Lifecycle Management; Lifecycle Models.

Self-learning component:

Programming in Embedded C; ARM (Part 1: Architecture and Assembly Language Programming; Part 2: Peripheral Programming of ARM MCU Using C); PSoC-SoC for Embedded Applications; DSP Processors.

Text books

1. *Lyla B. Das, Embedded System: An Integrated Approach, Pearson, 2013*
2. *KVKK Prasad, Embedded / Real Time Systems, Dreamtech Press, 2005.*
3. *Peter M, Embedded System Design: Embedded Systems Foundations of Cyber-Physical Systems, and Internet of Things, Springer, 3rd Edition, 2018*
4. *Rob Toulson, Fast and Effective Systems Design, Newnes Publisher, 2nd Edition, 2016*

Reference books

1. *Frank Vahid, Tony D. Givargis, Embedded System Design – A Unified Hardware/Software Introduction, John Wiley, 2002.*
2. *Jonathan W. Valvano, Embedded Microcomputer Systems, 3rd. edition, Cengage Learning, 2011.*
3. *David E. Simon, An Embedded Software Primer, Pearson Ed., 2005.*
4. *Raj Kamal, Introduction to Embedded Systems, TMH, 2002.*
5. *Sri Ram V Iyer, Pankaj Gupta, Embedded Real Time Systems Programming, TMH, 2004.*
6. *Michael Barr, Programming Embedded Systems in C and C++, O'Reilly, 1999.*
7. *International Journal of Embedded Systems-InderScience Publishers.*

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	a	b	C	d	e	f	g	h	i	j	k	l	m	N
CO1							L			L	M		H	
CO2	M		L				L				H			

CO3	M						L			M	H		H	
CO4	M	M			H		L			H	M		H	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

Note: Assignments based on following topics can be carried out on Keil µVision Simulator or any other Simulator for ARM Cortex M3 microcontroller.

1. Basic C and FreeRTOS programming.
2. Peripheral Interface Programming.
3. Interrupt System Programming.
4. ADC/DAC programming.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ wk
B19IT5054	Operations Research	SC - 2	3	0	0	0	3	3

Prerequisites:

Basic Mathematics, Linear Algebra, Calculus

Course Description:

This course teaches a student the science of modelling and optimization. It provides tools and theories to solve these real-world problems by finding the optimal solutions to the models subject to constraints of time, labour, resource, material, and business rules. With Operations Research, people make intelligent decisions to develop and manage their processes and businesses.

The objectives of this course are to:

1. Explain basic concepts of Operation Research
2. Illustrate a real world problem as a linear programing problem
3. Discuss applications of dynamic programming and integer programming to solve an optimization problem
4. Develop mathematical models based on game theory

Course Outcomes (Cos):

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

CO1: Outline the basic concepts of Operation Research
CO2: Develop a real world application using linear programing technique.
CO3: Apply Dynamic programming and integer programming to solve an optimization problem
CO4: Formulate a problem based on game theory

Course Content:

UNIT-1

Introduction to Operations Research: Overview of Operations Research Modelling Approach,origin of operations research, nature of operations research, impact of operations research, defining a problem and gathering data, formulating a mathematical model, deriving solution from model, testing models, preparing to apply model, implementation, Introduction to optimisation , Engineering Applications of Optimization, Statement of Optimization Problem.

UNIT-2

Linear and Non Linear Programming: Linear Programming - Applications of linear programming,standard form of linear programming problem, solution of a system of linear simultaneous equations simplex algorithm, two phases of simplex method. Transportation problem, assignment problem

Non-Linear Programming - Unimodal function, unrestricted search – search with fixed step size, search with accelerated step size, Exhaustive search, random walk methods, Gradient of a function-evaluation of gradient, rate of change of a function along a direction, Transportation problem, assignment problem.

UNIT-3

Dynamic and Integer Programming: Dynamic Programming-Multistage decision process-definitionand examples, Concept of sub-optimisation and principle of optimality, computation procedure in dynamic programming, example illustrating calculus methods of solution, example illustrating tabular method of solution.

Integer Programming – Graphical representation, Gomory's cutting plane method-concept of a cutting plane, Gomory's method for integer programming problems, branch and bound methods.

UNIT-4

Game Theory and Metaheuristics: Basic terminology – Player, Strategy, Optimal strategy, Payoff,Saddle point, Value of the game The formulation of two person, zero sum games, solving simple games- a prototype example, Pure Strategies (Minimax and Maximin Criterion)games with mixed strategies, graphical solution procedure, solving by linear programming.

Self-learning component:

Stochastic modelling and simulation, Metaheuristics

Text books

1. *Frederick S Hillier, Gerals J Lieberman, Bodhibrata Nag, PreetamBasu, Introduction to Operations Research, , 9th Edition, McGraw Hill Education, Special Indian Edition, 2012*
2. *Singiresu S Rao, Engineering Optimization Theory and Practice, 3rd Edition, New Age International, 3rd reprint, 2018*
3. *K.V.Mittal, C.Mohan, Optimization Methods in Operations research and System Analysis, , 3rd Edition New Age International Publishers, 1996*

Reference books

1. *Frank Tillman, A Professional's guide to problem solving with decision science, Pioneering Partnership, 2nd Edition, 2018*
2. *A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2016*
3. *Hamdy A. Taha, Operations Research An Introduction, , 8th Edition, Pearson Education, 2007*
4. *IEEE Transactions on Evolutionary Computation*

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CO1	H	H	H		H		M			M			M	
CO2	H	H	H		H		M			M	H	M	M	
CO3	H	H	H		H		M			M	H	M	M	
CO4	H	H	H		H		M			M	H	M	M	M
CO5	H	H	H		H		M			M	H	M	M	M

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

Describe in details the OR approach of problem solving. What are the limitations of the Operations Research?

A company makes two products, called X and Y, from a mix of chemicals. The mix is made up of three raw materials identified by the letters A, B, and C. At least 45% of the mix must be raw material A and no more than 30% of the mix may be raw material C. After processing the mix, the products are withdrawn in the proportions: 40% is X, 20% is Y, and 40% is a waste product that must be discarded.

Up to 1000 pounds of X can be sold for $12 per pound. Product Y is sold for $18 per pound for any amount up to 2000 pounds. No more than 1000 pounds of X or 2000 pounds of Y may be produced. The processing cost of the mix is $1.50 per pound. Material A costs $6 per pound for any amount. Material B costs $3 per pound up to 2500 pounds. Raw material C is free for up to 1500 pounds. No more than 2500 and 1500 pounds of raw materials B and C are available respectively.

a. Solve this problem with a linear programming model. Describe the optimum mix of raw materials and production levels for the products. How much profit does the business make?

b. What restrictions in the problem are limiting the profit?

c. Change the model so that the simple upper bounds are specified as explicit constraints. (If you previously specified these using the simple upper bound option, change the bound to a higher value 999999.)

$X \leq 1000, Y \leq 2000, B \leq 2500, C \leq 1500$

Note that it is necessary to use explicit constraints to get sensitivity information.

Solve the problem again and determine which of these simple upper bounds you would like to change.

Should the change be up or down? Predict the profit of the new solution.

d. How much can you increase the cost of raw material B increase before the solution changes? (Do all this without solving the problem again.)

e. How much can you increase the limit on product X before the variables in the basic solution change? (Do all this without solving the problem again.)

f. Add the restriction that the mix must be at least 60% raw material B. Solve the problem again and tell what happens to the solution with this constraint?

g. Delete the constraint added in part f. Change the model to remove the limitations on the sales of X and Y. What happens to the solution?

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT5055	**Microcontroller and Interfacing**	SC-2	3	0	0	0	3	3

Prerequisites:

Number System; Binary Arithmetic; C programming

Course Description:

Microcontroller course is suitable for candidates who are interested in embedded systems and robotics. 8051 is one of the first microcontrollers used in embedded system design. This course will give an understanding about:

- Embedded programming using 8051 microcontroller
- Architecture of 8051
- Interfacing to peripheral devices

Course Objectives:

The objective of this course are to:

1. Explain systematic and comprehensive treatment of microcontroller architecture, programming, and interfacing.
2. Discuss the implementation of system-level features using hardware and software components of a microcontroller.
3. Demonstrate the understanding of hardware and software aspects of integrating digital peripheral devices.
4. Illustrate the design, implementation, and debugging of microcontroller-based systems.

Course Outcomes (Cos):

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

1. Outline concepts of based embedded systems.
2. Develop applications to implement human interfaces with microcontrollers;
3. Evaluate assembly language programs for the 8051 microcontroller;
4. Make use of modern system development tools in the design of a microcontroller-based system.

Course Content:

UNIT-1

8051 microcontroller architecture: Preliminaries of micro-computing, Microcontroller architecture, registers flags, memory organization, stack, special-function registers, serial and parallel ports, counters and timers, serial input/output, interrupts.

UNIT – 2

8051 microcontroller programming: Addressing modes, complete instruction set, assembly language programming.

UNIT --3

8051 microcontroller-based system design: External memory interface, reset and clock circuits, testing the design, software and hardware timing, look-up table access, serial data transfer in various modes.

UNIT – 4
8051 Microcontroller applications: Interfacing keyboards, displays, measuring frequency and time, interfacing analog to digital and digital to analog converters.

Self-learning component:

Text books

1. *Kenneth J. Ayala, 8051 Microcontroller: Architecture, Programming, and Applications (2nd ed.), Delmar Thomson Course, 1999*

Reference books

1. *Muhammed Ali Mazidi and Janice GillispieMazidi, The 8051 Microcontroller and Embedded Systems (1st ed.), Prentice Hall PTR, Upper Saddle River, NJ, USA, 1999.*
2. *David Calcutt, Frederick Cowan and Hassan Parchizadeh, 8051 Microcontroller: An Applications Based Introduction, Elsevier, 2004.*
3. *Scott MacKenzie, The 8051 Microcontroller (3rd ed.), Prentice Hall PTR, Upper Saddle River, NJ, USA, 1998.*

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	a	b	C	d	e	f	g	h	i	j	k	l	m	n
CO1									H					
CO2	H													
CO3										H				
CO4	H													

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

Group-1

1. Draw and explain the internal structure of 8051.
2. Explain PSW register of 8051 indication functionality of its bits.
3. Estimate the time required for the following instructions to execute.
   a) MOV A, R3 requiring 1M/C cycle and running on 6MHz clock.
   b) MUL AB requiring 4M/C cycle and running on 6MHz clock

4. Explain the RAM structure of 8051 with a neat memory map.

5. Explain how Port0 pins can be used as I/P and O/P ports. Is the port pin multiplexed? IF so explain how multiplexed function can be performed by the port.
6. 8051 is operating with a clock of 16MHz. Find the minimum period for its fetch operation. What is the minimum period during which a simple instruction can get executed?
7. What is addressing mode? Explain immediate and direct addressing modes with examples.
8. Identifying the addressing modes used in the following instructions. How do each one of them execute?
   a) MOV R0, #42H
   b) MOV R3, 72H
   c) MOV A, @R0
   d) MOV R1, A
   e) MOV 03H, 01
9. Explain register and indirect addressing modes with examples.
10. Develop an ALP for block transfer of 10 data starting from memory locations 30h-39h to 2050h-2059h.
11. Check whether the following instructions are valid or not. If valid, give working of instruction and if invalid, give reason.
    a) ADD A, @B
    b) MULT R0, R1
    c) DAA A
    d) DIV B, A
    e) DJNZ R7, #0Ah, LABEL
    f) AND B, #FCh
12. Explain the special function TMOD register bits configuration.

Group-2

1. Elaborate on the 8051 features with the help of block diagram.
2. How Port 0 pins of 8051 can serve as input and output?
3. Show the contents of PSW register after addition of 0BFh and 1Bh in the following instructions.

   MOV A, #0BFh
   ADD A, #1Bh
4. Calculate in an 8051 system, driven by 11.0592MHz clock the time taken for an instruction which takes 4 machine cycles.
5. How is internal RAM of 8051 organized?
6. Elaborate on the Timer/Counter logic and discuss Auto-reload mode and 13 bit timer mode of operation.
7. Are the addressing modes in the following instructions valid? If not valid, state Why? If valid, how do they execute?
   a) MOV A, @R4
   b) MOV R0, #1258h
   c) MOV DPTR, 2374h
   d) MOV A, @DPTR
   e) MOV 07h, 03h
8. Discuss the immediate addressing mode with example instructions.
9. Discuss how program counter or Date pointer register in conjunction with Accumulator can be used to access code memory.
10. Identify the addressing mode and give the operation of each instruction
    a) MOV @R0, #35h

b) MOV 6, 3
c) MOV 3Ch, #3Ch
d) MOVX A, @R0
e) MOVC A, @A+DPTR
f) MOV A, 4Eh

11. Write an ALP to find the largest element in a given string n=6 bytes at location 4000h, store the result at the location 4060h.
12. Figure out the functions of the following 8051 instructions giving correct syntax of each:
    a) SWAP b) CJNE

Group-3

1. Illustrate block diagram of 8051 and explain its functionality in detail?
2. Explain the importance of PSW register bits.
3. Explain the special function TCON register bits configuration.
4. Explain the special function IE register bits configuration.
5. Illustrate the diagram of programming model of 8051 and explain them in detail.
6. Detail indirect addressing mode of 8051 with example instructions.
7. Develop an ALP to find sum and average of 5 hexadecimal numbers stored in memory locations 40h onwards, store the sum in memory location 50h and average in 51h.
8. Outline the status of overflow flag and check when the result is correct after the execution of
    a) MOV A, #+66
       MOV R4, #+69
       ADD A, R4
    b) MOV A, #-30
       MOV R0, #+24
       ADD A, R0
9. Figure out the functions of the following 8051 instructions giving correct syntax of each:
    a) DAA b) JBC
10. Explain immediate, direct and register indirect addressing modes of 8051 with example for each.
11. Explain the working of the following instructions with examples:
    a) MOV dst, src
    b) PUSH addr
    c) ADD dst, src
    d) ORL dst, src
    e) MUL AB
12. Write an ALP to demonstrate the serial and parallel data transfer to the I/O ports. To read the data parallel from P1 and write the same data to P0.0 serially.

Group–4

1. Illustrate the structure of Program Status Word.
2. Draw the block diagram of 8051 controller and summarize literally its components in brief.
3. Show the operation of the Port0 pins drawing the correct circuits diagram in regard to 8051 microcontroller.
4. Draw the oscillator circuit and represent on timing diagram the Pulse, State and Machine cycle in context of the 8051 microcontroller.
5. Make use of diagram to indicate and explain the internal Ram organization of 8051 microcontroller.
6. Assume that 5 BCD data items are stored in RAM locations starting at 40h; create an ALP to find sum of all numbers.
7. Explain addressing modes of 8051 with examples.

8. Write an ALP to an to sort an array of n=6 bytes of data in descending order stored from location 9000h.(Use bubble sort algorithm)
9. Explain the conditional jump instructions of 8051 microcontroller with example.
10. Explain the following instructions with examples
    a) DAA
    b) ANL
    c) ACALL
    d) SWAP
11. Explain the working of the following instructions with examples:
    a) SUBB dst, src
    b) XRL dst, src
    c) RLC A
    d) CPL C
    e) JZ rel
12. Write an ALP to check whether the given number is ODD or EVEN. If odd, store 'O' else store 'E' in memory location 80h.

Questions for Assignment-2

Group- 1

1. Examine how to interface 8255 programmable interface with 8051 microcontroller to expand its I/O capability.
2. Develop an assembly language program the tests to ensure that the microcontroller can fetch and execute program from the EPROM.
3. Develop an assembly level program to illustrate pure software time delay used in applications.
4. Write an ALP to demonstrate how DPTR can be used for lookup tables in applications.
5. Evaluate the various keyboard configurations using their schematic diagrams.
6. Build an ALP to measure the width of pulses fed to pin3.2(INT0); that are known to vary from 400 to 900µSec. Utilize timer T0, to enable count on the first pulse edge and count when the pulse is high and stop on the second edge. Output the width at internal memory location 100h(MSB) and 101h(LSB).
7. Outline how analog signal is converted into digital using A/D converter with the help of circuit diagram.
8. Indicate the pin function of an intelligent LCD by explaining each of them.

Group- 2

1. Develop an ALP to demonstrate how PC can be used for lookup tables in building applications.
2. Enumerate the importance of RAM and ROM in a microcontroller? With illustration explain how the capacity of RAM and ROM can be extended.
3. Develop an ALP to illustrate hardware time delay used in microcontroller applications.
4. Develop an ALP to demonstrate how DPTR can be used for lookup tables in building applications.
5. Evaluate the various keyboard configurations using their schematic diagrams.
6. Design the circuit for LCD interfacing with 8051. The display is of two lines, 20 characters per line. Port 1 is used to furnish the command or data byte, and ports 3.2 to 3.4 furnish register select and read/write levels.
7. Summarize how timers can be used to measure the frequency in industrial and commercial control applications.
8. Outline how digital signal is converted into analog using D/A converter with the help of a circuit diagram.

Group- 3

1. List all the key board configurations. Sketch and detail one of them.
2. A 4X4 key pad is interfaced with the controller. It is required to display the key press information on a seven segment display. Develop an algorithm, flow chart, program for the above task.
3. Develop an algorithm, flow chart, program the helps 8051 in measuring the width of the unknown pulse appearing on INT1.
4. Sketch the interrupt register (IP) and detail each of its bits that are designed to setup interrupt priority.
5. Elaborate on the expansion of input/output ports of 8051.
6. Briefly discuss the program test that ensures that the microcontroller can fetch and execute programs from the ROM.
7. Develop a program to demonstrate the PC usage for lookup tables, which are essential part of many applications.
8. Summarize how timers can be used to measure the frequency in industrial and commercial control applications.

Group – 4

1. A DAC interfaced with the controller has the following specifications. Maximum O/P voltage is 5Vand Minimum voltage is 0V. Develop a program that generates a sine wave having valid specification along with flow chart.
2. An 8-bit ADC is interfaced with controller. It is required to sample that I/P every 50µSec, 500time. Each sample has to be stored in external RAM. Develop an algorithm, flow chart, program that performs the given task.
3. Detail the controls of the 2-line 20 characters LCD display interfaced with the controller.
4. Develop an algorithm, flow chart, program to display "GOOD LUCK" on the LCD display. Assume that display. Assume that display commands are embedded in the array.
5. Develop an algorithm, flow chart, program to display 00 to 55 on the seven segment display interfaced with the controller.
6. Illustrate how the capacity of RAM and ROM of 8051 can be extended?
7. Briefly discuss the program to perform RAM test in 8051.
8. Label the SCON register contents and give the importance of each bit.

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
B19IT5061	**Digital Signal Processing with SCILAB**	**SC-3**	**3**	**0**	**0**	**0**	**3**

Prerequisites:

Linear algebra, Calculus and Multivariable calculus and Trigonometry [B19IT1010], Complex number

Course Description:

This course provides insight into fundamentals of Continuous and Discrete-time signals and systems, their properties and representations, understanding of signal representation in Frequency domain, discrete Fourier

transform and its properties. It introduces fast Fourier transform and finite impulse response filter designing. It analyses infinite impulse response filter designing.

Course Objectives:

1. Explain the Discrete Fourier Transform (DFT) properties

2. Describe algorithms to compute DFT & IDFT, FFT MATLAB commands.
3. Enumerate various characteristics of commonly used analog filters

4. Discuss various Designs of FIR Filters and Digital Filter Structures.

Course Outcomes:

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

CO1: Implement discrete Fourier transform to represent signal in frequency domain

CO2: Analyse and solve signal representation problems using DFT properties and fast Fourier transforms using radix-2 form.

CO3: Apply DFT to perform linear filtering.

CO4: Design IIR filters from analog domain and linear phase FIR filters using windows.

Course Content:

UNIT-1:

Discrete Fourier Transforms&its properties: The Discrete Fourier Transform (DFT)-Definition & Concept, and Properties of DFT: Periodicity, Linearity, and Symmetry Properties, Circular Convolution, Additional DFT Properties. Problems. DFT SCILAB commands

UNIT-2:

Fast Fourier Transform Algorithms:A linear filtering approach based on DFT, Filtering of long data sequences using overlap - add method, direct computation of the DFT, efficient computation of the DFT, FFT algorithms: Radix–2 DIT- FFT, DIF-FFT algorithms to compute DFT & IDFT, FFT SCILAB commands.

UNIT-3:

Design of IIR Filters: Characteristics of commonly used analog filters, design of Butterworth and Chebyshev analog filters. Frequency transformations in the analog domain, design of digital IIR Butterworth. IIRMATLAB commands.

UNIT-4:

Design of FIR Filters and Digital Filter Structures: Introduction to Linear-phase FIR filters, Symmetric and Anti-symmetric FIR Filters, Design of Linear phase FIR filters using windowing technique: Rectangular, Hamming & Kaiser windows. Design of Linear phase FIR filters by frequency sampling method. Implementation of FIR digital filters: Frequency sampling structures, direct form-I Linear phase structures, Implementation of IIR digital filters: Direct form-I & Direct form-II structures, filter SCILAB commands.

Self-learning component:
Implement the above using Scilab and Octave instead of Matlab.

Text books

1. *Proakis&Monalakis, "Digital signal processing – Principles Algorithms & Applications", PHI, 4th Edition, New Delhi, 2007.*
2. *Sanjit K Mitra, "Digital signal Laboratory using MATLAB", MGH Ed.2000.*
3. *Ashok Ambardar, "Digital signal processing: A modern Introduction", Cengage Learning, 2009.*

Reference books

1. *Oppenheim & Schaffer, "Discrete Time Signal Processing", PHI, 2003.*
2. *S.K.Mitra, "Digital Signal Processing", Tata Mc-Graw Hill, 2nd Edition, 2004.*

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**												
	a	b	C	d	e	f	g	i	j	k	l	m	n
CO1	H	H			H								
CO2	H	H											
CO3	H	H	H		H	H							
CO4	M	M				M							
CO5	H	H	H		H	H							

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Using a rectangular window technique, design a low pass filter with pass band gain of UNITy cut off frequency of 1000Hz and working at a sampling frequency of5kHz. the length of the impulse response should be 7.
2. Design an FIR low pass digital filter using the frequency sampling method for the following specifications:
   Cut off frequency = 1500Hz
   Sampling frequency = 15000Hz

Order of the filter N = 10

Filter Length required L = N+1 = 1

3. (i) Realize the following FIR system using minimum number of multipliers 1.
   $H(Z) = 1 + 2Z^{-1} + 0.5Z^{-2} - 0.5Z^{-3} - 0.5Z^{-4}$ 2.
   $H(Z) = 1 + 2Z^{-1} + 3Z^{-2} + 4Z^{-3} + 3Z^{-4} + 2Z^{-5}$
   (ii) Using a rectangular window technique, design a low pass filter with pass band gain of UNITy cut off frequency of 1000Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 5.

Lab Experiments: (Implement following using SCILAB)

1. Perform the Linear convolution of any two given sequences in time domain.
2. Computation of N point DFT of a given sequence using the definition of DFT and plot magnitude and phase spectrum, and verify using built in function (using FFT).
3. Perform the Circular convolution of two given sequences in time domain.
4. Perform Circular convolution of any two given sequences in frequency domain by using DFT and IDFT.
5. Obtain the Auto correlation and cross correlation of a given sequence and verify its properties.
6. Verification of sampling theorem.
7. Design of digital Low-pass and High-pass Butterworth IIR filter to meet the given specifications using bilinear transformations.
8. Design of digital Low-pass and High-pass Chebyshev IIR filter to meet the given specifications using bilinear transformations.
9. Design of digital Low-pass FIR filter to meet the given specifications using windowing technique.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT5062	**Parallel Processing and Algorithms**	**SC**	**3**	**0**	**0**	**0**	**3**	**4**

Prerequisites:

Computer organization and Architecture (**B19IT3020**), Problem Solving with Programming (**B19IT1030**), Design and Analysis of Algorithm (**B19IT4010**).

Course Description:

In a parallel computation, multiple processors work together to solve a given problem. These are exciting times in parallel computing. The largest parallel machine has over a hundred thousand processors, and it is believed that machines with over ten thousand processors will be commonly available by the end of the decade. Furthermore, with most chip manufacturers moving toward multicore processors, most machines will soon be parallel ones. It is, therefore, essential to learn to use parallel machines effectively.

Course Objectives:

1. Explain the concepts of parallelism.
2. Demonstrate the use of OpenMP for implementing shared memory concepts.
3. Discuss the computational bottlenecks of basic computational problems.
4. Illustrate the use of graph algorithms for solving problems.

Course Outcomes (Cos):

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

CO1: Outline the concepts of parallelism.

CO2: Develop parallel programs using OpenMP and pthreads.

CO3: Analyze computational bottlenecks of basic computational problems.

CO4: Make use of graph algorithms for solving problems.

Course Content:

UNIT- 1

Introduction to Parallel Computing: Motivating Parallelism, Scope of Parallel Computing. **Parallel Programming Platforms**: Implicit Parallelism-Trends in Microprocessor Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms. **Principles of Parallel Algorithm Design:** Decomposition Techniques, Characteristics of Tasks and Interactions, Parallel Algorithm Models.

UNIT -2

Programming Shared Address Space Platforms: Thread Basics, Why Threads?, The POSIX Thread API, Thread Basics: Creation and Termination, Synchronization Primitives in Pthreads, Controlling Thread and Synchronization Attributes, Thread Cancellation, Composite Synchronization Constructs, Tips for Designing Asynchronous Programs, OpenMP: a Standard for Directive Based Parallel Programming.

UNIT- 3

Dense Matrix Algorithms: Matrix-Matrix Multiplication. **Sorting:** Issues in Sorting on Parallel Computers, Bubble Sort and its Variants, Quicksort. **Graph Algorithms:** Definitions and Representation, Minimum Spanning Tree: Prim's Algorithm.

UNIT- 4

Graph Algorithms continued: Single-Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths and Transitive Closure. **Search Algorithms for Discrete Optimization Problems:** Definitions and Examples, Sequential Search Algorithms, Search Overhead Factor, Parallel Depth-First Search, Parallel Best-First Search, Speedup Anomalies in Parallel Search Algorithms.

Self-learning component:
Algorithms merging and sorting, Lower Bounds Lock Free synchronization, load stealing, lock free synchronization.

Recommended Learning Resources (Text books):

1. *Introduction to Parallel Computing (2nd Edition). Ananth Grama , George Karypis, Vipin Kumar, Anshul Gupta - Addison Wesley Publications, ISBN : 0-201-64865-2,2003.*

Recommended Learning Resources (Reference books):

1. *Parallel Programming in C with MPI and OpenMP by M.J. Quinn, McGraw-Hill Science/Engineering/Math, 1st edition, ISBN: 0072822562,2003.*

2. *OpenMP: www.openmp.org/*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	c	D	e	f	g	h	i	j	k	l	m	n
CO1	L			L										
CO2	M		L		M					L				
CO3	M		L		M			M		L	M			
CO4	M		L		M			M		L	M			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1 Implement a multi-access threaded queue with multiple threads inserting and multiplethreads extracting from the queue. Use mutex-locks to synchronize access to the queue.Document the time for 1000 insertions and 1000 extractions each by 64 insertion threads(producers) and 64 extraction threads (consumers).

2 Develop a threaded program for computing the Sieve of Eratosthenes. Think throughthe threading strategy carefully before implementing it. It is important to realize, forinstance, that you cannot eliminate multiples of 6 from the sieve until you have eliminatedmultiples of 3 (at which point you would realize that you did not need to eliminatemultiples of 6 in the first place). A pipelined (assembly line) strategy with the currentsmallest element forming the next station in the assembly line is one way to think aboutthe problem.

3 Device a sorting algorithm that sort the elements of an array by partitioning it and also parallelize such an algorithm.

4 convert the following sequentially executing programs into parallel using OpenMP

a)Matrix Multiplication b) Matrix Addition c.) Addition of two arrays d) Searching

e) Sorting

5. Show how Dijkstra's single-source algorithm and its parallel formulation need to be modified in order to output the shortest paths instead of the cost. Analyze the run time of your sequential and parallel formulations.

6. Compute the total amount of memory required by the different parallel formulations of the all-pairs shortest paths problem.

7. Discuss and illustrate the speed up gain due to pipelining.

8. Demonstrate Super-Scalar execution with the help of an example

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT5063	Object Oriented Programming with C++	HC	3	0	0	0	3	3

Prerequisites:

Problem Solving with programming [B19IT1030]

Course Description:

This course introduces the basic concepts of object oriented programming. Familiarizes with object creation and accessing members of object. OOP concepts such as data abstraction, information hiding (Encapsulation), overloading operations, inheritance mechanisms, virtual functions, friend functions and are discussed. File I/O operations, Templates and exception handling mechanisms are also introduced.

The objectives of this course are to:

1. Explain the basic concepts of objects and classes for a real world application.
2. Illustrate the use of operator overloading/function overloading for given applications.
3. Demonstrate the use of inheritance in real world applications.
4. Describe I/O streams and Templates and Exception Handling.

Course Outcomes

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

CO1: Apply the basic concepts of objects and classes for a real world application.

CO2: Make use of operator overloading/function overloading for given applications.

CO3: Develop programs using Inheritance feature of OOP.

CO4: Design programs using I/O streams and Templates and Exception Handling.

Course Content:

UNIT - 1

Introduction: Introduction to object oriented concepts: Encapsulation, Abstraction, Inheritance,Polymorphism, Overview of OOP, Introduction to object oriented modelling, Introduction to variables in C++, I/O operators, Function overloading, Inline function, Recursive function.

Classes & Objects: Introduction to Classes, Member Functions and Member data, Constructors and Destructors, Static Class members.

UNIT - 2

Operator overloading: Introduction to Objects, Array of Objects, Dynamic Objects, Pointers toobjects, Friend Function, Access specifiers.

The scope resolution operator, Generic functions and classes, Operator overloading using Friend function: Unary operator '+' & binary operator, Copy constructor.

UNIT – 3

Inheritance: Base Class, Inheritance and Protected members, inheriting multiple base classes,Constructors, Destructors and Inheritance, Virtual base classes. Virtual functions and Polymorphism: Virtual functions, pure virtual functions, Early and late binding.

UNIT – 4

Templates and Exception handling: Template Functions, Template Classes, Fundamentals ofException handling, handling derived class exceptions.

Self –Learning Components:

I/O System Basics, File I/O: C++ stream classes, Formatted I/O, <fstream> and File classes.

Recommended Learning Resources (Text books):

1. *HerbertSchildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.*
2. *SanleyB.Lippmann, JoseeLajore: C++ Primer, 4th Edition, Pearson Education, 2005.*

Recommended Learning Resources (Reference books):

1. Paul J Deitel, Harvey M Deitel: C++ for Programmers, Pearson Education, 2009.

2. K R Venugopal, RajkumarBuyya, T Ravi Shankar: Mastering C++, Tata McGraw Hill, 1999.

3. ACM, ACM Transactions on Programming Languages and Systems (TOPLAS).

4. ACM Journal on Object-Oriented Programming.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	a	b	C	d	e	f	g	h	i	j	k	l	m	n
CO1				L	M			M			M	L	M	M
CO2	M		H					L		H	H		H	M
CO3					H						H		M	
CO4	M		H					L		H	H		H	M

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Write a C++ program to implement library information system of C & IT of REVA University.
2. Develop an object motion tracking system in C++.
3. Implement Auto Time-Table generation system for Academics in engineering education.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT5064	**Principles of Programming languages**	SC	3	0	0	0	3	4

Prerequisites:

Problem Solving with Programming [B19IT1030]

Course Description:

The course is aimed at introducing the student with the general concepts common to all programming languages so as to make him learn new languages. The course describes syntax and semantics, lexical and syntax analysis, Expressions and Assignment Statements, Statement-Level Control Structures, Subprograms, Concurrency and Exception Handling and Event Handling.

Course Objectives

The objectives of this course are to:

1. Explain the fundamentals of programming languages design and implementation.

2. Describe Names, Scopes, and Bindings of objects, variables.

3. Discuss various machine architectures and issues in language design.

4. Illustrate the use of Composite Types, Records (Structures), Arrays, Strings, Sets, Pointers and Recursive Types, Lists, Files and Input/Output structures, data abstraction.

Course Outcomes

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

1. Outline the fundamentals of programming languages design and implementation.

2. Compare various Scopes, and Bindings of objects and variables

3. Make use of Regression techniques for data analysis.

4. Develop applications using Composite Types, Records (Structures), Arrays, Strings, Sets, Pointers and Recursive Types, Lists, Files and Input/Output structures, data abstraction.

Course Content:

UNIT -1:

Preliminaries: Reasons for Studying Concepts of Programming Languages, Programming Domains,Language Evaluation Criteria, Influences on Language Design, Language Categories, Language Design, Trade-Offs, Implementation Methods and Programming Environments.

Describing Syntax and Semantics: Introduction, The General Problem of Describing Syntax, Formal

Methods of Describing Syntax, Attribute Grammars, Describing the Meanings of Programs: Dynamic Semantics.

UNIT -2:

Lexical and Syntax Analysis: Introduction, Lexical Analysis, The Parsing Problem, Recursive-Descent Parsing, and Bottom-Up Parsing. Names, Bindings, and Scopes: Introduction, Names, Variables, The Concept of Binding, Scope, Scope and Lifetime, Referencing Environments, Named Constants.

Data Types: Introduction, Primitive Data Types, Character String Types, User-Defined Ordinal Types, Array Types, Associative Arrays, Record Types, Tuple Types, List Types, Union Types, Pointer and Reference Types, Type Checking, Strong Typing, Type Equivalence and Theory and Data Types.

UNIT-3:

Expressions and Assignment Statements: Introduction, Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational and Boolean Expressions, Short-Circuit Evaluation Assignment Statements and Mixed-Mode Assignment.

Statement-Level Control Structures: Introduction, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands and Conclusions.

Subprograms: Introduction, Fundamentals of Subprograms, Design Issues for Subprograms, Local Referencing Environments, Parameter-Passing Methods, Parameters That Are Subprograms, Calling Subprograms Indirectly, Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, User-Defined Overloaded Operators, Closures and Coroutines.

UNIT-4:

Implementing Subprograms: The General Semantics of Calls and Returns, Implementing "Simple"Subprograms, Implementing Subprograms with Stack-Dynamic Local Variables, Nested Subprograms, Blocks and Implementing Dynamic Scoping.

Concurrency: Introduction, Introduction to Subprogram-Level Concurrency, Semaphores, Monitors, Message Passing, Ada Support for Concurrency, Java Threads, C# Threads, Concurrency in Functional Languages and Statement-Level Concurrency.

Exception Handling and Event Handling: Introduction to Exception Handling, Exception Handling in Ada, Exception Handling in C++, Exception Handling in Java, Introduction to Event Handling, Event Handling with Java and Event Handling in C#.

Self-learning Component:

Abstract Data Types and Encapsulation Constructs, Support for Object-Oriented Programming and Functional Programming Languages.

Recommended Learning Resources (Text books):

1. Robert .W. Sebesta, "Concepts of Programming Languages", 10/e, Pearson Education.

Recommended Learning Resources (Reference books):

1. *A. B. Tucker, R. E. Noonan, "Programming languages", 2e, TMH.*
2. *K. C. Louden, "Programming Languages", 2e, 2003.*
3. *Patric Henry Winston and Paul Horn," LISP", Pearson Education.*
4. *W. F. Clocksin, C. S. Melish, "Programming in Prolog", 5e, Springer*.

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	a	b	C	d	e	f	g	h	i	j	k	l	m	n
CO1	M	H												
CO2	H				M									
CO3					M				H					
CO4	H	M												
CO5	H				M									

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Perform the comparsion of the PL/I and Ada programming languages, considering both completeness and flexibility.

2. Write EBNF descriptions for the following:

   a. A Java class definition header statement
   b. A Java method call statement
   c. A C switch statement
   d. A C union definition
   e. C float literals
   f. Write features of concurrency of different programming language.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT5070	Web Application Development Lab	HC	0	0	2	0	2	3

Course Outcomes (Cos):

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

CO1: Build web pages using HTML syntax and semantics.

CO 2: Make use of Cascading Style Sheets in developing web applications.

CO 3: Develop Web based applications using Angular JS, Java Scripts and XML concepts.

CO 4: Apply the principles of object oriented development using Perl and PHP

Lab Experiments:

Sl. No.	Name of the experiment	CO	PO
1	In today's digital world, information dissemination through printed documents consume lot of time. To overcome this drawback it is better to adopt digital technology for information dissemination, like e-journals, e-books, e-advertisements, etc. Information dissemination through Internet in the form of web content is essential and convenient option. Design and develop a static web pagesfor an online Book store. The pages should resemble like www.amazon.comThewebsite should consist of. Home page, Registration & Login, User profile page, Books catalog, Shopping cart, Payment by credit card, and order confirmation.	1	a,b
2	Internet or online services works on clients and server model. A client is a web browser through which users make requests, which contain input required, for service from the server to perform tasks. Server is a program running on a dedicated computer. Performance of any service or server depends on its throughput. Server throughput deteriorates when users send more and more invalid requests for service and thus results in wastage of server resources that are very precious. As a solution to this problem design a web page that takes student details such as Name, branch, Semester, University, date of admission, mobile number, email id and check forvalidity or correctness of the input data by writing a JavaScript to validate these fields.	1	a,c

3	Clients interact with servers by sending service requests that contain input required to complete the requested task or service. Input required for requested service may be collected through a web page that acts as an interface between users and the server, in the form of text fields, text areas, radio buttons, push buttons and so on. Hence it is better to instruct or help clients to input correct data through web pageby displaying appropriate error messages or alerts as and when users supply wrong input using event handlers. To demonstrate this task, design and develop a web page using JavaScript, XHTML that collects the SRN (Valid format is: Any letter followed by two digits, followed by two letters then followed by three digits). Include event handler for the form elements that collects information to validate the input. Messages must be produced in the alert windows as and when errors are detected.	2	a,e ,f
4	Dynamic web content is the information that is retrieved from one or more web servers depending upon what information client have requested for, and composedin response to users' requests. Advanced web technologies play a vital role in storage, processing and retrieval of dynamic web content from web servers. Hence itis important to use advanced web technologies such as XML to improve the efficiency in data retrieval. Create and save XML document for students information and display the same using cascaded style sheet.	2	a , c
5	Information technology has become part and parcel of humanity to such an extent that people can shop anything online, from anywhere, at anytime using an electronic device that has access to Internet. This has brought in the concept of virtual stores which provide products at less cost. To improve sales it is mandatory to organize items catalog based on item name, item price, and manufacturer so on. For such online shopping sites, look and feel is an obvious requirement which can be achieved using CSS 3 XSLT. Design a document using CSS and XSLT to create a catalog of items for an online electronic shopping	1, 2	a , e
6	In any business organization, employees keep traveling across different geographical locations and at the same time they want to be connected to their organization's computing resources such as email server, database server, file server, etc. to retrieve information such as sales details, assigning tasks to employees, and upload inspection site details, so on. Using PHP develop a web page that accepts book information such as ISBN number, title, authors, edition and publisher and store information submitted through web page in MySQL database. Design another web page to search for a book based on book title specified by the user and displays the search results with proper headings.	4	a g
7	Using computers without graphical user interfaces require the knowledge about syntax of computer commands and programming languages, also this makes users to feel that the use of computers is difficult and cumbersome. This impression of users on computers can be changed by providing good and easy-to-use graphical user interfaces which play vital role in use of computer applications or software without worrying about syntax of programming languages or computer commands. In fact	3	a.c

	computer software with good and easy-to-use graphical user interfaces will have large number of users. a) Design HTML page that takes UNIX command as input in a text field and submit it to a Perl program that executes given command and display the output on the web page b) Write a Perl program to keep track of the number of visitors to a web page and display the count of visitors with proper headings.		
8	*PHP* is a server scripting language, and a powerful tool for making dynamic and interactive Web pages. 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.	4	i,k
9	*PHP* (recursive acronym for *PHP*: Hypertext Preprocessor) is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.	4	i,k
10	Databases are the storage systems used by most of the business an information technology enterprises as back end. When users generate data using GUI, for ex. personal information, data are sent to back end database for storage and also users can retrieve this data as and when required from the back end (database) to the front GUI. In the real world there are several databases such as Oracle, DB2, MySQL, SQL Server, MS-Access, DBMongo, etc. To illustrate the process of generating data from the front end and store it on back end database then retrieve the available data from the back end database, write a Perl program to read personal information of a person such as first name, last name, age, permanent address and pin code entered by the user into a table created in MySQL. Read the same information from the database and display on the front end.	2,3	f,g

First Name	Last Name	Age	Address	Pincode
Ram	Kumar	21	REVA University	560064
Anil	Vinay	30	REVA University	560064

SIXTH SEMESTER

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
B19IT6010	**Artificial Intelligence**	HC	**4**	**0**	**0**	**4**	**4**

Prerequisites:

Data structures (B19IT3040), Design and Analysis of Algorithms (B19IT4010)

Course Description:

This course introduces the basics of Artificial Intelligence (AI), AI problems and search strategies. The students can explore knowledge representation issues and methods. This course provides planning methods /algorithms for, problem solving and controlling the knowledge and also demonstrates various learning methods for constructing knowledge and taking decisions.

Course Objectives

The objectives of this course is to:

1. Discuss the basics of Artificial Intelligence (AI).
2. Illustrate knowledge representation issues and methods
3. Explain planning methods/algorithms in problem solving
4. Demonstrate various learning methods for constructing knowledge.

Course Outcomes (Cos):

At the end of the course, the students shall be able to:

CO1: Outline basics of Artificial Intelligence and AI search strategies.
C02: Represent knowledge using logic and apply reasoning methods
CO3: Construct plans using agent technology for solving problems.
C04: Employ learning and reasoning methods in programs for constructing the Knowledge.

Course Content:

UNIT 1:

Problems and search: What is AI, AI Problems; AI Techniques; Problem Space and Problem Search techniques; Defining the problem as a state space search, production systems; Problem characteristics, production system characteristics, Issues in the design of search programs; Heuristic search techniques, generate-and-test; Hill climbing, BFS, DFS; Problem reduction; Constraint satisfaction

UNIT 2:

Knowledge Representation: Knowledge representation Issues, representations and mappings; Approaches to knowledge representation; Issues in knowledge representation; Using Predicate logic: Representing simple facts in logic; Representing Instance and ISA relationships; Computable functions and predicates; Representing Knowledge using Rules; Procedural versus declarative knowledge; Resolution Forward versus backward reasoning; Matching

UNIT 3:

Planning: A simple planning agent; Representations for planning; A partial-order planning example; A partial-order planning algorithm; Planning with partially Instantiated operators; Knowledge Engineering for planning; Uncertainty: Sources of Uncertainty; Probability Theory, Issues with Probability; Advantages & Disadvantages of Bayesian Network

UNIT 4:

Learning: Learning from observations; Inductive learning; A general model of learning agents; Learning decision trees; Using information Theory, Learning general logical descriptions; Computational learning theory, Reinforcement learning; Passive learning in a known environment, passive learning in Unknown environment; Examples: Connection to server, creating database, selecting a database; Active learning in an unknown environment; Neural Networks; Applications of Neural Networks

Self-Learning Components:

PEAS (Performance, Environment, Actuators and Sensors) for Agents ,Genetic Algorithm,Distributed Agents,Wumpus World game (Understanding the game and applying planning and learning rules),Bioinformatics.

Text books

1. *Russell & Norvig: Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.*
2. *Elaine Rich, Kevin Knight: Artificial Intelligence, 3rd edition, TataMcgraw Hill, 2009.*
3. *Timothy J. Ross: Fuzzy Logic with Engineering applications: Third Edition, 2010*

Reference books

1. *Nils J.Nilsson: Principles of Artificial Intelligence, Elsevier, 1980.*
2. *Krishan Mehrotra, Chilkuri K. Mohan, Sanjay Ranka: Artificial Neural Networks, Penram International Publishing, 1997.*
3. *B.Yegananarayana: Artificial Neural Networks, PHI, 2001.*
4. *ACM, ACM transaction on Multi-Agent System.*
5. *IEEE, IEEE transaction for computational Intelligence.*
6. *Springer, Springer transaction for security based intelligent systems.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	1			1		2								
CO2		1		1			2							
CO3	2		1		2									
CO4	1		2					3						

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

Application Development for any the following topics:

1. Personality Prediction System through CV Analysis: This system will help the HR department to easily shortlist the candidate based on the CV ranking policy. This system will focus not only in qualification and experience but also focuses on other important aspects which are required for particular job position. This system will help the human resource department to select right candidate for particular job profile which in turn provide expert workforce for the organization. Candidate here will register him/herself with all its details and will upload their own CV into the system which will be further used by the system to shortlist their CV. Candidate can also give an online test which will be conducted on personality questions as well as aptitude questions. After completing the online test, candidate can view their own test results in graphical representation with marks.

2. Website Evaluation Using Opinion Mining: Here an advanced Website Evaluation system should be developed that rates the website based on the opinion of the user. Website will be evaluated based on factors such genuineness of the website, timely delivery of the product after online transaction and support provided by the website. User will comment about the website, based on the comment system will rate the website. The system takes opinion of various users, based on the opinion; system will decide whether the website is genuine or not. The system uses opinion mining methodology to achieve desired functionality. A database of sentiment-based keywords along with positivity or negativity weight in database should be used and then based on these sentiment keywords mined in user comment is ranked. The system contains keywords related to fraud, genuineness, timely delivery of the product and service meters in the database. Based on these factors system will rate the website.
   The working of the system is follows: -
   - The user logins to the system he can view various websites posted by the admin and can comment about the website.
   - User can see the comment of another user.
   - System will rate the website based on the comment of various users.
   - The role of the admin is to add various website to the system and to add keywords in database.
   - So that system will match the comment with the keywords in database and will rate the website based on the sentiment analysis.

3. Student Information Chatbot: A Student bot project is built using artificial algorithms that analyzes user's queries and understand user's message. This System is a web application which provides answer to the query of the student. Students just must query through the bot which is used for chatting. Students can chat using any format there is no specific format the user has to follow. The System uses built in artificial intelligence to answer the query. The answers are appropriate what the user queries. If the answer found to invalid, user just need to select the invalid answer button which will notify the admin about the incorrect answer. Admin can view invalid answer through portal via login. System allows admin to delete the invalid answer or to add a specific answer of that equivalentquestion. The User can query any college related activities through the system. The user does not haveto personally go to the college for enquiry. The System analyzes the question and then answers to theuser. The system answers to the query as if it is answered by the person. With the help of artificial intelligence, the system answers the query asked by the students. The system replies using an effectiveGraphical user interface which implies that as if a real person is talking to the user. The user can queryabout the college related activities through online with the help of this web application. This system helps the student to be updated about the college activities.

4. Fake Product Review Monitoring & Removal for Genuine Ratings: As most of the people require review about a product before spending their money on the product. So, people come across various reviews in the website, but these reviews are genuine, or fake is not identified by the user. In some review websites some good reviews are added by the product company people itself to make to produce false positive product reviews. They give good reviews for many different products manufactured by their own firm. User will not be able to find out whether the review is genuine or fake. To find out fake review in the website this "Fake Product Review Monitoring and Removal for Genuine Online Product Reviews Using Opinion Mining" system is introduced. This system will find out fake reviews made by posting fake comments about a productby identifying the IP address along with review posting patterns. User will login to the system using his user id and password and will view various products and will give review about the product. To find out the reviewis fake or genuine, system will find out the IP address of the user if the system observes fake review send by the same IP Address many at times it will inform the admin to remove that review from the system. This system uses data mining methodology. This system helps the user to find out correct review of the product.

   System works as follows: -

   - Admin will add products to the system.
   - Admin will delete the review which is fake.
   - User once access the system, user can view product and can post review about the product.
   - System will track the IP address of the user.
   - If the system observes fake review coming from same IP address many a times this IP address will be tracked by the system and will inform the admin to remove this review from the system.

5. Android Attendance System: The mobile attendance system has been built to eliminate the time and effort wasted in taking attendances in schools and colleges. It also greatly reduces the amount of paper resources needed in attendance data management. This is an android mobile app. It's built to be used for school/college faculty so that they may take student attendance on their phones.

   The system is divided into following modules:

   - Student Attendance List Creation: Once this App is installed on a phone, it allows user to create a student attendance sheet consisting of name, roll number, date, Absent/Present mark and subject. He must fill student names along with associated roll numbers.

- Attendance Marking: The faculty has the list on his phone now. He may see the list call roll numbers and select absent id the student is absent or select present if student is present.
- Attendance Storage: This data is now stored in the faculty mobile phone. Faculty may also view it anytime on their phone.
- Attendance sheet transfer: The faculty can transfer the file to a server (normal computer) via a Bluetooth connection where this data can be stored and maintained by the school or college.

Thus, this system automates attendance system and eliminates the use of paperwork needed for attendance marking and monitoring student attendance.

Reference site for projects: (http://nevonprojects.com/artificial-intelligence-projects)

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6020	**Business Intelligence and Process Management**	HC	4	0	0	0	4	4

Prerequisites:

Database Management Systems [B19IT4030]

Course Description:

Business Intelligence and Robotic Process Management (BPM) offers many challenges for software developers and scientists. This course introduces the business intelligence process management concepts, where a student gains overview of all aspects of business intelligence and process modelling.

Course Objectives:

1. Explain the basic concepts of Business Intelligence.
2. Discuss the concepts of Robotics Process automation.
3. Demonstrate the use of UiPath studio.
4. Describe the Process Management Architectures and Methodology.

Course Outcomes (Cos):

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

CO1: Outline the modern concepts and theories of Business Intelligence.
CO2: Identify the Robotics Process automation tools
CO3: Implement the concepts of UiPath studio in a real world application.
CO4: Make use of the UiPath studioand Methodology in a real world application.

Course Content:

UNIT - 1:
Introduction to Business Intelligence: Overview; Changing Business Environments and computerized decision support, A framework for Business cy and legalIntelligence (BI), Why a BI Program?, Transaction

processing vs. Analytic processing, Successful BI Implementation, Major Tools and Techniques of BI.

UNIT - 2:

What Is Robotic Process Automation: Scope and techniques of automation? Robotic process automation, About UiPath

UNIT- 3:

Record and Play :Downloading and installing UiPath StudioLearning UiPath Studio,Task recorder,Step-by-step examples using the recorder.

UNIT- 4:

Handling User Events and Assistant Bots: What are assistant bots?Monitoring system event triggers

Self-learning components:
Handling User Events and Assistant Bots

Text books

*1. Learning Robotic Process Automation Alok manitripathi*Kindle Edition, Published rch by Packt Publishing .

2.E. Turban, R. Sharda, D. Delen, David King, Business Intelligence, 2nd ed. Pearson India, 2010.

Reference books

1. *Marlon Dumas et. al., Fundamentals of Business Process Management, Springer, ebook, 2012.*
2. *Van der Aalst, Process Mining: Discovery, Conformance and Enhancement of Business Processes, Third edition, 2011.*

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3									3			2	
CO2	3	3	3		3					3				
CO3	3	3	3		3					3	2		3	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Download and install UIPathStudio (Community edition)
2. Perform recording in UIpath studio.

- Basic

- Desktop
- Web
- Citrix

3. Empty a folder in Gmail with help of UIpath Robot.
4. Empty a Recycle Byn with help of UIpath Robot.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6030	Information and Network Security	HC	4	0	0	0	4	4

Pre-requisites:

Computer networks (B19IT5010).

Course Description:

The most important issue in organization operations, services and individuals is security of the exchanged data. This course introduces security policy, standards and tools used to provide security, such as shared key encryption (DES), public key encryption, and digital signature (Diffie-Hellmann, RSA, etc.). It then reviews how these tools are utilized in the internet protocols and applications and the system security issues, such as viruses, intrusion, and firewalls, will also be covered.

Course Objectives:

Objectives of this course are to:

1. Explain the security planning, standards and practices.
2. Describe the different cryptographic algorithms.
3. Demonstrate the use of the various authenticating functions.
4. Discuss Firewalls and Intrusion Detection system.

Course Outcomes (Cos):

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

CO1: Analysethe security planning, standards and practices.
CO2: Identify the different cryptographic algorithms.
CO3: Identify the various hashing functions and analyse it.
CO4: Interpret and analyse the different types of network issues.

Course Content:

UNIT- 1

Planning for Security: Introduction; Information Security Policy, Standards, and Practices; The Information Security Blue Print; Contingency plan and a model for contingency plan. **Introduction to Security Technology**: Physical design; Firewalls; Protecting Remote Connections.; Intrusion Detection Systems (IDS); Honey Pots, Honey Nets, and Padded cell systems; Scanning and Analysis Tools.

UNIT- 2

Computer Security Concepts: The OSI Security Architecture, Security Attacks, Security Services , Security Mechanisms, A Model for Network Security Symmetric Ciphers, Classical Encryption Techniques, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography , Block Ciphers and the Data Encryption , The Data Encryption Standard, A DES Example, Block Cipher Design Principles, Advanced Encryption Standard . Public-Key Cryptosystems , The RSA Algorithm , Diffie-Hellman Key Exchange,

UNIT- 3

Authentication Applications: Kerberos, X.509 Directory Authentication Service. **Electronic Mail Security:** Pretty Good Privacy (PGP); S/MIME. **Transport level Security, Web Security Considerations:** Web Security Threats, Web Traffic Security Approaches, SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Hand shake Protocol, Cryptographic Computations.

UNIT- 4

Firewalls: Introduction, Identification, Authentication, Authorization, Accountability, Firewall processing modes, Firewalls categorized by generation, Firewalls categorized by structure, Firewalls architectures, Selecting of right firewalls, Content Filters, Protecting remote connections, Remote Access, Virtual Private Networks. **Intrusion Detection and Prevention Systems**: IDPS terminology, Use of an IDPS, Types of IDPS, IDPS detection methods, IDPS response, Selecting IDPS approaches and products, Strength and limitations of IDPS, Honeypots. Tools: Auditing tools, Pocket PC hacking, wireless hack walkthrough.

Text books

1. William Stallings, Cryptography and Network Security, Pearson Publications, 6th edition,2014.

2. M. E. Whitman and Herbert J. Mattored, Principles of Information Security, Information Security Professional, 4th edition, 2014.

Reference books:

1. *Behrouz A. Forouzan, Cryptography and Network Security, Tata McGraw-Hill, 2007.*
2. *Joseph MiggaKizza, Guide to Computer Security, Springer Science & Media Inc., 3rd edition, 2015*
3. *Springer Journal of Cryptographic Engineering, ISSN 2190-8508*
4. *ACM, ACM- International Journal of Applied Cryptography,ISSN:1753-0563*
5. *IEEE, IEEE Transactions on Information Forensics and Security.*
6. *Elsevier, Journal of Information Security and Applications.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	2	2			3	2	2	1		3		2		1
CO2			2		3		2				3			
CO3		2	3	3	3		2	2						
CO4	2	2			3	2	2	1		3	3	2	3	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. A generalization of the Caesar cipher, known as the affine Caesar cipher, has the following form: For each plaintext letter *p*, substitute the ciphertext letter *C*:

   $C = E([a, b], p) = (ap + b) \bmod 26$

   A basic requirement of any encryption algorithm is that it be one-to-one. That is, if $p \neq q$, then $E(k, p) \neq E(k, q)$. Otherwise, decryption is impossible, because more than one plaintext character maps into the same ciphertext character. The affine Caesar cipher is not one-to-one for all values of *a*. For example, for $a = 2$ and $b = 3$, then $E([a, b], 0) = E([a, b], 13) = 3$.
   a Are there any limitations on the value of *b*? Explain why or why not.
   b Determine which values of *a* are not allowed.
   c Provide a general statement of which values of *a* are and are not allowed. Justify your statement.

2. How many one-to-one affine Caesar ciphers are there?

3. A cipher text has been generated with an affine cipher. The most frequent letter of the ciphertext is "B," and the second most frequent letter of the cipher text is "U." Break this code.

4. It is possible to use a hash function to construct a block cipher with a structure similar to DES. Because a hash function is one way and a block cipher must be reversible (to decrypt), how is it possible?

5. If F is an error-detection function, either internal or external use will provide error-detection capability. If any bit of the transmitted message is altered, this will be reflected in a mismatch of the received FCS and the calculated FCS, whether the FCS function is performed inside or outside the encryption function. Some codes also provide an error-correction capability. Depending on the nature of the function, if one or a small number of bits is altered in transit, the error-correction codecontains sufficient redundant information to determine the errored bit or bits and correct them. Clearly, an error-correction code will provide error correction capability when used external to the encryption function. Will it also provide this capability if used internal to the encryption function?

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6041	**Cyber Security**	SC-4	4	0	0	0	4	4

Prerequisites:

Computer Networks, Information & Network Security, Cryptography

Course Objectives:

The objectives of this course are to:

1. Explain the basic concepts of cyber security.
2. Demonstrate the use of Intrusion Detection and Prevention in a real world application**.**
3. Illustrate the use of cryptography and network security ina real world application.
4. Discuss the implications of cyber space and Law on public.

Course Outcomes:

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

CO1: Summarize the basic concepts of cyber security..

CO2: Develop a real world application to make use of Intrusion Detection and Prevention technique**.**
CO3: Apply the concepts of cryptography and network security to develop network security solutions for given applications.
CO4: Analyze the implications of cyber space and Law on public.

Course Content:

UNIT 1: Introduction to Cyber Security

Overview of Cyber Security & Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Cyber Security Vulnerabilities- Overview, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT 2: Intrusion Detection and Prevention

Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Security Information Management.

UNIT 3: Cryptography and Network Security

Introduction to Cryptography, Symmetric key Cryptography, Asymmetric key Cryptography, Message Authentication, Digital Signatures, Applications of Cryptography. Overview of Firewalls- Types of Firewalls, User Management, VPN Security Security Protocols: - security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS, Security at Network Layer-IPSec.

UNIT 4: Cyberspace and the Law

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.

Cyber Forensics

Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E- mail header information, Tracing Internet access, Tracing memory in real-time.

Text books

1. *Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition,*
2. *Information Security Management: Concepts and Practice. New York, McGraw-Hill, 2013.* • *Whitman, Michael E. and Herbert J. Mattord.*
3. *Roadmap to Information Security for IT and Infosec Managers. Boston, MA: Course Technology, 2011.*

Reference books

1. *CYBER SECURITY ESSENTIALS, James Graham, Richard Howard, Ryan Olson, 2011 by Taylor and Francis Group, LLC.*
2. *DATA ANALYSIS FOR NETWORK CYBER-SECURITY, Niall Adams and Nicholas Heard, Imperial College London, Heilbronn Institute for Mathematical Research, University of Bristol, 2014 by Imperial College Press.*
3. *Cyber-Physical Security - Protecting Critical Infrastructure at the State and Local Level, Robert M. Clark and Simon Hakim, 2017 Springer International Publishing Switzerland.*
4. *Computer Network Security and Cyber Ethics, FOURTH EDITION, Joseph MiggaKizza, 2014, McFarland & Company, Inc., Publishers Jefferson, North Carolina*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	2	3					3					1		
CO2	3	3		2						2				
CO3	3										2		2	2
CO4	3	3		2						2	2			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

5. Identify the Cyber security strategy for SMEs
6. Collect the details about the Cyber security risk assessment
7. Implement Governance solutions to each threat in Cyber security
8. Evaluate various Cyber Security technologies so far implemented

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
B19IT6042	**Advanced Web Technology**	SC	4	0	0	4	4

Prerequisites:

Web Application Development [B19IT5030].

Course Description:

This course covers features of HTML 5 and CSS 3, controls and web services of ASP.Net and database access with MYSQL, basics of AngularJS, basics of AJAX and JQuery AJAX library, basics of Ruby, controls and RESTFul web services. These concepts are used in the development of Client-Server technology.

Course Objectives:

The objectives of this course are to:

1. Explain the features of HTML 5 and CSS-3.
2. Illustrate the use of ASP.Net and Angular JS as front end and MYSQL as backend in real world applications.
3. Demonstrate the use of AJAX and Ruby in real world applications.
4. Discuss the different RESTFul Web Services available for users.

Course Outcomes:

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

1. Outline the features of HTML 5 and CSS-3.
2. Make use of the features of ASP.Net and Angular JS for creating a front end and MYSQL as backend in real world applications.
3. Develop a real world application using AJAX and Ruby.
4. Design an application for making use of the different RESTFul Web Services available.

Course Content:

UNIT-1

HTML 5 and CSS-3: Basic HTML Structure, Text, Images, CSS Building Blocks, Working with Style Sheets-Creating an External Style Sheet, Linking to External Style Sheets, Creating an Embedded Style Sheet, Formatting Text with Styles, Layout with Styles.

UNIT-2

ASP.Net and AngularJS : ASP.Net-Overview of .NET Framework, Introduction to C#, ASP.NET, ASP.NET Controls, Web Services, Architectures for Database Access, MYSQL Database System, Database Access with JDBC and MYSQL, AngularJS- The Basics of AngularJS, Databinding and first AngularJS Web Application.

UNIT-3

Ruby and AJAX: 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. Basic communication techniques – XHR, AJAX with images, Dynamic script loading, Cache control, AJAX patterns-Communication control patterns – predictive fetch, page preloading, submission throttling, periodic refresh, and multi-stage download, Fallback patterns, AJAX libraries – JQuery, JSON.

UNIT-4

Restful Web Services: What Makes RESTful Services Different?- Introducing the Simple Storage Service, Object-Oriented Design of S3, Resources, HTTP Response Codes, An S3 Client, Request Signing and Access Control, Using the S3 Client Library, Clients Made Transparent with ActiveResource, Parting Words, The Resource-Oriented Architecture, REST and ROA Best Practices, Ajax Applications as REST Client.

Self-learning Component:

Rails, Angular JS complete study.

Text books

1. Elizabeth Castro, Bruce Hyslop, HTML5 and CSS3, 7th Edition, Peachpit Press, 2012

2. Robert W. Sebesta, Programming the World Wide Web, 4th Edition, Pearson Education, 2008.

3. Nicholas C Zakas et al, Professional AJAX, 2nd Edition, Wrox publications,2007.

4. Ari Lerner, The Complete Book on AngularJS, Fullstack.io, 2013.

5. Leonard Richardson and Sam Ruby, RESTFul Web Services, 1st Edition, O'Reilly publications, 2007

Reference books

1. Deitel P, Deitel HM, Internet and World Wide Web How To Program, Pearson Education, 2012
2. AchyutS. Godbole and AtulKahate, Web Technologies, Tata McGraw Hill, 2003.
3. Jason Hunter, William Crawford, Java Servlet Programming, O'Reilly Publications, 1998.
4.Paul S Wang, SandaKatila An introduction to Web design and programming Cengage Course, 2003.
5. ACM Transactions on Internet Technology
6. IEEE International Conference on Enterprise Computing and E-Commerce.
7. ACM Transactions on Information Systems.

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01
CO1	3		3										
CO2	3	2						3		3			
CO3			3		3								
CO4	3		3	2							3		

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO

Sample Assignments:

1. Design and create the page(s) for accepting the values of name and marks in a table then displays them in the descending order of the marks.
2. Design HTML forms with proper syntax of the corresponding HTML tags using Text Input, Selectable list with multiple selection option and Radio Buttons
3. Design a frame with a table contents on the left side of the window, and have each entry in the table of contents. Use internal linking to scroll down the document frame to the appropriate subsection using HTML.
4. Develop dynamic web pages using Angular JS.
5. Build a web page which can interface client and server using Ruby technology.
6. Make use of HTML 5 features to enhance a web page created using HTML 3.
7. Illustrate the syntactic differences between the "JavaScript if" statement and "Ruby if" with a suitable example.
8. Illustrate how the parameters are passed in a GET Ajax request with a suitable example?
9. Illustrate with an example the use of two integer classes of Ruby.

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
B19IT6043	**Advanced Java Programming**	SC	4	0	0	4	4

Object Oriented Programming with Java [B19IT3030], Data Structures [B19IT3040].

Course Description:

This course intends to provide a clear understanding of each of the topics of Advanced Java Programming. The course covers advanced concepts of JAVA programming JSP, Servlets, Networking and database programming, Advanced GUI, Java Beans and Distributed Objects. The course also introduces students to advanced research topics. Students are expected to do independent reading of research papers and make class presentations.

Course Objectives:

The objectives of the course are to:

1. Explain the concepts required for developing the web applications using JSP and Servlets.
2. Demonstrate the use of networking and databases in real world applications.
3. Illustrate the development of GUI programs using Swings and AWT concepts.
4. Discuss the use of Java Beans and distributed objects in real world applications.

Course Outcomes (COs):

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

CO1: Develop Web applications using JSP and Servlets.

CO2: Implement Networking and database concepts using Java.

CO3: Design GUI Programs using Swings and AWT concepts.

CO4: Make use of Distributed objects concepts like RMI and JAX-WS in real world applications.

Course Content:

UNIT- 1

JSP and Servlets: JSP: Introduction, Jsp Life Cycle, Jsp Implicit Objects & Scopes, Jsp Directives,Jsp Scripting Elements, Jsp Actions, JSTL & Tag Library; Servlets: Introduction, Web application Architecture, Http Protocol & Http Methods, Web Server & Web Container, Servlet Interface, GenericServlet, HttpServlet, Servlet Life Cycle, ServletConfig, ServletContext, Servlet Communication-Servlet-Browser communication, Web-component Communication, Servlet-Applet Communication, Session Tracking Mechanisms, Filters & Wrappers, Listeners, Web-Security;

UNIT -2

Networking and Database Programming: Networking: Connecting to a Server, Implementingservers, Interruptible Sockets, Sending Email, Making URL Connections; Database Programming: The Design of

JDBC, SQL, JDBC Configuration, Executing SQL statements, Query Execution, Result sets, row sets, Metadata, Transactions, Connection Management in Web and Enterprise Applications, Introduction to LDAP.

UNIT- 3

Advanced Swings and AWT: Advanced Swings: Lists, Tables, Trees, Text Components, ProgressIndicators, Components Organizers; Advanced AWT: The Rendering Pipeline, Shapes, Areas, Strokes, Paint, Coordinate Transformations, Clipping, Transparency and Composition, Readers and Writers for Images, Image Manipulation, Printing, Clip Board, Drag and Drop, Platform Integration,

UNIT- 4

Java Beans and Distributed Objects: Bean- Writing Process, Using Beans to Build and Application,Naming Patters for Bean Properties and Events, Bean Info Classes, Property editors, Customizers, JavaBean Persistence; Distributed Objects: Remote Method Calls, The RMI Programming Model, Parameters and Return Values in Remote Methods, Remote Object Activation, Web Services and JAX-WS.

Self-learning component:

File handling and Extended Mark-up Language (XML).

Text books

1. Steven Holzner, Java Black Book, Black Group Books, 2000
2. Uttam K Roy, Advanced Java Programming, Oxford Press, 2015.
3. Joe Wigglesworth and Paula McMillan, Java Programming: Advanced Topics,3rd edition, Thomson Press, 2003.

Reference books

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Data Structures and Algorithms in Java, 6th Edition, Wiley, 2014.
2. Robert Lafore, Data Structures and Algorithms in Java, 2nd Edition, Sams, 2002.
3. Danny Poo; Object-Oriented Programming and Java; Second Edition; Springer; 2008
4. H.M.Dietel and P.J.Dietel; Java How to Program; Sixth Edition; Pearson Education/PHI
5. Cay.S.Horstmann and Gary Cornell; Core Java 2, Vol 1, Fundamentals; Seventh Edition; Pearson Education/PHI
6. Cay.S.Horstmann and Gary Cornell; Core Java 2, Vol 2, Advanced Features; Seventh Edition; Pearson Education/PHI.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3							3						
CO2			2	2								2		
CO3			3			3			3		3			
CO4			3	3										

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Projects:

1. NET BANKING PROJECT:

Net banking project does banking online. This aims in functioning always as in Banking. The Net banking project constitutes of modules like

Savings Account: This module contains of normal Bank transaction such as deposit and withdrawal of funds by Bank employee and transaction by customers directly using net banking, Viewing account details by customers, Viewing accounts by bank employee for any customers Bank employee are allowed to add customers are done here.

Demat Account: In this module Customers can be updated from Savings Account to Demat account. Their shares can be de materialized and be converted to electronic format. The account maintenance charges are collected. Demat customers can view their account of demat account.

Trading Account & Share Trading: By this module customers are allowed to view their trading account details, transfer amount from or to Savings account , Trade ie, to buy any new shares available based on amount available in trading account and sell the holding shares on prevailing rates. Share rates are now manually updated by admin part based on prevailing rates.

Customer Service: Customers are provided with variety of service like Change of address online, Change of password, registering cheque book request, Bill Payments etc. In Bill payment the customer can pay any bill enabled online. Customers request of their password are served by mail

Administration & Communication: Admin are enabled to view the accounts of bank income, view the status of customer service, like the status of cheque book request etc. Almost all activity related to customers are made known to customer by mail like new entry are welcomed, cheque book registration Bill Payments and more.

Human Relation: In this module Admin is enabled to add Branches add and delete employee in a branch and to transfer employee from one branch to another etc.

2. IPL GAME APPLICATION PROJECT

This is a social networking application and fun game application. This application is based on the IPL (Indian premier league). It just like playing cricket match, but we won't play directly. As we know different teams are participating in IPL under different franchises. In this IPL Game Application Java Project each user is a franchise and he will select the players from list and he will create his own team. And he can invite his friends to site also.

Then he will create a group. Once IPL matches' started he will get the score based on the player score, scored on a particular match. If player hits 1 run then user will get 1 point, if payer hit 4 runs he will get bonus points etc.

Finally one user will win among his friends group. The IPL game application includes modules;

Admin: Adding players: Here admin will add the player to site. He will add player profile, strength.

Adding Team: Create Cricket teams as per IPL.

Add Score: Update the live score details of the players to view by team players.

Selecting players: Here user will select the payers from the list.

Choose Players: User will select the players from the list of players from each team.

Invite Friends: Here user will invite his or her friends to participate in IPL.

View Score: User can view the live score updated by the admin.

Updating profile: User will update his profile.

3. CLIENT SERVER NETWORK PROTOCOLS PROJECT

Client server protocol implementation project is implemented in java platform. Main aim of this project is to implement a gateway protocol for improving routing mechanism and updating routing tables on different connected gateways and nodes in the network. At present most of the internet works on client server technology where clients are servers are connecting through gateways which will route packets form source to destination based on ip address provided in packet. Gateways are key for any client servermodel; gateways need to communicate with nodes in side network and other gateways by updating routingtable.

4. CONGESTION CONTROL PROTOCOL PROJECT

Congestion Control Using NETWORK BASED PROTOCOL project is a networking project which is implemented in java platform. Main aim of this project is to implement a new model called congestion

avoidance mechanism called CRF for controlling congestion in network and improve efficiency of communication without any time delay.

In present network congestion is important factor where researches are working to reduce congestion and increase scalability and robustness in network communication. CRF will control and restrict unwanted traffic before they enter the network and communicate with routers which are located at borders and restrict unwanted traffic.

5. DATA TRANSMISSION USING MULTI-TASKING SOCKET PROJECT

Data Transmission Using Multi-Tasking-Socket project is implemented in java platform. Main aim of this project is to explain importance of multitasking socket programming in network communication when dealing with large amount of data from different sources. In this paper we propose a new model in which feedback system is created. When there is any break in socket connection users is informed with connection loss information and similarly packet delay and packet loss information is send to user in the form of feedback message. This method is not available in regular methods which are developed in this project.

6. MANPOWER ACQUISITION PLANNING AND EMPLOYEE RECRUITMENT SYSTEM

This project will be designed and developed for any educational universities or colleges for making recruitment process. “Manpower Acquisition Planning and Employee Recruitment System” is a web-based tool to reduce communication gap between Placement Officers (Applicants) & Job Providers (MNC Companies). Especially in fast growing IT market technologies are changing very fast, based on technology trend Organizations has to recruit the people. This process will make recruitment process very easy and fast.

This project can be very easily used in the process of decision making in new recruitment’s and it will reduce the amount of time required to complete the recruitment process of any organization. This system will allow the Job providers (i.e. HR department) to post the required jobs (Opportunities) which will be available to University’s/College’s placement officers. Then Placements officers can check the student’s profiles, if matches with opportunities then they will forward the student’s profiles to respective HR department. So this system will allow the Job providers to search from database for suitable candidate for a position based on skill set.

The project contains seven modules:

a. Registration Module
b. User Management Module
c. Employee Management Module
d. Resumes Module
e. Opportunities Module
f. Schedule Interviews Module
g. Results Module

7. ONLINE CHILD ABUSE DATABASE PROJECT

Online child abuse database is a application developed to move beyond addressing the impact of child abuse by seeking out the root cause and identifying ways to prevent it. This is a application created to trace out the statistics based on the reports about children. This is a web based application. This application maintains a centralized repository of all scheme related information. This system verifies and reports incidents of abusive parents, physical and sexual abuse. Child abuse application maintains information about child laws.it provides details about those children who are in risk. The project may include the following modules,

Administrator module: Administrator has full access to all the modules of this system. Administrator is responsible for all approving the NGO/Police registrations and has to approve the newsletters generated by NGO and police.

User module: In our system all users are anonymous users, so any user can give complaint and they view newsletters posted by NGO and police.

Investigation Agencies (Police) module:

The investigating agencies will be able to build conclusive picture of the suspect on the basis of reports and statistics provided by the Admin. And they can solve the problem.

Social Activists (NGO's) module: A regular newsletter shall be sent to the registered users (NGO's, Investigation agencies &other users).NGOs in our project captures the information from admin and they posts newsletters.

Reports Module: This module is used by administrator to generate reports based on various criteria such as scheme details, applicant's details, applications details, status of applications, etc.

Sample Assignments:

1. Design webpage for collecting students information, use servlets for validation of phone number, date of birth, pin number, name etc data (Task based)
2. Write notes on Networking using JAVA (Assignment)
3. Write notes on JDBC connectivity (Assignment)

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs./ Wk.
B19IT6044	Real Time Systems	SC	4	0	0	0	4	4

Prerequisites:

Operating systems [B19IT4040]

Course Description

This course familiarizes the fundamental problems concepts and approaches in the design and analysis of real-time systems. It also introduces various approaches, abstract models and terminologies for real-time scheduling. It also outlines various Priority-Ceiling Protocols used in resource sharing. Also gives the Impart knowledge of Real Time Operating Systems and Databases.

Course Objectives

The objectives of the course are to:
1. Discuss real-time systems and describe their functionality.
2. Explain algorithms to analyze and design a real-time system.
3. Describe access Control in Multiple-UNIT Resources to analyse, design and schedule the real-time systems.
4. Illustrate working of characters of Real Time Operating Systems and Databases in new projects.

Course Outcomes

On successful completion of this course, the student shall be able to:
CO1.Characterize real-time systems and describe their functionality.
CO2.Apply the appropriate algorithms to analyze and design a real-time system.
CO3.Illustrate access Control in Multiple-UNIT Resources to analyse, design and schedule the real-time systems.
CO4. Employ the characters of Real Time Operating Systems and Databases in new projects.

Course Content:

UNIT-1:

Introduction: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing, Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT- 2:

Real Time Scheduling: Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-3:

Resources Sharing: Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-UNIT Resources, Controlling Concurrent Accesses to Data Objects.

UNIT- 4:

Real Time Operating Systems and Databases: Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases.

Self-Learning Component:
Case study on features of VxWorks and QNX.

Text books:

1. Jane W. S. Liu, Real Time Systems, Pearson Education Publication 2000.
2. Mall Rajib, "Real Time Systems", Pearson Education, 2007

Reference books:

1. Albert M. K. Cheng, "Real-Time Systems: Scheduling, Analysis, and Verification", Wiley, 2003
2. Springer, International Journal of Time-Critical Computing Systems
3. Inderscience, International Journal of Embedded and Real-Time Communication Systems
4. Research Science Press, International Journal of Embedded Systems and Computer Engineering.

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	2	3	2						3					
CO2		3				2		2						
CO3	2		2	2									2	
CO4	3			2				2				2		

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments for Internal Assessments:

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs./ Wk.
B19IT6045	**Advanced Database Management Systems**	**SC**	**4**	**0**	**0**	**0**	**4**	**4**

1. Demonstrate Application of mutual exclusion protocols with an example. Implement the concept on a shared variable protected using mutex on VxWorks RTOS.

2. Develop program to show resource access control in POSIX application.

3. Implement Accumulating time drift, a simple cyclic executive which does some periodic computation and simple waiting.Measure the accumulating drift under different conditions, for example:
   • different hardware or operating system,
   • different "background" load of the computer,
   • several parallel task of the same type (as processes, as threads).
   Do the measurements repeatedly and focus not just on the average results, but also on the variance. Provide summary and interpretation of your measurements. Implement a solution without an accumulatingdrift, e.g., by use of timers or simply by measuring the current time and delaying for the remaining time.
4. List the names of RTOS available in the market and write features of each Real Time operating system. Also discuss where they are currently used.
5. Develop a program to illustrate passing of message from one thread to another using pipes.

Prerequisites:

Data Base Management system [B19IT4030]

Course Description:

Advanced database system deals with current and emerging technologies which enables to handle complex applications, provides a comprehensive understanding of data modelling techniques, OLAP, OLTP,Data warehouse and its practical implementation.

Course Objectives:

1. Discuss object oriented concepts and object relational data bases.
2. Describe Parallel and distributed database.
3. Illustrate queries for distributed data storage and processing
4. Explain enhanced data models for applications

Course Outcomes (Cos):

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

CO1: Outline the object oriented concepts and object relational data bases.

CO2: Develop applications for processing parallel and distributed databases.

CO3: Implement queries for distributed data storage and processing.

CO4: Apply enhanced data models for developing industry applications

Course Content:

UNIT- 1

Introduction to various tools and frameworks: Introduction to OLAP, OLTP and Data warehousesystem, data modelling, star schema, snow flake schema. Build Data warehouse/data mart using opensource tools like pentaho data integration tool, pentaho business analytics. OLAP versus OLTP, Introduction to various toolsOverview of Object-Oriented Concepts, Object and Object-Relational Databases: Objects, Encapsulation, Polymorphism, Type and class hierarchies etc. Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Overview of C++ language binding; Conceptual design of Object database; Overview of object relational features of SQL; Object-relational features of Oracle.

UNIT -2

Parallel and Distributed Databases: 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; Distributed catalog management; Distributed Query processing; Updating distributed data; Distributed transactions; Distributed Concurrency control and Recovery.

UNIT- 3

Enhanced Data Models for Some Advanced Applications: Active database concepts and triggers; Temporal, Spatial, and Deductive Databases – Basic concepts

UNIT- 4

Data Warehousing and Data Mining: Introduction to decision support, OLAP, multidimensionalmodel, Window queries in SQL, Finding answers quickly, Implementation techniques for OLAP, Data Warehousing, Introduction to Data Mining, Counting co-occurrences, Mining for rules, Tree-structured rules, Clustering, Similarity search over sequences, Incremental mining and data streams;

Self-learning Component:

More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management, P-P database, Transaction Management

Text Books:

1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw- Hill, 2003.
2. Elmasri and Navathe, Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007.
3. Jiawei Han, MichelineKamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier, 2011.

Reference Books:

1. Connolly and Begg, Database Systems, 4th Edition, Pearson Education, 2002.
2. Journal of Data and Information Quality (JDIQ)
3. ACM Transactions on Knowledge Discovery from Data (TKDD)
4. ACM Transactions on Database Systems (TODS)
5. IEEE Transactions on Knowledge and Data Engineering

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3							3						
CO2			2	2								2		
CO3			3			3			3		3			
CO4				3				3		2				

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Projects:

1. Railway system Database Project.

A railway system, which needs to model the following: Stations Tracks, connecting stations. You can assume for simplicity that only one track exists between any two stations. All the tracks put together to form a graph. Trains, with an ID and a name

Train schedules recording what time a train passes through each station on its route.

You can assume for simplicity that each train reaches its destination on the same day and that every train runs every day. Also for simplicity, assume that for each train, for each station on its route, you store

Time in,

Timeout (same as time in if it does not stop)

A sequence number so the stations in the route of a train can be ordered by sequence number. Passenger booking consisting of train, date, from-station, to station, coach, seat and passenger name.

3. Library Management system Database Project.

A student and faculty can issue books. Different limits for the number of books a student and teacher can issue. Also, the number of days will be distinct in the case of students and teachers for issue any book. Each book will have different ID. Also, each book of the same name and same author (but the number of copies) will have different ID. Entry of all the book will be done, who issue that book and when and also duration. Detail of Fine (when the book is not returned at a time) is also stored.

3. Health Care Organization Database Project.

Emergency Care 24x7

Support Groups

Support and Help Through calls

Any new Patient is first registered in their database before meeting the doctor. The Doctor can update the data related to the patient upon diagnosis (Including the disease diagnosed and prescription). This organization also provides rooms facility for admitting the patient who is critical. Apart from doctors, this organization has nurses and ward boy. Each nurse and ward boy is assigned to a doctor. Also, they can be assigned to patients (to take care of them). The bill is paid by the patient with cash and E-banking. Record of each payment made is also maintained by the organization. The record of each call received to provide help and support to its existing person is also maintained

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6051	Finite Automata Formal Languages	SC -5	4	0	0	0	4	4

Prerequisites:

Problem Solving with programming (B19IT1030), Discrete Mathematics and Graph Theory (B19IT3050) and Design and Analysis of Algorithms (B19IT4010)

Course Description:

The course introduces some fundamental concepts in automata theory and formal languages including finite automaton, regular expression, formal language, grammar, pushdown automaton, and Turing

machine. These form basic models of computation; they are also the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc.

Course Objectives (Cos):

1 Explain the concepts of Deterministic and Non-Deterministic Automata.

2. Demonstrate the use of regular expressions for constructing DFA and NFA.

3. Illustrate the construction of context free grammar for a given data.

4. Describe computing Machine including PDA and Turing Machine

Course Outcomes (Cos):

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

CO1: Outline the concepts of Deterministic and Non-Deterministic Automata.
CO2: Make use of regular expressions for constructing DFA and NFA.
CO3: Construct context free grammars for given data.
CO4: Apply the concepts of Push down Automata and Turing machine for a given data..

Course Content:

UNIT - 1:
Introduction to finite automata: Alphabets; Languages; strings; Deterministic and non-deterministic finite automata (with and without epsilon transitions) and their applications; Equivalence of finite automata; Minimization of Finite Automata

UNIT - 2:
Regular Expressions, regular languages and their properties: Regular Expressions; Finite Automata and Regular Expressions; Equivalence of finite automata and regular expressions; Pumping lemma for regular languages;

UNIT - 3:
Context free Grammars and Normal forms: Context Free Grammars; Parse Trees; Ambiguity in Grammars and languages; Normal forms-CNF and GNF.

UNIT - 4:
Push Down Automataand Turing Machine: Push down automata (PDA); Languages of a PDA; Deterministic PDA; Turing Machine.

Self-Learning:
Applications of Finite Automata and Applications of Regular Expressions.

Text Books:

1. John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2009.

2. Peter Linz, An Introduction to formal Languages and Automata, 4/ E, Jones and Bartlett Publishers, 2006.

Reference Books:

1. Kamala Krithivasan, Rama R, Introduction to Formal Languages, Automata Theory and Computation, Pearson, 2009.
2. B N Srinivasa Murthy, Formal Languages and Automata Theory, Sanguine Publishers, 2006.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	2			1			2							
CO2	2				2		2							
CO3	1						2							
CO4	2		1		2		2							

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Design a Finite automaton to accept valid Identifiers of C programming language.
2. Construct Finite Automata to accept the floating numbers.
3. Design a context free grammar to solve dangling else problem of a programming language.
4. List the differences between various finite automata DFA, NFA and epsilon NFA.
5. Design and implement a program in C that read an NFA as input and results an equivalent DFA.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6052	System Modeling and Simulation	**HC**	**4**	**0**	**0**	**0**	**4**	**4**

Prerequisites:

Probability and Statistics (B19IT2010).

Course Description:

System modelling is a process of development of a model for a real world operation. Model is built to check the feasibility of implementation of the real world applications. Simulation is the imitation of the operation of a real world system that gives information about the system being investigated. . The system may be electrical, electronic, industrial, and chemical. The activities of the model consist of events, or inputs and outputs, which are activated at certain points in time and in this way affect the overall state of the system.

Course Objectives:

Objectives of this course are to:

1. Explain the concept of simulation along with single channel and multichannel queuing system.
2. Illustrate the working of discrete event system and manual simulation with respect to event scheduling algorithm.
3. Discuss random number generation and variates with different testing techniques.
4. Describe how to model, calibrate, verify and validate a software model along with simulation

Course Outcomes (Cos):

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

CO1: Make use of the simulation and its tools in real world examples.
CO2: Analyse the concept of schedulingw.r.t time and events, simulation analysis
CO3: Develop an application program for generation of random numbers and random variates using different techniques.
CO4: Differentiate between Verification and Validation of simulation models.

Course Content:

UNIT- 1

Introduction to Simulation: Simulation, Advantages, Disadvantages, Areas of application, System environment, components of a system, Model of a system, types of models, Discrete Event system simulation, steps in a simulation study. Simulation Examples: Simulation of Queuing systems, Simulation of Inventory System.

UNIT -2

General Principles: Concepts in discrete - event simulation, event scheduling/ Time advance algorithm, simulation using event scheduling, list processing.
Statistical models in simulation: Review of terminology and concepts; Useful statistical models, Discrete distribution: Bernoulli distribution, Binomial distribution, Geometric and Poisson distribution. Continuous distribution: Uniform distribution, Exponential distribution and normal distribution.

UNIT- 3

Random Numbers: Properties, Generations methods, Tests for Random number- Frequency test, Runs test, Autocorrelation test.
Random Variate Generation: Inverse Transform Technique- Exponential, Uniform distributions, direct transformation for Normal and log normal Distributions, convolution methods- Erlang distribution, Acceptance Rejection Technique.

UNIT- 4

Analysis of Simulation Data

Input Modelling: Data collection, Identification and distribution with data, parameter estimation, Goodness of fit tests, Selection of input models without data, Multivariate and time series analysis. **Verification and Validation of Model:** Model Building, Verification, Calibration and Validation of Models.

Self-learning component:

Types of simulations with respect to output analysis;Output analysis for terminating simulations; Output analysis for steady-state simulations.

Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson,David M. Nicol, **Discrete-Event System Simulation,**Pearson Education, 4th Edition, 2007.

2. Lawrence M. Leemis, Stephen K. Park,**Discrete – Event Simulation: A First Course** Pearson Education/ Prentice-Hall India, 2006.

Reference Books:

1. Geoffrey Gordon, System Simulation, Prentice Hall publication, 2nd Edition
2. Averill M Law, W David Kelton, Simulation Modelling & Analysis, McGraw Hill International Editions – Industrial Engineering series, 4th Edition.
3. Narsingh Deo, Systems Simulation with Digital Computer, PHI Publication (EEE), 3rd Edition, 2004

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3				2									
CO2			3										2	
CO3		1	1		3									
CO4					3					2				
CO5		3	2		1									

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments for Internal Assessment:

1. Suppose you just arrived to the USA and are going through immigration and customs at the airport – a two-step process. For the first step, passengers arrive to be processed according to an exponential distribution with a mean inter arrival time of 10 minutes. Upon arrival, passengers select one of three lines to be have their passport inspected – they choose Line 1, Line 2, or Line 3 based on the smallest number in queue. There is a single inspector for each line and the time she spends inspecting your immigration visa/passport follows an exponentially distribution with a mean of 22 minutes (Line 1),

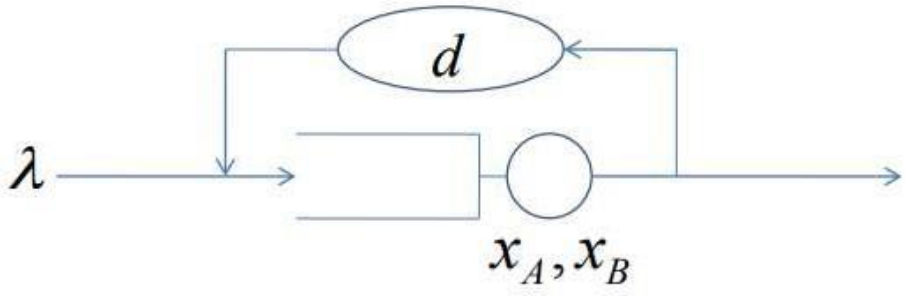
26 minutes (Line 2), and 36 minutes (Line 3). Due to new chemical detection machines, everyone must stay in Line 1, Line 2, or Line 3 for at least 30 seconds – even if the associated inspector is free. After having their paperwork inspected in Step 1, passengers from Line 1 next wait in a new queue (called Line 4), passengers from Line 2 wait in Line 5, and passengers from Line 3 wait in Line 6. Passengers are waiting in this line to get processed by a customs agent who inquires as to what they are bringing into the country and potentially inspects their luggage. There are two customs agents. Customs agent 1 inspects passengers waiting in Line 4 and Line 5. When free, customs agent 1 chooses the next passenger from the longer of their two respective lines. Customs agent 2 priority is to inspect passengers waiting in Line 6. When he is free and no one is in Line 6, he selects the next person from Line 5. If Line 5 is empty, he selects from Line 4.

The inspection time by customs agent 1 takes UNIF(4, 14) minutes; customs agent 2 takes UNIF(5,16) minutes.
Simulate this system for 24 hours and collect the following statistics based off of 25 replications of your model:
(1-1) the total number of people from line 4 processed by Customer Agent 1**(1-2)** the total number of people from line 5 processed by Customer Agent 1**(1-3)** the total number of people from line 4 processed by Customer Agent 2**(1-4)** the total number of people from line 5 processed by Customer Agent 2**(1-5)** the total number of people from line 6 processed by Customer Agent 2

NOTE: Write a simul8 model to simulate the above description.

2. Assume that we have two queuing systems, let us call them Q1 and Q2. All customers first arrive to Q1. Q1 has 10 queuing places and one server. If a customer arrives to Q1 and all queuing places are occupied, the customer is rejected and never returns. When a customer has been served in Q1, it continues to Q2. Q2 has an infinite number of queuing places and one server. The times between the arrivals to Q1 are constant. The service time in Q1 is exponential with mean 2.1 seconds and the service time in Q2 is constant and equal to 2 seconds.
Write a simulation program and use it to answer the following questions:
1. Find the mean number of customers in Q2 for the following interarrival times to Q1: 1, 2 and 5 seconds.
2. For interarrival times in question 1 you should also find the probability that a customer is rejected at Q1.
Let the times between measurements of the number of customers in Q2 be exponentially distributed with mean 5 seconds and make at least 1000 measurements.

3. We shall study a model that can be used to investigate the capacity of the control processor in a switch in a network. A request for the establishment of a new virtual connection that arrives to the switch generates a job of type A. If that job has to wait for other jobs it is put in a buffer. Finally the job is executed and the connection is established. When the connection shall be taken down, a new job is generated. The jobs that teardown connections (jobs of type B) have a higher priority than jobs of type A. Thus, when a job has been served, one first looks if there are any jobs of type B in the buffer. If there are the processor starts to serve oneof the jobs of type B. If there are no jobs of type B in the buffer, the processor can start to serve jobs of type Aif there are any. A job that is being served is never interrupted. The model is illustrated in the figure below



We assume that requests for the establishment of a connection arrive to the switch as a Poisson process of rate λ, i.e. the times between arrivals are exponentially distributed. Each request generates a job of type A. This job represents the work that must be done at the establishment of a connection and has a constant service time$x_{Æ}$. After that the job is put in a delay of constant length d that represents the lifetime of the connection. After the delay the job is put in the queue again, now as a job of type B. Finally it gets one more service, which models the teardown of the connection. This second service time is constant with lengthx_B. After the second service the job leaves the system. We assume that the buffer has an infinite number of places. The parameters have the following values: λ = 150 s^{-1},$x_{Æ}$= 0.002 s, x_B= 0.004 s and d = 1 s.

You shall write a simulation program for this model and answer the questions below.

In all questions, let the time between measurements be 0.1 seconds and collect 1000 samples. 1. Find the mean number of jobs in the buffer for the system above.

2. Let the delay distribution be exponential instead of always having the same value, but let its mean still be 1 s. What is now the mean number of jobs in the buffer?

3. Let the distribution be of constant length = 1 s again. Change the priorities so that jobs of type A have the higher priority. What is now the mean number of jobs in the buffer?

4. In this task you shall compare results from simulation programs to analytical results obtained by queuing theory. We shall study two connected queuing systems (a queuing network) as shown below:

Both queues have an infinite number of buffer places, i.e. customers are never rejected. The service times in the queues have an exponential distribution with mean 1. We also assume that the times between arrivals to the first queue are exponentially distributed (the means are given below). Assume the following:

x = mean time between arrivals

T = the mean time of a customer from the arrival to the first queue to the departure from the second

N= mean number of customers in both the queues Then one can derive the following formulas:

N=$\frac{2}{x-1}$ and $T = \frac{2x}{x-1}$

Do the following: 1. Modify the simulation program written for the first task in this home assignment so that it simulates this system instead.

2. For the mean arrival times 2, 1.5 and 1.1 simulate the system and measure:

a. the mean number of customers in the queuing network

b. the mean time a customer spends in the queuing network

3. Compare the simulation results to the formulas above!

5. The system you shall simulate works as follows: arrivals come to the system in accordance with a Poisson process of rate λ per second. There are n servers in the system. The service time of a customer is x seconds. There is no buffer in the system, which means that if all servers are busy when a customer arrives the customer is rejected. We also set T = the time between measurements and M = number of measurements that should be done. Write a simulation program for this system and do the following:

1. Let N = 1000, x = 100, λ = 8, T = 1 and M = 1000. Write the number of customers in the system at each measurement in a file and use matlab to plot the number in the system versus the measurement. Use the command 'load' to read a file into matlab and then 'plot' to plot the data. How long is approximately the transient phase?

2. Run the program again but change x to 10 and increase λ to 80. How long is the transient phase now? Observe that the mean number of customers in equilibrium is the same as in 1 above.

3. Now increase x to 200 and reduce λ to 4. How long is the transient phase in this case? Observe that the mean number of customers in equilibrium is the same as in 1 and 2 just above.

6. The system you shall simulate works as follows: arrivals come to the system in accordance with a Poisson process of rate λ per second. There are n servers in the system. The service time of a customer is x seconds. There is no buffer in the system, which means that if all servers are busy when a customer arrives the customer is rejected. We also set T = the time between measurements and M = number of measurements that should be done. Write a simulation program for this system and do the following:

1. Now we shall see how the number of measurements and the distance between them affects the accuracy of the simulation. In 4, 5 and 6 we set n = 100, x = 10 and λ = 4 but we let T and M vary. First let T = 4 and M = 1000 and find the length of the 95 % confidence interval.

2. It is tempting to make the times between measurements shorter. Let T = 1 and M = 4000. How long will the confidence interval be? Explain the result.

3. Let now T = 4 again and let M = 4000. How long is the confidence interval? Explain the result.

7. The following table shows the number of journal paper submissions received per month by an ACM journal for the past three years (n = 36 months):

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	7	6	6	8	5	6	6	5	11	13	8	5
2016	7	8	15	4	8	9	4	10	5	4	9	8
2017	10	11	4	7	7	7	8	6	13	9	5	7

The editor of the journal suspects that this data follows a Poisson distribution, but is not sure. Your task is to use a Chi-square test to find out the following.

1. Compute a histogram of this data, and sketch a diagram of it. Does it look Poisson? Why or why not?

2. Compute the mean and variance of the number of paper submissions per month. Do these statistics suggest that the data is from a Poisson distribution? Why or why not?

3. Using a Chi-square test at $\alpha = 0.05$ level of significance, does this data obey a Poisson distribution? Justify your answer.

8. Assume that we have a system that consists of five components; each one of them has a uniformly distributed life length in the interval from 1 to 5. We also assume that if component 1 breaks down, also component 2 and 5 breaks down and if component 3 breaks down also component 4 breaks down. There are no other dependencies between the life lengths of the components. The system works as long as at least one component works. Find the mean time until the system breaks down. Simulate at least 1000 "runs" of the system.

9. Consider designing a two-runway (one each for landing and takeoff) airport for propeller driven aircrafts. The time to land an airplane is known to be exponentially distributed, with mean of 1.5 minutes. If airplane arrivals are assumed to be Poisson, what arrival rate can be tolerated if the average wait time in sky is not to exceed 3 minutes?

10. Alex requests a video file from a popular Web server. The server delivers this file as a sequence of 10 equal-sized User Datagram Protocol (UDP) packets. Suppose that each UDP packet can be independently corrupted in the network with probability $p = 0.1$ (i.e., 10% of the UDP packets are, on average, corrupted). What is the probability that at least 8 corruption-free packets are received at Alex's computer?

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
			L	T	P	C	
B19IT6053	Computer Vision	HC	4	0	0	4	4

Prerequisite:

Data mining concepts, Matrices

Course description:

Computer Vision is one of the fastest growing and most exciting AI disciplines in today's academia and industry. This course is designed to open the doors for students who are interested in learning about the fundamental principles and important applications of computer vision. The course, introduces a number of fundamental concepts in computer vision, expose students to a number of real-world applications that are important to our daily lives. More importantly, students will be guided through a series of well-designed projects such that they will get to implement using few interesting and cutting-edge computer vision algorithms. The course benefit is to apply computer vision algorithms to solve real world problems.

Course Objectives

The objectives of this course are to:

1. Explain the fundamentals of Computer vision
2. Experiment with different segmentation techniques
3. Demonstrate the use of techniques for registration and classification of images.
4. Illustrate the object detection in a given application.

Course Outcomes

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

1. Outline the fundamentals of Computer vision.
2. Apply and compare different segmentation techniques.
3. Implement registration and classification of images.
4. Develop application to perform object detection

Course Content:

UNIT 1: Introduction and overview to computer vision

Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms , Sampling and Aliasing, Filters as Templates , Technique: Normalized Correlation and Finding , Technique: Scale and Image Pyramids.Local Image Features: Computing the Image Gradient , Representing the Image

Gradient, Finding Corners and Building Neighborhoods , Describing Neighborhoods with SIFT and HOG Features , Computing Local Features in Practice , Texture

UNIT – 2 MID-LEVEL VISION

Segmentation by Clustering, Human Vision: Grouping and Gestalt, Important Applications, Background Subtraction, Shot Boundary Detection, Interactive Segmentation, Forming Image Regions , Image Segmentation by Clustering Pixels . Basic Clustering Methods , The Watershed Algorithm , Segmentation Using K-means , Mean Shift: Finding Local Modes in Data ,Clustering and Segmentation with Mean Shift ,Segmentation, Clustering, and , Terminology and Facts for Graphs , Agglomerative Clustering with a Graph ,Divisive Clustering with a Graph.

UNIT – 3 HIGH-LEVEL VISION

Registration: Registering Rigid Objects, Model-based Vision: Registering Rigid Objects, Registering Deformable Objects .Learning to Classify: Classification, Error, and Loss, Major Classification Strategies, Practical Methods for Building Classifiers, Classifying Images: Building Good Image Features, Classifying Images of Single, Image Classification in Practice

UNIT – 4 Detecting Objects in Images:

The Sliding Window Method, Detecting Deformable Objects, The State of the Art of Object Detection

Topics in Object Recognition: What Should Object Recognition Do?

Self-Learning:

Implementation of applications using the above topics

Text books

1. David A. Forsyth, Jean Ponce, "Computer Vision: A Modern Approach" , 2nd Edition, University of Illinois at Urbana-Champaign Jean Ponce, Ecole Normale Superieure, Paris©2012, Pearson
2. Richard Szeliski, " Computer Vision: Algorithms and Applications" , Springer
3. David Marr, Tomaso A. Poggio, Shimon Ullman "A Computational Investigation into the Human Representation and Processing of Visual Information", , eBook - Amazon.com

Reference books

1. Gary Bradski, Adrian Kaehler, " Learning OpenCV: Computer Vision with the OpenCV Library" Amazon
2. International Journal of Computer Vision, Springer
3. Image and Vision Computing, Elsevier
4. Computer Vision and Image Understanding, Elsevier
5. IEEE Transactions on Image Processing
6. IEEE Transactions on Pattern recognition and machine intelligence

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1									3	2		2		
CO2		3	2		1					3	3		3	3
CO3		2	3							2	2		3	3
CO4		2	3								2	1	3	3

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Lab Experiments/Assignments: (details of the experiment/s)

1. Segmentation of certain applications need background detection, List the various methods for background detection and implement the same.

2. Segmentation could be interactive. Explain Interactive segmentation and implement the same

3. Clustering has become very popular as they are used to group things having similar attributes. There are various clustering techniques used for segmentation. Implement the below

i) The Watershed Algorithm

ii) Segmentation Using K-means

iii) Agglomerative Clustering with a Graph

iv) Divisive Clustering with a Graph

4. Image registration involves aligning of images of the same thing taken at different time. Given two images captured at different time slots, perform Image registration

5. When images are being captured, there could be deformation, Explain the techniques used when there is deformation and implement the technique.

6. Classifiers are used to classify the given image. Using any dataset, compare the performance of various classifiers

7. Object detection and localization are used for drawing bounding boxes for objects in an image. Perform object detection and localization

8. Sliding window is used in computer vision. List out various computer vision tasks using sliding window and also implement them.

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
			L	T	P	C	
B19IT6054	Data Mining and Ware Housing	SC	4	0	0	4	4

Database Management systems [B19IT4030]

Course Description:

Data warehousing and data mining are two major areas of exploration for knowledge discovery in databases. Data mining is for relatively unstructured data for which more sophisticated techniques are needed. The course aims to cover powerful data mining techniques including clustering, association rules. It then teaches high volume data processing mechanisms by building warehouse schemas such as snowflake, and star.

Course Objectives

The objectives of this course is to:

1. Describe the basic concepts of Data Warehouse and Data Mining techniques.
2. Illustrate the processing of raw data to make it suitable for various data mining algorithms.
3. Explain the measurement of interesting patterns in different databases
4. Discuss the techniques of clustering, classification, association finding, feature selection and visualization to real world data.

Course Outcomes (Cos):

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

CO1: Outline the basic concepts of Data Warehouse and Data Mining techniques.

CO2: Develop an application to process raw data to make it suitable for various data mining algorithms.

CO3: Identify interesting patterns in different databases

CO4:.Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data.

Course Content:

UNIT- 1

Data Warehousing: Introduction, Operational Data Stores (ODS), Extraction TransformationLoading (ETL), Data Warehouses, Design Issues, Guidelines for Data Warehouse Implementation, Data Warehouse Metadata, Online Analytical Processing (OLAP): Introduction, Characteristics of OLAP systems, Multidimensional view and Data cube.

UNIT -2

Data Mining: What is Data Mining? Motivating Challenges, The origins of data mining, Data MiningTasks, Types of Data, Data Quality, Data Pre-processing, Measures of Similarity and Dissimilarity, Data Mining Applications, Visualization.

UNIT- 3

Association Analysis: Basic Concepts and Algorithms, Frequent Itemset Generation, RuleGeneration, Compact Representation of Frequent Itemsets, Alternative methods for generating Frequent Itemsets, FP GROWTH Algorithm, Evaluation of Association Patterns .

UNIT- 4

Clustering: Clustering Techniques: Overview, Features of cluster analysis, Types of Data andComputing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis.

Self-learning component:

Decision Trees, Rule Based Classifiers, Nearest Neighbour Classifiers.

Text Books:

1. A Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2007.

2. Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques" Second Edition, Elsevier, Reprinted 2008.

Reference Books:

1. K.P. Soman, ShyamDiwakar and V. Ajay, "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.

2. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.

3. Data Mining and Knowledge Science – Springer.

4. Inderscience,The International Journal *of*DataMining, Modelling and Management-

5. IEEE, IEEE Transactions on Knowledge and Data Engineering.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1		2									2			
CO2		2												
CO3	1	1	3	3										
CO4	1	1	3	3		2								

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments for Internal Assessment:

1. Cross-selling: In an marketing model, we can use data mining to discover cross-selling opportunities and build cross-selling models to target right customers for cross-selling. Illustrate the Market Basket for Association analysis for cross-selling.

2.Customer segmentation: Customer segmentation is to divide customers into different groups in which each has a different profile and characteristics. The simplest segmentation method is to divide customers into different age groups, sex groups and income groups. Although such segmentation is useful for certain purposes and still in use in many cases, it is too coarse and no longer satisfies the new business requirements in direct marketing, recommendation and personalized service. Propose an Data mining technique to create fine customer segments to satisfy the new business requirements.(clustering).

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6061	Wireless and Mobile Networks	SC -6	4	0	0	0	4	4

Pre-requisites:

Computer Networks (18BCS53)

Course Description:

This course will introduce to wireless communication and mobile computing. It covers the fundamentals of wireless transmission and telecommunication system such as GSM, GPRS, DECT, and UMTS. Mobile network layer and transport layers covers about mobile IP, Traditional TCP and the architecture of LTE and its protocol.

Course Objectives:

1. Explain the basic concepts of wireless communication.
2. Describe wireless network architecture and concepts of Ad-hoc network.
3. Demonstrate the working of wireless Local area networks and wireless ad-hoc networks.
4. Discuss various applications using the wireless technologies

Course Outcomes (Cos):

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

CO1: Outline the fundamental concepts of wireless communication.
CO2: Analyse the working of wireless network and wireless Ad-hoc network.
CO3: Make use of the Wireless Application protocol in a real world application.
CO4. Develop applications using the wireless technologies.

Course Content:

UNIT -1

Introduction: Fundamentals of wireless communication: Wireless communication system, Wireless media, Frequency spectrum, Wireless communication channel specifications, Types of wireless communication systems.

Basics of wireless networks: Wireless network architecture, Wireless network reference model, Wireless networking issues.

UNIT -2

Telecommunication System: Global system for mobile communications (GSM) Services, System Architecture, Radio interface, protocol, handover, General packet radio service (GPRS). DECT System Architecture, protocol, TETRA, UMTS System Architecture.

Wireless Body Area Networks, Properties, Network architecture, Components, Network Protocols, Bluetooth and Zigbee, Applications.

UNIT -3

Wireless Local Area Networks: Network Components, Network architecture, WLAN standards, WLAN protocols, IEEE 802.11p, WLAN applications.

Wireless Ad Hoc Networks: Wireless Ad Hoc Networks, Mobile Ad Hoc networks, Wireless sensor networks, Vehicular Ad Hoc networks (VANETs).

UNIT -4

Wireless Application protocol: Version 1.X Architecture, WAP 2.0.

4G LTE Networks: Introduction, LTE, LTE Architecture, Protocol layer Architecture, LTE Advanced, 5G Networks overview.

Self-learning components:

Network Function Virtualization (NFV),Capability-based Security,5G,Cyber Physical Systems (CPS), **and Capability-based Security.**

Text books

1. *Sunil Kumar S.Manvi,MahabaleshwarS.Kakkasageri, Wireless and mobile networks concepts and protocols- ,second edition, Wiley,2016.*
2. *Jochen H. Schillier, Mobile Communications, 2nd edition, Pearson publishers.*

Reference books

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, Mobile computing technology, Application and service creation, Second edition, Tata McGraw Hill Education Private limited, 2010.

2. IEEE Transactions on Vehicular Technology

3. IEEE Transactions on Wireless Communications

4. Springer Wireless Networks Journal

Mapping COs with POs (Program outcomes):

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3			2			3	3					3	
CO2	3		2	2	3		3					2		
CO3			3	2	3	3	3		3					
CO4				2			3							

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Simulate an NS3 program that implements a simple network scenario which provides the communication between three nodes in which the second node acts as a router.
2. Wi-Fi stands for wireless fidelity and uses the 802.11 standard. Implement a wifi network (wired and wireless network) consisting of 5 to 6 nodes and provide the communication between the nodes considering any one node as a hub using NS3 simulator tool.

3. Implement aCognitive Radio Ad hoc network scenario which provides the secure data transmission between the numbers of nodes over the network using NS3 simulator tool.
4. Implement LTE WIFI WIMAX Radio Access network protocol using NS3 simulator tool.
5. Create a Customized Wireless Mesh Network consisting of 10 nodes in a network for communication using NS3 simulator tool.

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
B19IT6062	**High Performance Computing**	**HC**	**4**	**0**	**0**	**4**	**4**

Prerequisites:

Computer organization and architecture [B19IT3020], Programming for Problem Solving [B19IT1030].

Course Description:

This course provides foundations for developing parallel algorithms. It focuses on types of parallelism and Flynn's classification of Computer Architectures. It provides a practical feeling of how algorithms map to and behave on real systems and supplement algorithmic theory with hands-on exercises on modern HPC systems, such as CUDA for graphics co-processors (Graphics Processing UNIT).

Course Objectives:

The objective of this course are to

1. Explain the basic concepts related to HPC architecture and parallel computing.
2. Illustrate the use of CUDA concepts in real world applications.
3. Describe the concepts of NVIDIA SLI.
4. Discuss different Parallel algorithms and their applications in real world examples.

Course Outcomes:

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

CO1: Outline the basic concepts related to HPC architecture and parallel computing.

CO2: Implement the concepts of CUDA for scientific computations.

CO3: Make use of concepts of NVIDIA SLI in real world applications.

CO4: Analyse performance of different parallel algorithms.

Course Content:

UNIT-1:

Parallel Processing Concepts: Levels of parallelism –Bit, instruction; Data, transaction; task; thread;memory; function; Flynn's Classification of Computer Architectures: SISD,SIMD, MISD, MIMD. Dataflow Models, Demand-driven Computation, Introduction to superscalar architectures; multi-core; multi-threaded.

UNIT-2:

Parallel Programming with CUDA: Processor Architecture; Interconnect; Communication; MemoryOrganization; and Programming Models in high performance computing architecture Memory hierarchy and transaction specific memory design ;

Thread Organization. Heterogeneous Computing; Blocks; Threads; Indexing Shared memory sync threads (); Asynchronous operation; Handling errors; Managing devices.

UNIT-3:

NVIDIA SLI: What is SLI? , Choosing SLI Modes, Avoid CPU Bottlenecks, Disable VSync byDefault, DirectX SLI Performance Tips, OpenGL SLI Performance Tips.

Multi-GPU Performance: Moving to Multiple GPUs, Subdividing Computation across Multiple GPUs, Peer-to-Peer Communication on Multiple GPUs, Finite Difference on Multi-GPU, Scaling Applications across GPU Clusters

UNIT 4:

Parallel Algorithms and Applications: Numerical Algorithms: Dense Matrix Algorithms -Matrix-Vector Multiplication, Matrix-Matrix Multiplication, Solving a System of Linear Equations; Non-numerical algorithms: Sorting: Bubble Sort and its Variants and Quicksort

Self-learning component:
Open-MP, Open MPI, Quantum computing.

Text books

1. Nielsen, Frank,Introduction to HPC with MPI for Data Science, Springer, 2nd Edition, 2016
2. Ananth Grama, Anshul Gupta, George Karypis, and VipinKumar, Introduction to Parallel Computing,, 2nd edition, Addison-Welsey, 2003.
3. Grama, A. Gupta, G. Karypis, V. Kumar, An Introduction to Parallel Computing, Design and Analysis of Algorithms: 2 e, Addison-Wesley, 2003.
4. NVIDIA GPU Programming Guide Version 2.5.0, by NVIDIA Corporation, 2006.
5. John Cheng, Max Grossman ,Ty McKercher, PROFESSIONAL CUDA C Programming, by John Wiley & Sons, Inc,.2014
6. Kai Hwang ,Advanced Computer Architecture: Parallelism, Scalability, Programmability, McGraw Hill 1993

Reference books

6. J. Dongarra, I. Foster, G. Fox, W. Gropp, K. Kennedy, L. Torczon, A. White, editors, The Sourcebook of Parallel Computing, Morgan Kaufmann, 2002.
7. G.S. Almasi and A. Gottlieb, Highly Parallel Computing, 2ndEdition, Addison-Wesley, 1994.
8. Wilkinson and M. Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, 2nd Edition, Prentice Hall, 2005.
9. M.J. Quinn, Parallel Programming in C with MPI and OpenMP, McGraw-Hill, 2004.
10. G.E. Karniadakis, R.M. Kirby II, Parallel Scientific Computing in C++ and MPI: A Seamless Approach to Parallel Algorithms and their Implementation, Cambridge University Press, 2003
11. Elsevier Journal on hign performance computing for Big data.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO 1	PO2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO9	PO1 0	PO1 1	PO1 2	PS01	PS02
CO1											3	2		
CO2			3		2						3	2		1
CO3				3	1							3	2	2
CO4		3	1									3		

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Develop a Program using CUDA basics
2. Write a Program for implementing blocks using CUDA
3. Build a Program for implementing threads using CUDA
4. Illustrate the addition of two vectors using CUDA.
5. Demonstrate multiplication of two matrices using CUDA.
6. Show howPoint to Pointcommunicationcan be implemented in open MPI .
7. Demonstrate the use of Collective communication functions in open MPI
8. Build a Program for adding two matrices of same size in open MPI
9. Write a Program for adding two arrays of same size in open MPI.
10. Develop a Program for implementing Reduce function in open MPI.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6063	**Pattern Recognition**	SC	4	0	0	0	4	4

Prerequisites:

Probability and statistics [B19IT2010]

Course Description:

The course provides an overview of the theory, principles and algorithms used to construct high performance information processing systems that learn from experience. The course discusses main and modern concepts for model selection and parameter estimation in recognition, decision making and statistical learning problems. The objectives of the course are to;

Course Objectives

1. Explain pattern recognition concepts and its applications.
2. Discuss various mathematical models required for pattern recognition tasks.
3. Describe the nearest neighbour classifier and bayes classifier
4. Demonstrate the supervised and unsupervised tasks

Course Outcomes (Cos):

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

CO1: Identify the areas where Machine Learning can offer a solution to Pattern Recognition.

CO2: Illustrate the nearest neighbour classifier

CO3: Implement learning algorithms for supervised and unsupervised tasks

CO4: Develop algorithms for Pattern Recognition.

Course Content:

UNIT- 1

Introduction: Definition of PR, Applications, Datasets for PR, Different paradigms for PR,Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems.

UNIT -2

Representation: Data structures for PR, Representation of clusters, proximity measures, size ofpatterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation.

UNIT- 3

Nearest Neighbor based classifiers & Bayes classifier: Nearest neighbor algorithm, variants of NNalgorithms use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities,

estimation of probabilities, comparison with NNC, Naive Bayes classifier, Bayessian belief network.

UNIT- 4

Decision Trees: Introduction, DT for PR, Construction of DT, Splitting at the nodes, Over-fitting &Pruning, Examples.

Self-learning component:

Clustering: Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy's, k-means, Iso-data), clustering large data sets, examples.

Text Books:

1. V Susheela Devi, M Narsimha Murthy, Pattern Recognition (An Introduction), Universities Press, 2011.
2. Earl Gose, Richard Johnsonbaugh, Steve Jost,Pattern Recognition & Image Analysis, PHI, 1996

Reference books:

1. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, Academic Press, 4th Edition, 2009
3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO1 2	PS01	PS02
CO1	3	3		3	3			3		3				
CO2	3		2		3							2		
CO3	3	3			3			3				2		
CO4	3	3	1									2		

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments for Internal Assessment:

1. Apply nearest neighbor classification for document categorization. (Project Based)
2. Demonstrate how clustering method works on a given numerical data. (Task Based)
3. Develop a program to obtain features from Medical data set that are suitable for medical data classification. (Project)

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
B19IT6064	Web and Text Mining	**SC**	**4**	**0**	**0**	**4**	**4**

Prerequisites:

Probability and statistics [B19IT2010] and Database Management system [B19IT4030].

Course Description:

This course in web and text data mining covers basic concepts and techniques of the data mining and application of these techniques in text data and web data for various types of analysis. The course also introduces some research topics which can be used for implementation in projects.

Course Objectives:

1. Discuss various data mining techniques for different applications.
2. Describe different clustering techniques for text data.
3. Demonstrate the classification techniques for text data.
4. Illustrate web data retrieval techniques.

Course Outcomes:

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

CO1: Apply data mining methods in different applications.
CO2: Extract an interesting pattern from text using clustering techniques.
CO3: Classify text data using classification techniques in different applications.
CO4: Analyse web data and retrieve interesting information using link analysis.

Course Content:

UNIT- 1

Introduction to Data Mining Techniques: Text Extraction and Document Clustering. Introduction todata mining, Classification, Clustering, Association Analysis, Introduction to key extraction methods, Rapid automatic keyword extraction, Benchmark evaluation, Stoplist generation, Evaluation on news articles, Algebraic techniques for multilingual document clustering: Introduction, Experimental setup, Multilingual LSA.

UNIT -2

Text Data Classification: Content-based spam email classification using machine-learningalgorithms: Introduction, Naive Bayes, LogitBoost, Support vector machines, Augmented latent semantic indexing spaces, Radial basis function networks, Data pre-processing, Feature selection, Message representation,

Evaluation of email classification, Utilizing nonnegative matrix factorization for email classification problems: Introduction, Nonnegative matrix factorization.

UNIT- 3

Web Mining - I: Information Retrieval and Web Search:Basic Concepts of Information Retrieval,Information Retrieval Models, Relevance Feedback, Evaluation Measures, Text and Web Page Pre-Processing, Link Analysis: Social Network Analysis, Co-Citation and Bibliographic Coupling.

UNIT- 4

Web Mining - II: Web Crawling: A Basic Crawler Algorithm: Breadth-First Crawlers, PreferentialCrawlers, Implementation Issues: Fetching, Parsing, Stop word Removal and Stemming Link Extraction and Canonicalization, Spider Traps, Page Repository, Concurrency, Universal Crawlers: Scalability, Coverage vs Freshness vs Importance, Focused Crawlers, Topical Crawlers: Topical Locality and Cues.

Self-learning component:
PageRank for Social network analysis, Focused Crawlers

Text books

1. Michael W. Berry and Jacob Kogan, Text Mining: Applications and Theory, Wiley, 2010

2. Bing Liu, Web DataMining: Exploring Hyperlinks, Contents and Usage Data, springer, 2007

Reference books

1. Jiawei Han, MichelineKamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier, 2011.
2. ACM Transactions on Knowledge Discovery from Data (TKDD)
3. IEEE Transactions on Knowledge and Data Engineering.

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO1 2	PS01	PS02
CO1		3		3				3		3				
CO2	3		2		3							2		
CO3	3				3			3				3		
CO4	3	3										2		

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets A. Explore various options in Weka for Preprocessing data and apply (like Discretization Filters,
2. Load each dataset into Weka and run Aprior algorithm with different support and confidence values. Study the rules generated.
3. Apply different discretization filters on numerical attributes and run the Aprior associationrule algorithm. Study the rules generated. Derive interesting insights and observe the effect of discretization in the rule generation process.
4. Load each dataset into Weka and run id3, j48 classification algorithm, study the classifier output. Compute entropy values, Kappa ststistic.
5. Extract if-then rues from decision tree gentrated by classifier, Observe the confusion matrix and derive Accuracy, F- measure, TPrate, FPrate , Precision and recall values. Apply cross-validation strategy with various fold levels and compare the accuracy results.
6. Load each dataset into Weka and perform Naïve-bayes classification and k-Nearest Neighbor classification, Interpret the results obtained.
7. Explore visualization features of weka to visualize the clusters. Derive interesting insights and explain.
8. Load each dataset into Weka and build Linear Regression model. Study the cluster formed. Use training set option. Interpret the regression model and derive patterns and conclusions from the regression results.

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
			L	T	P	C	
B19IT6065	Research Methodology	SC	4	0	0	4	4

Pre-Requisites:

Fundamental knowledge in C/C++, Java & MS-World

Course Description:

This course offers "An overview of research methodology including basic concepts employed in quantitative and qualitative research methods. Includes computer applications for research.

Prerequisites: Admission to the Doctoral Program. Note: Meets requirements for a Level I research tool course" (Graduate Catalog, 2012-2013, online version). This course introduces research methods as they apply to the higher education (HIED) field of study. HIED 695 provides a macro perspective of the methods associated with conducting scholarly research in all follow-on core, elective, quantitative and qualitative courses; and the doctoral dissertation. Completion of HIED 695 is a prerequisite for follow-on tools courses.

Course Objectives:

The objectives of this course are to:

1. Discuss the dimensions and methods of research.
2. Describe alternative methods and experimental designs available
3. Enable the student to present a good research proposal.
4. Explain the knowledge and skills required for undertaking a research project for presenting a conference paper and for writing a scientific article.

Course Outcomes:

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

CO-1. Outline the basic concepts of research and its methodologies

CO-2. Select and define appropriate research problem and parameters

CO-3. Prepare a project proposal (to undertake a project)

CO-4. Organize and conduct research (advanced project) in a more appropriate manner

Course Content:

UNIT - 1:
Research Methodology: An Introduction - meaning of research - objectives of research - motivation in research - types of research - research approaches - significance of research -research methods versus methodology - research and scientific method - importance of knowing how research is done - research processes - criteria of good research (Kothari)
Defining research problem: selecting the problem - necessity of defining the problem - techniques involved in defining a problem. (Kothari)

UNIT - 2:
Research design: Meaning of research design - need for research design - features of good design - different research designs - basic principles of experimental design. (Kothari)

Originality in Research- research skills - time management - role of supervisor and scholar - interaction with subject experts. (Oliver, Stephen Covey, Slides from Net)

Review of Literature Description: Review of Literature: Significance of review of literature - source for literature: books -journals – proceedings - thesis and dissertations - unpublished items. On-line Searching: Database – SciFinder – Scopus - Science Direct - Searching research articles - Citation Index - Impact Factor - H-index etc, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism. (Slides from net)
Thesis Writing: The preliminary pages and the introduction - the literature review - methodology - the data analysis - the conclusions - the references (in IEEE and ACM format). (Oliver, Slides from Net)

UNIT – 3:

Data Collection and Preparation: Sample surveys, sampling errors, types of sampling designs, experiment and surveys, collection of primary data and secondary data, methods, data preparation process, outliers, analysis, statistics. (Kothari)

Descriptive Statistics: measures of central tendency, dispersion, skewness, relationship, kurtosis, sampling distribution, central limit theorem, statistical inference (Kothari)

Introduction to Tools used in Computer Science: MATLAB, NS2/3, C, C++, Java, Web Service, SPSS, SAS, LOTUS, Excel, Latex and Ms Word. (From net)

UNIT – 4:
Testing hypothesis: Concepts, testing, critical region, decision, and hypothesis testing for mean proportion and variance, limitations, chi-square test, one-way ANOVA. (Kothari)

Linear Regression Analysis: Simple model, multiple model and T-test. (Kothari)

LaTeX and Beamer Description: Writing scientific report - structure and components of research report - revision and refining' - writing project proposal - paper writing for international journals, submitting to editors - conference presentation - preparation of effective slides, pictures, graphs - citation styles. Software for detection of Plagiarism. IPR and Patent filing.

Note: Every batch of students comprising maximum of 4 members should define a research problem. Develop solution for the problem. Write a technical paper and publish it in IEEE/reputed conference/ Journal.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1									3			3		
CO2	2			1	3				2			2	2	
CO3		3												
CO4		3		2					3					

Recommended Learning Resources: (Text Books)

1. C. R. Kothari, Research Methodology Methods and Techniques, 2nd. ed. New Delhi: New Age International Publishers, 2009.
2. R. Panneerselvam, Research Methodology, New Delhi: PHI, 2005.
3. P. Oliver, Writing Your Thesis,New Delhi:Vistaar Publications, 2004.
4. F. Mittelbach and M. Goossens,The LATEX Companion, 2nd. ed. Addison Wesley, 2004.

Recommended Learning Resources: (Reference Books)

1. J. W. Creswell, Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 3nd. ed. Sage Publications, 2008.
2. Kumar, Research Methodology: A Step by Step Guide for Beginners, 2nd. ed. Indian: PE, 2005.
3. B. C. Nakra and K. K. Chaudhry, Instrumentation, Measurement and Analysis,2nd. ed. New Delhi: TMH publishing Co. Ltd., 2005.
4. I. Gregory, Ethics in Research, Continuum, 2005.
5. COLIN NEVILLI , " The complete guide to referencing and avoiding plagiarism" , Second Edition published by Open Up Study Skills.
6. **RUDRA PRATAP** , " Getting Started with MATLAB " , published by Oxford University Press-2010
7. **TEERAWAT, ISSARIYAKUL, EKRAM, HOSSAIN – 2008 , "Introduction to Network Simulator NS2"**
8. https://www.stir.ac.uk/media/services/registry/quality/**Book**of**Plagiarism**.pdf
9. ceur-ws.org/Vol-706/poster22.pdf
10. https://**books**.google.co.in/**books**?isbn=1446281094
11. www.nalsarpro.org/pl/projects/modelproject2.pdf
5. www.uninova.pt/cam/teaching/SRMT/SRMTUNIT11.pdf
6. http://matlab_tools.myetang.com/index_e.htm

Sample Assignment:

1. Consolidate the various research approaches.
2. Summarize the research methods versus methodology - research and scientific method
3. Explore the importance of knowing how research is done
4. Explain the various criteria of good research
5. Enumerate the significance of review of literature

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6071	Advanced Computer Networks	SC - 7	4	0	0	0	4	4

-Prerequisites:

Computer Organization and Architecture [B19IT3020], Computer Networks [B19IT5010]

Course Description:

This course is designed to introduce advanced topics in computer networks. Algorithms and protocols at the application, transport, network and medium access layers. The course explores emerging research challenges in the field of information and content centric networks. This course assumes students with graduate level knowledge in Computer Networks, familiarity with Operating Systems, Statistics and proficiency in at least one programming language. The course is also organized in traditional lectures, and also students will have chance to study the state-of-art research in Computer Networks field that is particularly interesting to them, and work on it.

Course Objectives:

1. Explain the concepts of SONET and ATM.
2. Discuss the different application protocols.
3.Describe the **Congestion Control and Resource Allocation techniques.**
4. Demonstrate the management of computer network.

Course Outcomes:

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

CO1. Outline the concepts of SONET and ATM.
CO2.Make use of different application protocols in real world applications.
CO3. Develop a program to overcome the problem of congestion control and also implement a resource allocation technique.
CO4. Design a program for management of computer network.

Course Content:

UNIT-1

SONET: Architecture, SONET Layers, Frames, Multiplexing, Networks.
ATM: Design Goals, Problems, Architecture, ATM Layers, ATM switch structure, ATM LAN's. Applications of ATM networks.

UNIT-2

Application Protocols: BGP, Traditional Applications- SMTP, MIME, IMAP, HTTP, Web services, FTP, TELNET. Multimedia Applications, Infrastructure services-DNS, SNMP.

UNIT-3

Congestion Control and Resource Allocation: Issues in Resource Allocation, Network Model, Taxonomy, Evaluation Criteria. Queuing Disciplines: FIFO, Fair Queuing, Congestion-Avoidance Mechanisms: DECbit, Random Early Detection (RED), Source-Based Congestion Avoidance, Quality of Service: Application Requirements, Integrated Services (RSVP), Differentiated Services (EF, AF), and Equation-Based Congestion Control.

UNIT-4

NetworkManagement: Introduction, SNMP, ASN.1
Socket Programming in Java: Introduction, Programming with UDP, Programming with TCP.

Self-Learning Component:
Project development using (NS3 Tool or NetSim). MPLS, VPN, IGMP. SSH, AES, Blowfish.

Text books

1. Larry L. Peterson & Bruce S. Davie: Computer Networks A Systems Approach, 4th Edition, Elsevier.
2. Behrouz A Forouzan: Data Communications and Networking, 5th Edition, McGraw – Hill, 2006.

Reference books

1. *Nader F. Mir: Computer and Communication Networks, Pearson Education, 2009*
2. *Alberto Leon-Garcia and Indra Widjaja: Communication Networks – Fundamental Concepts and Key Architectures, 2nd Edition Tata McGraw – Hill, 2004.*
3. *Andrew S. Tanenbaum: Computer Networks, 4th Edition, Pearson Education, 2005.*
4. *Larry L. Peterson and Bruce S. Davie: Computer Networks- A system Approach, 5th Edition, Elsevier, 2012.*
5. *William Stallings: Data and Computer Communications, 10th Edition, Pearson Education, 2008.*
6. *Douglas E. Comer: Internetworking with TCP/IP Vol.1, 6th Edition, Pearson, 1995.*
7. *IEEE Network Magazine*
8. *IET Communications*
9. *Elsevier Computer Networks*
10. *Springer Journal of Networks and Systems Management.*

Mapping COs with POs (Program outcomes):

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO1 1	PO1 2	PS01	PS02
CO1		2	2		1				2				3	
CO2		2	2		2				2	2	1			
CO3			3		3				3	1	3			
CO4			3		3			1		2	3		3	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO

Sample Assignments:

1. Setup Network of 100 computers with a given topology.
2. Develop intrusion detection system.
3. Compare the Congestion control and congestion avoiding algorithms for any specific communication application.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6072	User Interface(UI)/User Experience(UX) Design	SC-7	4	0	0	0	4	4

Prerequisites:

Object Oriented Programming with Java [B19IT 3030], Computer Graphics and Animation [B19It 6063]

Course Description:

This course is designed to give a foundational understanding of how people interact with computers and computing technology, and will provide with a set of basic skills for evaluating and designing for this type of interaction. These are valuable skills to have, especially if a student is considering post-baccalaureate work in the fields of psychology, design, computer science, or plan to work in industry with such technology. Even if a student does not plan to pursue a career in such areas, this is useful information to know to improve his/her own interaction with technology.

The overall objectives of the Course are as follows:

1.Explain user interface design process for a given problem

2: Illustrate the selection of designs, utilize the design thinking processes with UX/UI tools.

3: Describe the assumptions and prototype potential design solutions.

4: Discuss the issues and challenges to achieving a human-centered design process, especially with regard to user experience design

Course Outcomes (Cos):

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

CO1: Develop user interface design process for a given problem

CO2: Interpret the selection of designs, utilize the design thinking processes with UX/UI tools.

CO3: Discriminate the assumptions and prototype potential design solutions.

CO4: Describe the issues and challenges to achieving a human-centered design process, especially with regard to user experience design

Course Content:

UNIT- 1

A Design Process for Digital Products; A Design Process for Digital Products; Modeling Users:

Personas and Goals.

UNIT -2

Setting the Vision: Scenarios and Design Requirements; Designing the Product: Framework andRefinement; A Basis for Good Product Behavior

UNIT- 3

User Experience and Why It Matters? Meet the Elements; Understanding the Strategy Plane;Understanding the Scope Plane.

UNIT- 4

Understanding the Structure Plane; Understanding the Skeleton Plane; Understanding the SurfacePlane; UI/UX Designing for the Desktop, Mobile and other devices. UI/UX Designing for the web.

Self-Learning Components:

Implementation of Common sight patterns in the Interaction design, Prediction of User expectations, Choosing and using the best UI patterns.

Text books:

1. Alan Cooper, About Face-Essential of the User Interface Design, Wiley, 4th edition, 2014
2. Jenifer Tidwell, Designing Interfaces, O'Reilly Media, 2nd edition, 2010.

Reference books:

1. William Buxton, Sketching user experiences-getting the design right and the right design, Elsevier-Morgan Kaufmann, 2007.
2. Don Norman, The Design of Everyday Things - Revised and Expanded Edition, 2013.
3. Jesse James Garrett - The Elements of User Experience-User-Centred Design for the Web and Beyond, 2nd Edition, New Riders Press, 2010.
4. ACM, International Journal of Human-Computer Studies.
5. IEEE, Transactions on Human-Machine Systems.
6. Elsevier, International Journal of Human-Computer Studies.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	2		1	3				1				2	1	1
CO2		2	2		2			1			2	2	2	
CO3		2			1			1			2		2	2
CO4	1		2		1			1				2		2

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Projects:

1. New typeface system design and promotion design Individual project.
2. Data visualization graphics (Information & user interface design): Competition based project, Group or Individual project.
3. Service design: Creating user centred (interaction design) design for public needs, Group or Individual project.

Sample Assignments for Internal Assessment:

1. Observing Users: Observe Users with a GUI.
2. Usability Analysis: Evaluate the GUI
3. Specifying and Prototyping: Propose a Better GUI.
4. Task Analysis, User-Centered Design: Sketch People-Icons, Task Decomposition, Ethnographic, Observation, Allocation of Functions

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6073	Computer Graphics and Animation	SC - 7	4	0	0	0	4	4

Prerequisites:

Problem Solving with Programming [B19IT1030]

Course Description:

This course introduces techniques, algorithms and principles of interactive computer graphics and animation, this course also prepares for study in real-time rendering, realistic image synthesis, and computer animation.

Course Objectives:

Objectives of this course are to:

1. Explain the basic principles of 3-dimensional computer graphics using Software and Hardware.
2. Describe the basics of Geometric transformation systems.
3. Demonstrate the use of two and three dimensional viewing pipeline.
4. Illustrate the use of Animation and Flash overview.

Course Outcomes (Cos):

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

CO1: Develop interactive computer graphics programs using OpenGL
CO2: Apply three dimensional transformations for a real world application
CO3: Identify requirements and constraints of two and three dimensional viewing pipeline.
C04: Design Animations using ADOBE Flash.

Course Content:

UNIT- 1

Introduction to various graphical tools and platforms,OPENGL: Open GL Primitives & Attributes Pixel addressing and object geometry, Fill Area Primitives, Polygon Fill Areas, OpenGL Polygon Fill, Area functions, OpenGL Vertex arrays, Pixel Array Primitives, OpenGL Pixel array functions, Character Primitives, OpenGL Character Functions, OpenGL Display Lists, Open GL Display Window Reshape

Functions; OpenGL state variables, Colour and gray scale, openGLcolour functions, Point Attributes, Line Attributes, General Scan Line Polygon Fill Algorithm

UNIT -2

Geometric Transformations Basic Two-dimensional Geometric Transformations, Matrix representation and Homogeneous Coordinates, Inverse Transformations, Two Dimensional Composite Transformations, Geometric transformations in Three dimensional Space, Three dimensional Translation, Three dimensional Rotation, Three dimensional Scaling, Composite Three dimensional Translation, Other Three dimensional Translation, Transformations

UNIT- 3

Viewing The Two and Three Dimensional Viewing Pipeline, The clipping window, Normalization and view port transformation., OpenGL Two Dimensional Viewing functions, Clipping algorithms,; Over view ofThree dimensional Viewing concepts, The Three dimensional Viewing pipeline, Three dimensional Viewing coordinate parameters, transformation from word to viewing coordinates, Projections transformation, Orthogonal projections, Oblique parallel projections, Perspective Projections, Open GL Three dimensional viewing functions

UNIT- 4

Animation and Flash overview: Development of animation, Non Computer and computer based animation, Flash basics, Flash Work Environment, drawing overview, creating text boxes, creating animation.

Self-learning components:

Lighting and shading models, Tools for graphics and animation, VFX

Text books

1. Edward Angel, Interactive Computer Graphics A Top Down Approach with OpenGL, Addison-Wesley, 5th Edition,2008

2. Malay K. Pakhira, Computer Graphics and Animation, PHI Learning Pvt. Ltd., First edition, 2010

Reference books

1. Foley, Van Damn, Feiner and Hughes, Computer Graphics: Principles and Practice. Addison Wesley.

2. Modeling in Computer Graphics: Proceedings of the IFIP WG 5.10 Working Conference Tokyo, Japan, April 8–12, 1991 (IFIP Series on Computer Graphics) by Tosiyasu L Kunii

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3									3			2	
CO2	3	3	3		3					3				
CO3	3	3	3		3					3	2		3	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Draw a color cube and spin it using opengl transformation functions and also allow the user to move the camera using perspective functions
2. Animate the 3D Indian flag using suitable opengl functions.
3. Write a program to create 2D windmill and apply openggl rotate functions for clockwise and anticlockwise
4. Implement Cohen-Sutherland line clipping algorithm and specify input line, window for clipping and viewport for displaying the clipped image.
5. Write a program to display chess board of 8*8 -64 blocks.

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
B19IT6074	Project and Risk management	SC - 7	**4**	**0**	**0**	**4**	**4**

Prerequisites:

Software Engineering (**B19IT3060**)

Course Description:

This course provides an introduction to Software Project Management including Risk management. It explains Project evaluation, Software estimation, Planning, Project monitoring and control techniques .

Course Objectives:

1. Describe the importance of software project management and explain how to apply basic project evaluation techniques
2. Explain basic estimation techniques and preparation of activity plan
3. Discuss project progress charts to monitor the progress of the project
4. Illustrate the identification of the factors putting the project at risk and categorization of actions for risk elimination or containment

Course Outcomes:

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

CO1:Explain the importance of software project management and apply basic project evaluation techniques

CO2:Apply basic estimation techniques and prepare activity plan

CO3:Develop project progress charts to monitor the progress of the project

CO4: Identify the factors putting the project at risk and categorize actions for risk elimination or containment

Course Content:

UNIT-1:

Introduction to Software project management: Importance of software project management, project, activities covered by software project management, contract management versus technical project management, stakeholders, setting objectives, business case, management, management control, project portfolio management

UNIT-2:

Overview of Project planning: Introduction to stepwise project planning, select project, Identify project scope and objective, identify project infrastructure, analyze project characteristics, identify project product and activities, estimate effort for each activity, identify activity risks, allocate resources, review /publicize plans, execute plan/lower levels of planning

Estimation: Basis for software estimating, software effort estimation techniques, bottoms up estimating, top down approach and parametric models, caper jones estimating rules of thumb, expert judgement, estimating by analogy, Albrecht function point analysis

Activity planning: Objectives of activity planning, project schedules, sequencing and scheduling activities, network planning models, formulating a network model, forward pass, backward pass, identifying critical path

UNIT-3:

Resource allocation: Nature of resources, identifying resource requirements, scheduling resources, publishing resource schedule

Project monitoring: Creating framework, collecting data, review, visualizing progress, cost monitoring, earned value analysis, prioritizing monitoring, getting the project back to target

UNIT 4:

Risk management:

Business Risk: Business risk evaluation, risk identification and ranking, risk and net present value,cost benefit analysis, risk profile analysis, Using decision trees

Project Risks: Project risk, categories of risk, Framework for dealing with risk,
risk identification, risk assessment, risk planning

Risk management: Contingency, Deciding on risk actions, Creating and maintaining risk register

Self-learning component:

1. Project Management Professional certification
2. Directing a software engineering project
3. Software metrics and visibility of progress

Text book:

1. Software project management by Bob Hughes, Mike Cotterill, Rajib Mall, 5th edition, 2011.

Reference books

1. Managing global software projects by Gopalaswamy Ramesh. 2013
2. Software Engineering project management by Richard H Thayer, Edward Yourden, 2014.
3. https://www.managementstudyguide.com/software-project-management.htm

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1				3									2	
CO2													2	3
CO3								3					2	
CO4								3					2	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. For a project the activities , their duration and the precedence activities are as follows:

Activity	Duration(in weeks)	precedence
A	4	-
B	7	A
C	5	A
D	8	B
E	5	B,C
F	2	C
G	1	D,E,F

a. Draw precedence network

b. Identify critical activities

c. Identify critical path

d. Find project duration

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6080	Skill Development – 6	RULO	0	0	0	1	1	2

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT6090	Soft Skills - 4	RULO	0	0	1	0	1	2

Note: Soft Skill Training courses are organised by the **Placement and Training Centre**. The students have to undergo Soft Skill Courses conducted by the said Centre.

SEVENTH SEMESTER

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT7031	**Internet Computing and Applications**	OE	3	0	0	0	3	3

Prerequisites:
Nil

Course Description:

The course aims to provide an understanding with the principles on which the Internet and other distributed systems are based. Emphasizes the power of Javascript, PHP to design web pages that dynamically interact with databases that reside on a server. Scripting tools to build web pages that connect to servers and Client-Side Programming, Server-Side Programming, Database Connectivity to web applications.

Course Objectives:

The objectives of this course are to:

1. Describe the different types of computer networks.

2. Illustrate the use of distributed system technologies in real world applications.

3. Demonstrate the use of Java script in real world applications.

4. Explain the features of PHP, HTML and MySQL.

Course Outcomes:

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

CO1: Outline the different types of computer networks.
CO2: Make use of distributed system technologies in real world applications.
CO3: Develop real world applications using Java script.
CO4: Apply the features of MySQL, HTML and PHP for developing real world application.

Course Content:

UNIT -1:

Introduction to Networks: Data Communications, Networks: LAN, MAN, WAN, Layers, Protocolsand Interfaces of OSI Reference Model and TCP/IP Model.

Internet: URLs, the World Wide Web, WWW Architecture, Web Browsers, Web Servers, Web Search Engines, MIME, HTTP, FTP, Web Service, Software as a service

UNIT -2:

Distributed Computing: Client Server, Cloud, parallel computing and Grid computing, RemoteProcedure Call (RPC) and Remote Method Invocation (RMI).

UNIT 3:

JavaScript: Introduction: Overview of Java Script, Object orientation and Java Script, Data types andVariables - Operators, Expressions, and Statements - Functions - Objects - Array, Document Object Model - Event Handling - Controlling Windows & Frames and Documents - Form handling and validations, Errors in scripts, Examples.

UNIT 4:

PHP: Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML,Arrays, functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP. PHP and MySQL: Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.

Self-learning component:

Dynamic Documents with Javascript: Positioning elements, Moving elements, Element Visibility, Changing colors and fonts, Dynamic content, Stacking elements, Locating the mouse cursor, Reacting to a mouse click, Dragging and dropping elements, E-Commerce, Real Estate Business, Education, Health, Research and Social Networks like Facebook, FlipKart etc.

Text books:

1. *M.L.Liu, Distributed computing, Principles and Applications, Pearson Education, 4th edition, 2008.*

2. *Grid Computing, Joshy Joseph & Craig fellenstein, Pearson Education, 3rd edition, 2004.*
3. *Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2008.*

Reference books:

1. *Deitel, Goldberg, 'Internet & World Wide Web How to Program', Third Edition, PearsonEducation, 2006.*
2. *Behrouz A , Forouzan , Data Communication and Networks, Tata McGrahill, 4th Edition, 2006*
3. *Achyut S. Godbole and AtulKahate, Web Technologies, Tata McGraw Hill, Third edition, 2003.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1										3				
CO2						2				3				
CO3	1				1	2		1		3				
CO4						2		3		3	3			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. An organization wants to implement a very simple distributed file system (DFS) from where, a DFS client retrieves a file from a central DFS server and caches it in it's /tmp directory for better performance. Design and develop such a simple distributed file system.
2. A user wants to generate `n' consecutive Fibonacci numbers. He wants the program to ask for the value of `n', generate and display the required number of Fibonacci. Design and develop a program to carry-out these activities.
3. A user wants to display a table which consists of following information.

1	2	3	4	5	6	7	.	.	.
1	4	9	16	25	36	49	.	.	.

Design and develop a program that asks for an integer to be entered, generate and display the above table.

4. An Organization wants to create a database which consists of its Employee's name, Employee code, address and e-mail ids. It requires a provision to retrieve and display the employee details based on the Employee code. Design and develop an XML form suitably.

5. A student who is learning Javascript wants to know different methods to read the input and display the result, so explain him the methods how input can be read from keyboard and display the results on the screen. And also illustrate him how a Javascript can be written to find the largest of 3 numbers using alert box.

6. In a corporate organization, employees across different geographical locations are given access to the books library web site. For the librarian using PHP develop a web page that accepts book information such as Title, authors, edition and publisher and store information submitted through web page in MySQL database. For the employee- design another web page to search for a book based on book title specified by the user and displays the search results with proper headings

7. A student developing an HTML document that has six short paragraphs to text. And he want to incorporate three different paragraphs styles p1, p2 and p3. The p1 style must use left and right margins of 20 pixels, a background color of yellow, and a foreground color of blue. The p2 style must use font size of 18 points, font name 'Arial' and font style in italic form. The p3 style must use a text indent of 1 centimeter, a background color of green and foregrounded color of white. The 1st and 4th paragraph

8. An organization wants to implement a very simple distributed file system (DFS) from where, a DFS client retrieves a file from a central DFS server and caches it in it's /tmp directory for better performance. Design and develop such a simple distributed file system.

9. A user wants to generate `n' consecutive Fibonacci numbers. He wants the program to ask for the value of `n', generate and display the required number of Fibonacci. Design and develop a program to carry-out these activities.

10. A user wants to display a table which consists of following information.

1	2	3	4	5	6	7	.	.	.
1	4	9	16	25	36	49	.	.	.

Design and develop a program that asks for an integer to be entered, generate and display the above table.

11. An Organization wants to create a database which consists of its Employee's name, Employee code, address and e-mail ids. It requires a provision to retrieve and display the employee details based on the Employee code. Design and develop an XML form suitably.

12. A student who is learning Javascript wants to know different methods to read the input and display the result, so explain him the methods how input can be read from keyboard and display the results on the screen. And also illustrate him how a Javascript can be written to find the largest of 3 numbers using alert box.

13. In a corporate organization, employees across different geographical locations are given access to the books library web site. For the librarian using PHP develop a web page that accepts book information

such as Title, authors, edition and publisher and store information submitted through web page in MySQL database. For the employee- design another web page to search for a book based on book title specified by the user and displays the search results with proper headings

14. A student developing an HTML document that has six short paragraphs to text. And he want to incorporate three different paragraphs styles p1, p2 and p3. The p1 style must use left and right margins of 20 pixels, a background color of yellow, and a foreground color of blue. The p2 style must use font size of 18 points, font name 'Arial' and font style in italic form. The p3 style must use a text indent of 1 centimeter, a background color of green and foregrounded color of white. The 1st and 4th paragraph mustuse p1, the second and 5th must use p2, and the 3rd and 6th must use p3. Help him to create the HTML document

15. An organization wants to implement a very simple distributed file system (DFS) from where, a DFS client retrieves a file from a central DFS server and caches it in it's /tmp directory for better performance.Design and develop such a simple distributed file system.

16. A user wants to generate `n' consecutive Fibonacci numbers. He wants the program to ask for the value of `n', generate and display the required number of Fibonacci. Design and develop a program to carry-out these activities.

17. A user wants to display a table which consists of following information.

1	2	3	4	5	6	7	.	.	.
1	4	9	16	25	36	49	.	.	.

Design and develop a program that asks for an integer to be entered, generate and display the above table.

18. An Organization wants to create a database which consists of its Employee's name, Employee code, address and e-mail ids. It requires a provision to retrieve and display the employee details based on the Employee code. Design and develop an XML form suitably.

19. A student who is learning Javascript wants to know different methods to read the input and display the result, so explain him the methods how input can be read from keyboard and display the results on the screen. And also illustrate him how a Javascript can be written to find the largest of 3 numbers using alert box.

20. In a corporate organization, employees across different geographical locations are given access to the books library web site. For the librarian using PHP develop a web page that accepts book information such as Title, authors, edition and publisher and store information submitted through web page in MySQL database. For the employee- design another web page to search for a book based on book title specified by the user and displays the search results with proper headings

21. Design and implement a very simple distributed file system (DFS) in that a DFS client retrieves a file from a central DFS server and caches it in its /tmp directory for better performance.

22. Ajay is interested to know about the level of style sheet that is having high priority. So explain him what are the different levels of style sheets and demonstrate with sample program about priority.

23. Abdul started developing web pages. He want to make use of heading tags, subscript, superscript, bold, italic, insert an image and also want to preserve white spaces. Demonstrate him how to apply these tags in a web page.

24. John observed that URL started with HTTP and also observed Internal Server Error for a web page he was accessing. So explain him what is HT

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT7032	Web Application Development	**OE**	**3**	**0**	**0**	**0**	**3**	**3**

Prerequisites:

Object Oriented Programming with Java (B19IT3030) and Basics of Database Management System (B19IT4030).

Course Description:

The basics of Web application tools such as HTML, XHTML and CSS are introduced. The course also provides knowledge about advanced research topics such as XML, Perl and PHP.

Course Objectives:

1. Explain the basic concepts of HTML code.
2. Illustrate the use of Cascading Style Sheets in web pages.
3. Demonstrate the use of Angular JS, Java Scripts and XML in real world applications.
4. Describe the principles of object oriented development using Perl and PHP.

Course Outcomes (Cos):

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

CO1: Build web pages using HTML syntax and semantics.
CO 2: Make use of Cascading Style Sheets in developing web applications.
CO 3: Develop Web based applications using Angular JS, Java Scripts and XML concepts.
CO 4: Apply the principles of object oriented development using Perl and PHP

Course Content:

UNIT- **1**

Introduction to HTML, HTML Syntax, Semantic Markup, Structure of HTML Documents, HTML Elements, HTML Semantic Structure Elements, HTML Web Storage. HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Micro formats

UNIT -**2**

Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, CSS Text Styling. Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.

UNIT- **3**

Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, Caching, JavaScript and jQuery, Angular JS, JavaScript Pseudo-Classes, XML Processing and Web Services, XML Processing, Overview of Web Services.

UNIT- **4**

Introduction to Perl and PHP. Arrays and Superglobals, Arrays, GET and POST Superglobal Arrays, $_SERVER Array, $_Files Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling.

Self-learning component:

HTML5,JQuery,XML, Ruby, Introduction to REST and RESTful API

Text books

1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson Education India, 1st Edition, 2016

2. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 1st Edition, 2006.

3. Robert. W. Sebesta, "Programming the World Wide Web", Pearson Education, 4th Edition, 2007.

Reference books

1) Robin Nixon, "Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5", O'Reilly Publications, 4th Edition, 2015.

2) Luke Welling, Laura Thomson, "PHP and MySQL Web Development", Pearson Education, 5th Edition 2016.

3) Nicholas C Zakas, "Professional JavaScript for Web Developers", Wrox/Wiley India, 3rd Edition 2012.

4) David Sawyer Mcfarland, "JavaScript & jQuery: The Missing Manual", O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 1st Edition, 2014

5) Zak Ruvalcaba Anne Boehm, "Murach's HTML5 and CSS3", Murachs/Shroff Publishers & Distributors Pvt Ltd, 3rd Edition, 2016.

6) Gerardus Blokdyk, "Representational State Transfer: Practical Integration", CreateSpace Independent Publishing Platform, 1st Edition, 2018

7) Michael Fitzgerald, 'Learning Ruby", O'Reilly, 1st Edition, 2007

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3							3			3			
CO2			2									2		
CO3			3			3			3		3			

CO4			3				3							

Where L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Create a static REVA University web page using HTML tags
2. Create a web page that will have separate links to show map of India and World. When user will open a map of India, create links to display the information of each state i.e. highlighted in the map in a separate window/document. (The information should be brief i.e. not more than 3-4 sentences.) When user will open a world map, show the list of countries on clicking the image in a new window.
3. Write an HTML page to display information of three products. The name of three products should be displayed at the top. The hyperlink should be provided to move to the details of the product like its features, size, price etc .alongwith its image. The link should be internal link.
4. Explain the following tags with the attributes that often required. Write suitable example for each. 1) SELECT 2) TEXTAREA
5. What is CSS and List out the properties of CSS.
6. Differentiate between java and JavaScript.
7. Explain with sample program perl.
8. Explain with sample program php.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT7033	Data Structures with C	**OE**	**3**	**0**	**0**	**0**	**3**	**3**

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT7041	Advanced Storage Area Networks	SC	4	0	0	0	4	4

Prerequisites:

DBMS (B19IT4030), Computer Networks (B19IT5010).

Course Description:

The course provides students with an understanding of the need for SAN, caching, local file systems, SAN hardware, and SAN Architecture on going through this course**.**

Course Objectives:

1. Explain the architecture of Server Centric IT and discuss its Limitations.

2. **Describe the role of Caching** with respect of storage of data.

3. Discuss theuse of local file systems with respect of storage of data.

4. Demonstrate the creation of network storage for a given application.

Course Outcomes (Cos):

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

CO1: Outline the features of Server Centric IT Architecture and its Limitations.

CO2: Develop an application to make use of Cachingfor storage of data.

CO3: Make use of local file systems for storage of data.

CO4: Create a network storage for a given application.

Course Content:

UNIT 1:
Server Centric IT Architecture and its Limitations; Storage: Centric IT Architecture and its advantages; Case study: Replacing a server with Storage Networks; The Data Storage and Data Access problem; The Battle for size and access. Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels, JBOD, Storage virtualization using RAID and different RAID levels;

UNIT2:

Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems; Availability of disk subsystems. The Physical I/O path from the CPU to the Storage System; SCSI.
Fiber Channel Protocol Stack; Fiber Channel SAN; IP Storage The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system.

UNIT 3:

Local File Systems: Network file Systems and file servers; Shared Disk file systems; Comparison of fiber Channel and NAS, Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.

UNIT 4:

Overview, creating a Network for storage: SAN Hardware devices, the fiber channel switch, Host Bus adaptors; putting the storage in SAN; Fabric operation from a Hardware perspective. The switch's Operating system, Device Drivers, The Supporting the switch's components, Configuration options for SANs. Panning for business continuity.

Self-learning component:
Storage virtualization on Block or file level, Storage virtualization on various levels of the storage Network, Symmetric and Asymmetric storage virtualization in the Network.

Text books

1. *U. Troppens, R. Erkens and W. Muller,* ***Storage Networks Explained,*** *John Wiley and Sons, 2003.*
2. *R. Spalding,* ***Storage Networks: The Complete Reference,*** *Tata McGraw Hill, 2003.*

Recommended Learning Resources (Reference books):

1. *R. Barker and P. Massiglia, Storage Area Network Essentials: A Complete Guide to understanding and Implementing SANs, John Wiley India, 2002.*
2. *M. Farley, Storage Networking Fundamentals, Cisco Press, 2005*
3. *IEEE,Introduction to the IEEE Transactions on control of network systems,*
4. *ACM DL, ACM Transactions on Storage (TOS)-ACM*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3	3			2			3	3	3	3			
CO2		3	2	2					3	3	3	2		
CO3		3	3			3			3	3	3			
CO4		3							3	3	3			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Write a case study on Utilizing a Community Area Network (CAN) to store and back up patient data efficiently, two hospitals implemented compelling, reliable and cost-effective healthcare IT solutions to enhance patient care
2. Write a case study on how Cisco Migrated to a SAN Environment in Small European Data Center.

3. Citibank's DAS infrastructure couldn't keep pace with its growing customer base. It wanted a platform that would let it reduce cycle time for loan processing and beat the competition in terms of online response times. Write a case study to resolve the issue associated with Citibank.
4. The client required a high availability centralized data storage solution with extensive upgrades to the LAN infrastructure. It also provide minimal single points of failure. List out different storage to solve the above problem.
5. The millions of the thing go wrong while running any technology as the compound storage system have. Categorize the failures type into different categories.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs./ Wk.
B19IT7042	Network Programming	SC	4	0	0	0	4	4

Prerequisites

Problem solving with Programming.[B19IT1030], Operating systems [B19IT 4040], Computer Networks [B19IT5010].

Course Description:

This course is focusing on the programming aspects of computer networks. The goal of this course is to understand the current trends of communication protocols, socket programming, interprocess communication, and to understand how network research is done. Further, this course introduces the basics of computer networks, network Security and Internet programming. Students acquire knowledge of client-server architecture and secure network communication.

Course Objectives:

The objectives of this course are to:

1. Illustrate the use of socket programming in a real world application.
2. Explain the features of client and server Architecture required for developing real world applications.
3. Demonstrate the various methods of securing a network application.
4. Discuss the Case Study of Networked Application and Secure Networked Application

Course Outcomes (Cos):

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

CO1: Make use of features of socket programming in a real world application.

CO2: Develop an application using client and server Architecture for a real world application.

CO3: Design a securing a network application for a real world problem.

CO4: Analyze Case Study of Networked Application and Secure Networked Application

Course Content:

UNIT - 1

Networks and Protocols: Circuits vs. Packets, Internetworking, Ethernets, Ethernet Frames, Addressing, Internet Protocol, User Datagram Protocol, Transmission Control Protocol, The Client-Server Model, The Domain Name System, State vs. Stateless, Methods for Maintaining State; Socket Programming: What Is a Socket, Using Sockets, User Datagram Protocol, File Transfer, and Error Handling.

UNIT - 2

Client-Server Architecture: Client Test Program, Multiplexing, Forking, Multithreading, Combining Preforming and Pre-threading, Method Choosing, Dealing with Large Amounts of Data, Debugging and Development Cycle;

Custom Protocol Implementation: Designing a Custom Protocol, Our Chat Protocol, Protocol Registration, TCP vs. UDP, Application Protocol Choices, Client-Server Architecture, Client-Side Considerations, Server-Side Considerations

UNIT - 3

Securing Network Communication: Tunnelling, Public Key Infrastructure, Secure Network Programming Using OpenSSL, The Old Scenario, The Present-Day Scenario, The PAM Library, Public Key Authentication, Single Sign-on, Common Attacks, Buffer Overflow, Secure Coding, Tools of the Trade

UNIT - 4

Case Study1: A Networked Application: The Server, The Client

Case Study2: A Secure Networked Application: The Necessary Decisions, Code Design and Layout, The Code, Analysis.

Self-Learning Component:

Creating TCP clients, Creating TCP servers, Servers handling multiple clients, Malticast applications.

Text books

1. Keir Davis, John Turner and Nathan Yocom, "The Definitive Guide to Linux Network Programming'', Apress, First edition, 2004.
2. Warren Gay, "Linux Socket Programming by Example", Que, 1st edition, 2000.

Reference books

1. Graham Glass and King abls, "UNIX for Programmers and Users", Pearson Education, 3rd edition, 1998.
2. M. J. Rochkind, "Advanced UNIX Programming", Pearson Education, 2nd edition, 2004.
3. IEEE Transactions on Networking (IEEE TON)
4. ACM Transactions on Networking (ACM TON)

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1					1					2				
CO2					2									
CO3										2				
CO4										3	3			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Design a client-server program in C (internet domain, stream socket) which does the following:
   a. The server starts on a port (given as parameter in the command line).
      a. The client is started (server IP and port are provided in command line).

      b. Client connects to the server and waits for user messages on terminal. User messages are sent to server by the client using the socket created.

c. The server waits for user messages from client. If server receives message "Bye" from client, it replies "Bye". For any other string, server replies the same message but after making it into capital letters.
d. The client is closed, when it gets the message "Bye" from server.

2. By using Java's Remote Method Invocation or CORBA, create an online auction with the following description:

3. People can join the auction, leave the auction, and bid for an item in the auction. The current price of an item gets flashed as soon as anybody bids a valid price for the item. This is similar to the online stock market where the current prices of the shares are flashed as soon as their value changes. You need to create an auction server. The server should support at least the following methods:

a. join auction leave auction bid on an item.

4. You can read the initial list of items and minimum prices from a file or from standard input. When somebody joins the auction, you need to send the items on sale and their current price. Then, you need to create a client, either as an applet, or as an application. The client joins the auction, displays the items for sale along with their current price, and lets the user place a bid for a particular item. Since multiple clients will be bidding at the same time, the methods on the server must be properly synchronized. Whenever any client makes a successful bid, the current price at allthe clients must reflect this change. All the exceptions must be properly handled.

5. Write a Python network server program that will accept an unlimited number of connections, one at a time . Upon receiving a connection, it should send back to the client the client's IP address. Then it should wait for commands from the client. Valid commands are "TIME", "IP" and "EXIT". To the *TIME* command, the server should return the current time. To the *IP*command, it should again return the client's IP address. If the client closes the connection or does not respond with a command in a reasonable time (10 seconds), the server should close the current connectionand wait for another connection. To the *EXIT* command, your server should close all open socketsand exit.

Sample Projects:

1. Client protocol implementation.

The dream global communication is solved in a great deal by the introduction of Internet. This made the necessity of networking in communication clear. The internet protocol TCP/IP uses computers called gateways, which provide all interconnections among physical networks. A gateway is a special purpose, dedicated computer that attaches to two or more networks and routes packets from one to other. It will be having the information regarding the network connected to it. The gateways exchange routing information periodically to accommodate network changes and keeps their route up-to-date. In this context implement the client protocol.

2. Server protocol implementation.

Handle multiple socket connections with threads. A simple server waits for a client to connect and then read a message sent from the client. read() is a blocking function so the server will block until a client writes to it. If we assume two clients are concurrently writing to the server. The server will wake up to one of them but what will happen to the other one? Is the server still "listening" while handling the request from the first client? I know that the bind function takes an int as the second argument that specifies the backlog (5 by default). Does that mean that only 5 clients can connect concurrently to a server? If that's true, how are servers that handle multiple concurrent connections are implemented?

1. Network Load Balancing has several potential use cases and advantages. By distributing network traffic across multiple servers or virtual machines, traffic can be processed faster than in a scenario in which all traffic flowed through a single server. The feature can also enable an organization to quickly scale up a server application (such as a Web server) by adding hosts and then distributing the application's traffic among the new hosts. Similarly, if demand decreases, servers can be taken offline and the feature will balance traffic among the remaining hosts. Network Load Balancing can also ensure network traffic is re-routed to remaining hosts if one or more hosts within the cluster fail unexpectedly. Implement the Network Load Manager

2. Distributed Applications

ATM withdrawal Internet Banking

Reservation system for train/flight Real time logistic tracking

Implementation of Application Protocols

TELNET FTP

SMTP SNMP

3. IPv6 Networks: As IPv4 has been used for many years and the ISPs are running out of the IP addresses, new and current organizations will have to use the IPv6 networks. So, in this project students have to design and develop the IPv6 networks for medium organizations and deploy IPv6 networks for current organizations that have IPv4 running.

4. A graphical map of the network is the fundamental data used for each node. To produce its map, each node floods the entire network with information about the other nodes it can connect to. Each node then independently assembles this information into a map. Using this map, each router independently determines the least-cost path from itself to every other node using a standard shortest paths algorithm such as Dijkstra's algorithm. The result is a tree graph rooted at the current node, such that the path through the tree from the root to any other node is the least-cost path to that node. This tree then serves to construct the routing table, which specifies the best next hop to get from the current node to any other node. In this context implement the Link-state algorithm.

Course Code	Course Title	Course Type	L	T	P	C	Hrs./Wk.
B19IT7043	**Multimedia Systems**	**SC**	**4**	**0**	**0**	**4**	**4**

Prerequisites:

Computer Networks (B19IT5010), Operating Systems (B19IT4040)

Course Description:

The course includes fundamental concepts of multimedia, Speech, Image and video processing including international standards, Fundamentals of multimedia data compression, standards and synchronization.

Course Objectives:

The objectives of this course are to:

1. Explain various multimedia components
2. Describe the different Lossy and Lossless compression techniques with respect to multimedia data
3. Discuss the different compression techniques for Image and video
4. Illustrate the use of synchronization concepts.

Course Outcomes (COs):

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

CO1. Summarize the working of multimedia components
CO2. Develop applications using Lossy and Lossless compression techniques for multimedia data
CO3. Design the applications using different compression techniques for Image and video
CO4. Analyse the working of synchronization in multimedia data.

Course Content:

UNIT I

Introduction to Multimedia - What is Multimedia?, Multimedia- Past and Present, Multimedia Software Tools- A Quick Scan

Graphics and Image Data Representations - Graphics/Image Data Types, Popular File Formats, Colour Models in Images

UNIT 2

Multimedia Data Compression - Lossless Compression Algorithms, Basics of Information Theory, Run-Length Coding, Dictionary-Based Coding, Arithmetic Coding, Lossless Image Compression.

Lossy Compression Algorithms - Introduction, Distortion Measures, theRate-Distortion Theory, Quantization, Transform Coding.

UNIT 3

Image and Video Compressions - The JPEG Standard, the JPEG2000 Standard, the JPEG-LS Standard, Bi-level Image Compression Standards, Introduction to Video Compression, Video Compression Based on Motion Compensation, H.261, H.263, MPEG-1.

UNIT 4

Synchronization - Defining "Synchronization", Particularities of Synchronization in Multimedia Systems, Requirements to the Presentation, Reference Elements for Synchronization, Synchronization Types, System Components Involved in Synchronization, A Reference Model for Multimedia Synchronization, Synchronization Specification, Specification Methods for Multimedia Synchronization.

Self-Learning Concepts:

Multimedia applications including digital libraries, system software, toolkits, conferencing paradigms, structured interaction support, and examples from video/audio/graphics conferencing.Latest Web technologies, such as XML, X3D and Semantic Web.

Text books

1. *Li, Ze-Nian, Drew, Mark S., Liu, Jiangchuan, "Fundamentals of Multimedia", Springer, 2014.*
2. *Steinmetz, Ralf, Nahrstedt, Klara, "Multimedia Systems" Springer, 2004*

Reference books

1. *Fred Halshall "Multimedia communication - Applications, Networks, Protocols and Standards", Pearson education, 2007.*
2. *R. Steimnetz, K. Nahrstedt, "Multimedia Computing, Communications and Applications", Pearson Education. 2008.*
3. *KR. Rao,Z S Bojkovic, D A Milovanovic, "Multimedia Communication Systems: Techniques, Standards, and Networks", Pearson Education 2007.*
4. *Introduction to Multimedia Networks, Andrew W. Davis*
5. *Rao, Bojkovic, Milovanovic: Introduction to Multimedia Communications, Wiley & Sons, Hoboken, NJ, 2006*
6. *IEEE, IEEE Transactions on Multimedia.*
7. *ACM, ACM Transactions on Multimedia Computing, Communications, and Applications.*
8. *Elsevier, Elsevier Journal on Multimedia Computing.*
9. *Springer, Springer Journals on Communication Networks.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1				3									2	
CO2													2	3
CO3								3					2	
CO4								3					2	

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO

Sample Assignments:

1. Run-length encoding is a fast and simple method of encoding strings. The basic idea is to represent repeated successive characters as a single count and character. For example, the string "AAAABBBCCDAA" would be encoded as "4A3B2C1D2A".Implement run-length encoding and decoding. You can assume the string to be encoded have no digits and consists solely of alphabetic characters. You can assume the string to be decoded is valid.

2. The Lempel-Ziv-Welch (LZW) algorithm employs an adaptive, dictionary-based compression technique. Determine LZW Compression for String ABABBABCABABBA and write a program to implement LZW algorithm**.**

3. **Arithmetic coding** allows using "fractional" parts of bits and is Used in PPM, JPEG/MPEG (as option), Bzip. Code the system having five symbols using Arithmetic coding. Write an algorithm to implement this code.

Symbol	Probability	Range
A	0.2	[0, 0.2)
B	0.1	[0.2, 0.3)
C	0.2	[0.3, 0.5)
D	0.05	[0.5, 0.55)
E	0.3	[0.55, 0.85)
F	0.05	[0.85, 0.9)
$	0.1	[0.9, 1.0)

(a)

4. Lossy compression is most commonly used to compress multimedia data (audio, video, and images), especially in applications such as streaming media and internet telephony. Make a survey on recent lossy compression techniques for images.

5. List out the hurdles one can face in a Video conference. Explain how they can be handled ?

Course Code	Course Title	Course Type	Credit Pattern & Credit Value					Hrs/ Wk
B19IT7044	C# and .Net	SC-8	4	0	0	0	4	4

Prerequisites:

problem solving with Programming [B19IT1030] and Object Oriented Programming with Java [B19IT3030].

Course Description:

The course is geared towards providing students with the knowledge and skills they need to develop C# applications. C# is the core language of the Microsoft .NET framework, designed specifically to take advantage of CLI (Common Language Interface) features. The course focuses on C# program structure, language syntax, and implementation details. It is a simple, object-oriented, and type-safe programming language that is based on the C and C++ family of languages.

Course Objectives:

The objectives of the course are to:

1. Discuss Building Blocks of the .NET Platform.

2. Explain the fundamentals of C# language.

3. Demonstrate the use of the Object Oriented Programming features and Interfaces

4. Illustrate the use of exceptions in real world application.

Course Outcomes:

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

1. Identify the basic components of the .NET Framework.
2. Develop application using C# data types.
3. Make use of inheritance, polymorphism and encapsulation.
4. Design a C# program for making use of .NET exception handling mechanisms.

Course Content:

UNIT - 1

Introducing C# and .NET Platform: The Building Block of the .NET Platform (CLR, CTS, andCLS), The Role of the .NET Base Class Libraries, What C# Brings to the Table, An Overview of.NET Binaries (aka Assemblies), the Role of the Common Intermediate Language, The Role of .NET Type Metadata, The Role of the assembly Manifest, Understanding the Common Type System, Intrinsic CTS Data Types, Understanding the Common Languages Specification, Understanding the Common Language Runtime.

UNIT - 2

C# Language Fundamentals : The Anatomy of Basic C# Class, Creating objects: ConstructorBasics, The Composition of a C# application, Default assignment and Variable Scope, The C# Member Initialization Syntax, Basic Input and Output with the Console Class, Understanding Value Types and Reference Types, The Master Node: System.Object, The System Data Types (and C# Aliases), Converting Between Value Types and Reference Types: Boxing and Unboxing, C# Iteration Constructs, C# Controls Flow Constructs, The Complete Set of C# Operators, Defining Custom ClassMethods,

Understating Static Methods, Methods Parameter Modifies, Array Manipulation in C#, String Manipulation in C#, C# Enumerations.

UNIT - 3

Object Oriented Programming and Interfaces: Formal definition of a C# class, Definition the"Default Public Interface" of a Type, Recapping the Pillars of OOP, The First Pillars: C#'sEncapsulation Services, Pseudo- Encapsulation: Creating Read-Only Fields. The Second Pillar: C#'sInheritance Supports, keeping Family Secrets: The "Protected" Keyword, Nested Type Definitions, And the Third Pillar: C #'s Polymorphic Support, Casting Between. Defining Interfaces Using C# Invoking Interface Members at the object Level, Exercising the Shapes Hierarchy, Understanding Explicit Interface Implementation. Understanding Callback Interfaces.

UNIT - 4

Exceptions and Interfaces: Ode to Errors, Bugs, and Exceptions, The Role of .NET ExceptionHanding, The System. Exception Base Class, Throwing a Generic Exception, Catching Exception, CLR System – Level Exception (System. System Exception). Custom Application-Level Exception (System. System Exception), Handling Multiple Exception, The Family Block, Understanding object Lifetime.

Self-learning Component:

Basics of Garbage Collection, Finalization a Type, the Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, the System. GC Type.

Text books

1. *Andrew Troselen; Pro C# with .NET 3.0, Seventh edition, 2007.*
2. *E Balaguruswamy: Programming in C#, 5th reprint, Tata McGraw Hill 2004*

Reference books

1. *Vijay Nicoel, Visual C#.NET, 5th reprint, Tata McGraw Hill 2004*
2. *IEEE Transactions on Computers*
3. *ACM Transactions on Algorithms*

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3						2			3				
CO2	3	3	3				2				3	2		

CO3	3	3	3		2		2				3	2		

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

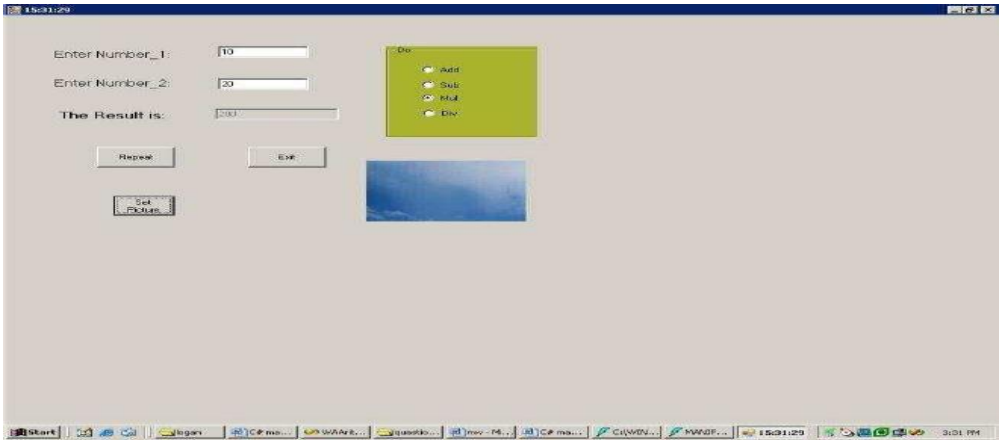
Sample Assignments:

1. REVA Library has essential tasks of book issue and return. The can be automated with help of object oriented programming in C#. Design and develop an objected oriented system to automate the tasks at REVA library.
2. Write a program in C# Sharp to generate all possible permutations of an array using recursion.
3. Write a program in C# Sharp to create a recursive function to calculate the Fibonacci number of a specific term.

Lab Experiments: (Implement following using MATLAB)

1. A student is instructed to build a calculator widget in windows application using C#. This application needs to be designed in the form with buttons and textbox like a calculator.

2. Develop an application for the above (Q.No. 1) concept, but which results as follows.



3. ABC Inc. wants you to design a standalone application using C#.NET, they want a login based access to their forms which have all the validations in place for all controls.

4. XYZ Bank wants to design a web application form having loan amount, interest rate and duration fields. Calculate the simple interest and perform necessary validation.

a. Ensures data has been entered for each field.

b. Checking for non numeric value.

5. For a standard 10th student you are required to design an application to help him with mathematics homework. The application should support mathematical operations, formulas etc.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs./Wk.
B19IT7051	Multimedia Computing & Networks	SC	4	0	0	0	4	4

Prerequisites:

Computer networks [B19IT5010] and Operating Systems [B19IT4040]

Course Description:

This Course provides the knowledge of multimedia operating Systems and Quality of Service, compression standards, Network Protocols for multimedia communication and multimedia over wireless networks.

Course Outcomes (Cos):

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

CO 1: Identify requirements and constrainsts for a good Quality of service in multimedia environment.

CO 2: Develop a multimedia buffer management technique.

CO 3: Analyze the performmance of the protocols used for multimedia networking.

Course Content:

UNIT - 1:

Introduction - Interdisciplinary Aspects of Multimedia, Quality of Service, Multimedia Operating Systems, Multimedia Networking and Communication, Synchronization.

Quality of Service - Requirements and Constraint, Quality of Service Concepts, Resources, Establishment Phase, Run-time Phase of Multimedia Call, QoS Management Architectures.

UNIT - 2:

Multimedia Operating Systems - Process Management, Real-Time Processing Requirements,Traditional Real-Time Scheduling, Real-time Scheduling: System Model, Soft-Real-Time Scheduling Concepts, Scheduling Policies, Prototype Operating Systems, Interposes Communication and Synchronization, Memory Management, Reservation Concept for Memory Management, Buffer Management Techniques, Buffer Management for Client/Server Systems, Device Management, System Architecture.

UNIT - 3:

Network Services and Protocols for Multimedia Communications - Protocol Layers of ComputerCommunication Networks, Local Area Network and Access Networks, Internet Technologies and Protocols, Multicast Extension, Quality-of-Service for Multimedia Communications, Protocols for Multimedia Transmission and Interaction, Case Study: Internet Telephony

UNIT - 4:

Internet Multimedia Content Distribution - Broadcast/Multicast for Heterogeneous Users,Application-Layer Multicast, Peer-to-Peer Video Streaming with Mesh Overlays, HTTP-Based Media Streaming. Multimedia Over Wireless and Mobile Networks - Characteristics of Wireless Channels, Wireless Networking Technologies, Multimedia Over Wireless Channels, Mobility Management.

Self-Learning component:

Social Media Sharing- Representative Social Media Services, User-Generated Media Content Sharing, Media Propagation in Online Social Networks

Text Books:

1. Li, Ze-Nian, Drew, Mark S., Liu, Jiangchuan, “Fundamentals of Multimedia”, Springer, First edition, 2014.
2. Steinmetz, Ralf, Nahrstedt, Klara, “Multimedia Systems” Springer, Second edition, 2004

Reference books:

1. Fred Halshall “Multimedia communication - Applications, Networks, Protocols and Standards”, Pearson education, Second edition, 2007.
2. R. Steimnetz, K. Nahrstedt, “Multimedia Computing, Communications and Applications”, Pearson Education, Sixth edition, 2008.
3. IEEE, IEEE Transactions on Multimedia.
4. ACM, ACM Transactions on Multimedia Computing, Communications, and Applications

5. Elsevier, Elsevier Journal on Multimedia Computing. Springer, Springer Journals on Communication Networks

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO 2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3				2									
CO2	2											2		
CO3			3			3			3					

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignment for Internal Assesment:

1. Given a task set (I1, I2, I3) with period pi and processing time ei for each task: p1 = 3, e1 = 1; p2 = 4, e2 = 1; p3 = 5, e3 = 1. Compare earliest deadline First and Real time monotonic algorithms.
2. In multimedia systems, the notion of Quality of Service (QoS) assumes importance. Multimedia applications have requirement in terms of bandwidth, delay and delay jitter and to specify these requirements, the application uses the notion of QoS. Discuss the various issues and means and mechanism to manage them.

3. The goal of multimedia transport protocols is to transmit multimedia signals from one point to another point. These points are connected by communication network employing specific protocols. Generally, multimedia original signals are encoded to reduce the bit rate. When the encoded stream is to be sent to another location in the network, the transport protocols are responsible for the packetization and the delivery of that stream. Write a note on Multimedia transport protocols.

4. The rapid growth in interactive multimedia applications, such as video telephonies, video games and TV broadcasting have resulted in spectacular strides in the progress of wireless communication systems. The current third generation (3G) wireless systems and the next generation (4G) wireless systems in planning support higher bit rates. However, the high error rates and stringent delay constraints in wireless systems are still significant obstacles for these applications and services. On the other hand, the development of more advanced wireless systems provides opportunities for

proposing novel wireless multimedia protocols and new applications and services that can take the maximum advantage of the systems. Discuss the wireless multimedia protocols in brief.

Course Code	Course Title	Course Type	Credit Pattern & Credit Value				Hrs/ Wk
			L	T	P	C	
B19IT7052	**Data Analytics using R**	**SC**	**4**	**0**	**0**	**4**	**4**

Pre-requisites

Database Management Systems [B19IT4030].

Course Description

This course describes that, 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. While this is broad and grand objective, the last 20 years has seen steeply decreasing costs to gather, store, and process data, creating an even stronger motivation for the use of empirical approaches to problem solving. This course seeks to present you with a wide range of data analytic techniquesand is structured around the broad contours of the different types of data analytics, namely, descriptive, inferential, predictive, and prescriptive analytics

Course Objectives

1. Explain the concepts of big data
2. Describe the different ways of Data Analysis
3. Demonstrate the use of data streams
4. Illustrate how to do mining and clustering

Course Outcomes

On successful completion of this course; the student will be able to:
CO1: Outline use of the concepts of Big Data
CO2: Apply the different ways of data analysis
CO3: Analyze data using Stream data model.
CO4: Design data mining application.

Course Content:

UNIT – 1 INTRODUCTION TO BIG DATA
Introduction to Big Data Platform –Challenges of conventional systems ,Web data ,Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting –Modern data analytic tools,Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.

UNIT – 2 DATA ANALYSIS

Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics –Rule induction –Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods

UNIT – 3 MINING DATA STREAMS

Introduction to Streams Concepts –Stream data model and architecture –Stream Computing, Sampling data in a stream –Filtering streams –Counting distinct elements in a stream –Estimating moments –Counting oneness in a window –Decaying window –Real-time Analytics Platform(RTAP)applications –case studies –real time sentiment analysis, stock market predictions

UNIT – 4 FREQUENT ITEMSETS AND CLUSTERING

Mining Frequent item sets –Market based model –Apriori Algorithm –Handling large data sets in Main memory –Limited Pass algorithm –Counting frequent item sets in a stream –Clustering Techniques –Hierarchical –K-Means –Clustering high dimensional data –CLIQUE and PROCLUS –Frequent pattern based clustering methods –Clustering in non-Euclidean space –Clustering for streams and Parallelism.

Self-Learning Component:

FRAMEWORKS AND VISUALIZATION- Map Reduce –Hadoop, Hive, MapR –Sharding –NoSQL Databases –S3 –Hadoop Distributed file systems –Visualizations –Visual data analysis techniques, interaction techniques; Systems and applications

Text books

1. *Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.*
2. *Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.*

Reference books

1. *Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics, John Wiley & sons, 2012.*
2. *Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O" Reilly, 2011.*
3. *Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.*
4. *Springer, International Journal of Data Science and Analytics.*
5. *Elsevier, Computational Statistics & Data Analysis*
6. *IEEE, Transactions on Big Data.*

Mapping Cos With POs (Program Outcomes)

Course Outcomes	Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01
CO1									3			3	
CO2	2			1	3				2			2	
CO3		3											
CO4		3		2					3				

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT7053	Deep Learning	SC -9	4	0	0	0	4	4

Prerequisites:

Machine Learning [B19IT5040]

Course Description:

This course is an introduction to deep learning, a branch of machine learning concerned with the development and application of modern neural networks. Deep learning algorithms extract layered high-level representations of data in a way that maximizes performance on a given task. Deep learning is behind many recent advances in AI, including Siri's speech recognition, Facebook's tag suggestions and self-driving cars.

Course Objectives:

The objectives of this course are to:

1. Explain the basic concepts of Deep Learning.
2. Describe supervised and unsupervised learning.
3. Demonstrate the use of a deep learning neural network in a real world application.
4. Illustrate the use of deep learning techniques in neural networks and natural language processing

Course Outcomes:

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

CO1: Develop a Mathematical model for a real world application.

CO2: Identify a suitable learning algorithm for the given real world applications.

CO3: Design a deep learning neural network for a real world application.

C03: Apply the deep learning techniques in neural networks and natural language processing

Course Content:

UNIT - 1

Introduction: Applied math and Machine Learning Basics: Linear Algebra-Scalars, Vectors, Matrices and Tensors, Eigen Decomposition, SVD, PCA Probability and Information Theory-Probability Distribution, Conditional Probability, Chain Rule of Conditional Probability, Bayes' Rule.

UNIT - 2

Numerical Computation: Overflow, Underflow, Gradient Based Optimization, Constrained Optimization, Linear Least Squares, Machine Learning Basics- Learning Algorithms, Overfitting and Underfitting, Maximum Likelihood Estimation, Supervised and Unsupervised Learning Algorithms, Building Machine Learning Algorithm, Challenges Motivating Deep Learning.

UNIT – 3

Deep Networks: Modern Practices-Example: Learning XOR, Gradient-Based Learning, Hidden UNITs, Architectural Design, Back-Propagation Algorithm.

UNIT - 4

Convolutional Networks: Recurrent Neural Networks, Applications- Natural Language Processing, Recommender Systems.

Self-Learning Components:

Linear factor Models, Structured probabilistics Models, Monte-Carlo Methods, Deep generative Modles.

Text Book:

1.Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." First edition, An MIT Press book in preparation. (2015).

Reference books:

1. *Duda, R.O., Hart, P.E., and Stork, D.G. Pattern Classification. Wiley-Interscience. 2nd Edition. 2001.*
2. *Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4. Academic Press, 2008.*
3. *Russell, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence. 2003.*
4. *Springer Journal of Machine Learning.*

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO1 0	PO11	PO 12	PS01	PS0 2
CO1	1			1										
CO2	1				2				1	1				
CO3			1	2				2		1				

CO4	3			1	2			2		1	2			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

List of Experiments

1. Write a program to classify movie reviews using IMDB dataset.
2. Write a program to predict house price use Boston Housing Price dataset.
3. Write a program for recommendation system for job recruiting company.
2. Write a program to identify objects in photographs and then generate textual descriptions of those objects, a complex multi-media problem that was previously thought to require large artificial intelligence systems.
3. Learn linear regression from scratch and build a programin Python for data analysis.
4. Build a program in Python for deriving and implementing word2vec,
5. Build a program in Python for GLoVe,
6. Build a program in Python for word embedding.
7. Build a program in Python for sentiment analysis with recursive nets
8. Write a python program to implement Multiclass Classification of Flower Species.
9. Write a python program to implement Binary Classification of Sonar Returns.
10. Write a python program to implement Regression of Boston House Prices.
11. Write a python program to implement Handwritten Digit Recognition.
12. Write a python program to implement Object Recognition in Photographs.
13. Write a python program to implement Predict Sentiment from Movie Reviews.
14. Write a python program to implement Sequence Classification with LSTMs for Movie Reviews.
15. Write a python program to implement Text Generation with Alice in Wonderland.

Sample Assignments:

Implement following using Python:

1. Write a program for face detection and classification using deep learning. Kindly use data set from UCI repository.
2. Write a program for printed document clustering using deep learning.
3. Develop E-mail classification system using deep learning.

Course Code	Course Title	Course Type	Credit Pattern & Credit Value					Hrs/ Wk
			L	T	P	J	C	
B19IT7054	Introduction to Genomic Data Science	SC-9	4	0	0	0	4	4

Prerequisites:

Nil

Course Description:

This is the first course in the Genomic Data Science Specialization. This course introduces to the basic biology of modern genomics and the experimental tools that is used to measure it. Central Dogma of Molecular Biology is introduced and how next-generation sequencing can be used to measure DNA, RNA, andepigenetic patterns is done is covered. An introduction to the key concepts in computing and data science, howdata from next-generation sequencing experiments are generated and analyzed are covered.

Course Objectives:

1. Explain the basic concepts of bioinformatics.
2. Demonstrate the working of the tools for information search and data retrieval.
3. Discuss various Genome Mapping techniques.
4. Describe Gene prediction methods and tools to find gene patterns.

Course Outcomes:

CO1: Summarize the basic concepts of bioinformatics.

CO2: Identify the tools for Information search and data retrieval.

CO3: Analyze Genome Mapping techniques

CO4: Apply various gene prediction. Methods and tools.

Course Content:

UNIT-1:

Bioinformatics: An Introduction
Introduction, Historical Overview and Definition, Bioinformatics Applications, Major Databases in Bioinformatics, Data Management and Analysis, Molecular Biology and Bioinformatics, Central Dogma of Molecular Biology, Biological Databases Considerations.

UNIT-2:

Information Search and Data Retrieval:
Introduction, Electronic Libraries, Tools for Web Search, Data Retrieval Tools, Data Mining of Biological Databases.

UNIT-3:

Genome Analysis and Gene Mapping
Introduction, Genome Analysis, Genome Mapping, The Sequence Assembly problem, Genetic Mapping and Linkage Analysis, Physical Maps, Cloning the entire Genome, Genome Sequencing, Applications of Genetic Maps, Sequence Assembly Tools, Identification of Genes in Contigs, The Human Genome Project.

UNIT 4:

Gene Identification and Prediction

Introduction, Basics of Gene Prediction, Pattern Recognition, Gene Prediction Methods, Other Gene Prediction Tools.

Self-learning component:
Genome data management, sequencing the pairs of genomes, Hidden Markov Models, Phylogenetics.

Text books

1. S.C. Rastogi, N. Mendiratta, P. Rastogi,Bioinformatics Methods and Applications, 4th Edition, EEE, PHI, 2013.
2. Andreas D. Baxevanis, B. F. Francis Ouellette, BIOINFORMATICS A Practical Guide to the Analysis of Genes and Proteins, 2nd Edition, Wiley Interscience, 2001.
3. Lloyd Low, Martti Tammi, Bioinformatics-Practical-Generation-Sequencing-Applications, 2017
4. T. R. Sharma, Genome-Analysis-Bioinformatics-Practical-Approach, I.K. International Publishing House Pvt. Ltd, 2009

Reference books

1. Genomic Data Science | Coursera

2. Introduction to Genomic Data Science | edX

3. Computational Genomics and Data Science Program, National Human Genome Research Institute.

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	2			2		3			3					
CO2		3					2				3			
CO3		2	3								3			
CO4			2											

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Assume that you have constructed the BAC contig map shown below. What additional steps would you use to validate the map and do so in a highly efficient manner? (Task based)

29F19

84J03

19B16

65J15

2. List the importance of Shine Dalgarno in gene identification. (Assignment)
3. Write notes on Chou-Fasman rules and their implications. (Assignment)

Sample Mini Projects:

1. Using the Entrez microbial genomes tables, you are interested in studying things that grow at very high temperatures(Hyperthermophilic).
a) Is the genome of*Carboxydothermushydrogenoformans Z-2901* completely sequenced?
b) What toxic substance does this organism use as its carbon source?
c) How many protein genes are there in this genome?
d) What is the optimal growth temperature for this organism?
e) What domain of life does it belongs to?

2. Design a dynamic programming table for determining the optimum global alignment between sequences ACTG and CGGA. Assume that a match is scored +3 and that mismatches and spaces are scored -1 each. Calculate the optimum alignment corresponding to the table in part and its score.

3. Compare MUSCLE and ProbCons tools for MSA.

4. Hypothetical organism X has the following DNA sequence. Part of the promoter is indicated by the sequence indicated in **bold**. Transcription starts at the non-bold A/T base pair.
xxxx**TATTTGATAG CTCT**ATGCAT GCATGGGTCC TGAAGTTCAG ATCTTTGAGT CATAGGAGTC 3
xxxx**ATAAACTATC GAGA**TACGTA CGTACCCAGG ACTTCAAGTC TAGAAACTCA GTATCCTCAG 5

5. The following Markov chain model governs the intracellular (I) and extracellular (E) placement of amino acids residues in transmembrane proteins.
Transition Probabilities

	E	I
E	0.7	0.3
I	0.2	0.8

Emission Probabilities

E		I	
L	0.00	L	0.45
V	0.16	V	0.25
D	0.50	D	0.25
K	0.34	K	0.05

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT7080	**Project Work and Dissertation Phase - I**	**HC**	**0**	**0**	**0**	**1**	**1**	**2**

EIGHTH SEMESTER

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT8031	Software Defined Networks and Network Function Virtualization	SC - 10	4	0	0	0	4	4

Prerequisites

Computer Networks (B19IT5010)

Course Description:

The course introduces the concepts of Software Defined Networks, how SDN works and SDN in other environments. It also describes OpenFlow which is used for open network switching experiments. The last section covers Network Function Virtualization, its architecture and some of the research challenges in the design of NFV.

Course Objectives:

The objectives of this course are to:

1. Explain the basic packet switching terminology , Software defined networks
2. Describe how SDN will work, its fundamental characteristics and operation
3. Demonstrate the use of openflow in real world.
4. Discuss the history of network function virtualization.

Course Outcomes:

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

CO1: Outline the significance of SDN.
CO2: Analyse the functions of different types of software defined networks.
CO3: Make use of Openflow additions in a real world application
CO4: Develop a virtual environment to provide various services to users

Course Content:

UNIT - 1:

Software Defined Networks – Introduction: Basic Packet-Switching Terminology, Historical Background. The Modern Data Centre, Traditional Switch Architecture, Autonomous and Dynamic Forwarding Tables, Can We Increase the Packet-Forwarding IQ?

Why SDN? : Evolution of Switches and Control Planes, Cost, SDN Implications for Research and Innovation, Data Centre Innovation, Data Centre Needs.

The Genesis of SDN: The Evolution of Networking Technology, Forerunners of SDN, Software Defined Networking is Born, Sustaining SDN Interoperability, Open Source Contributions, Legacy Mechanisms Evolve toward SDN, Network Virtualization.

UNIT - 2:

How SDN Works: Fundamental Characteristics of SDN, SDN Operation, SDN Devices, SDN Controller, SDN Applications, Alternate SDN Methods and Conclusion.

SDN in Other Environments: Wide Area Networks, Service Provider and Carrier Networks, Campus Networks, Hospitality Networks, Mobile Networks, In-Line Network Functions, Optical Networks, SDN vs. P2P/Overlay Networks and Conclusion.

UNIT - 3:

The OpenFlow Specification: Chapter-Specific Terminology, OpenFlow Overview, OpenFlow 1.0 and OpenFlow Basics, OpenFlow 1.1 Additions, OpenFlow 1.2 Additions, OpenFlow 1.3 Additions, OpenFlow Limitations and Conclusion.

UNIT - 4:

Network Function Virtualization: Introduction, History of Network Function Virtualization, NFV Examples and Related Work and Open Questions.

NFV Architecture: NFV Infrastructure (NFVI), Virtual Network Functions and Services, NFV Management and Orchestration (NFV MANO).

Business Model And Design Considerations: Business Model, NFV Design Considerations, NFV, SDN and Cloud Computing, NFV Standardization Activities, Collaborative NFV Projects, NFV Implementations.

Research Challenges: Management and Orchestration, Energy Efficiency, NFV Performance, Resource Allocation, Security, Privacy and Trust Modelling of Resources, Functions and Services and Research Directions in Selected NFV Use Cases.

Self-learning Components:

Explore SDN in the data centre and also SDN applications.

Text books

1.Paul Göransson, Chuck Black, "Software Defined Networks - A Comprehensive Approach", Morgan Kaufmann, 2014.

2.Rashid Mijumbi, Joan Serrat, Juan-Luis Gorricho, Niels Bouten, Filip De Turck, Raouf Boutaba, "Network Function Virtualization: State-of-the-art and Research Challenges", IEEE COMMUNICATIONS SURVEYS & TUTORIALS, 2015.

Reference books

1. SiamakAzodolmolky, "Software Defined Networking with OpenFlow", Packt Publishing Ltd, 2013.

2. Sreenivas Voruganti, Sriram Subramanian,"Software Defined Networking with OpenStack", Packt Publishing Ltd, 2016.

3. Jim Doherty, "SDN and NFV Simplified", Pearson Education, 2016.

4. Doug Marschke, Jeff Doyle, Pete Moyer, "Software Defined Networking: Anatomy of OpenFlow", Lulu Publishing services, 2015

Mapping COs with POs (Program outcomes)

Course	Program Outcomes													
Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3							2						
CO2		2							3					
CO3		2									3			
CO4	2	2												

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

1. Implement a control application for a software defined network-(SDN). A layer-3 routing application will install rules in SDN switches to forward traffic to hosts using the shortest, valid path through the network.
2. Implement a control application for a software defined network-A distributed load balancer application that will redirect new TCP connections to hosts in a round-robin order.
3. Implement a control application for a software defined network-A distributed load balancer application that will redirect new TCP connections to hosts in a FCFS order.
4. How to reduce the forwarding delay from Openflow switch to controller in SDN?
5. Shiva would like to get a topology information among openflow switches which are controlled by ryu. Please suggest a method for Shiva to listen to the network..

Course Code	Course Title	Course Type	Credit Pattern & Credit Value					Hrs/ Wk
B19IT8032	**Augmented and Virtual Reality**	**SC-10**	**4**	**0**	**0**	**4**		**4**

Prerequisites:

Problem Solving with Programming (C/C++)-[B19IT1030], Data Structures-[B19IT3040], Computer Graphics and Animation-[B19IT6063]

Course Description:

This course covers basic concepts of augmented reality and virtual reality. The course also introduces the student to the working of multiple models of input and output interface in VR. The course also helps the student to understand development tools and frameworks in VR. Further, this course helps the student to work on the application of VR in digital entertainment.

Course Objectives:

The objectives of this course are to:

1. Explain the principles and multidisciplinary features of Virtual Reality.
2. Illustrate the multimodal user interaction and perception in Virtual Reality.
3. Demonstrate the use of objects for managing large scale Virtual Reality environment in real time.
4. Discuss the various solutionsusing Virtual Reality system framework and development tools for industry and social relevant applications.

Course Outcomes:

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

CO1: Summarize the fundamentals of Augmented Reality and Virtual Reality.
CO2: Applymultimodal user interaction and perceptiontechniques involved in Virtual Reality.
CO3:Design different objects using Simulation and Interactive techniques for real world applications.
CO4: Develop innovative Virtual Reality solutions for industrial and Social relevant applications.

Course Content:

UNIT-1:

Introduction to Augmented Reality (AR): Definition and Scope, A Brief History of Augmented Reality, Examples, Related Fields, System Structure of Augmented Reality,Key Technology in AR.

Introduction to Virtual Reality (VR): Fundamental Concept and Components of VR, Primary Features and Present Development on VR.

UNIT-2:

Multiple Models of Input and Output Interface in VR: Input – Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus and 3D Scanner. Output – Visual, Auditory, Haptic Devices.

UNIT-3:

Environment Modeling in VR: Geometric Modeling, Behavior Simulation, Physically Based Simulation.

Interactive Techniques in VR: Body Track, Hand Gesture, 3D Manus, Object Grasp.

UNIT 4:

Development Tools and Frameworks in VR: Frameworks of Software Development Tools in VR, X3D Standard, Vega, MultiGen, Virtools, UNITy.

Application of VR in Digital Entertainment: VR Technology in Film and TV Production, VR Technology in Physical Exercises and Games, Demonstration of Digital Entertainment by VR.

Self-learning component:
UNITy 3D, Manus VR

Text books

1. *Dieter Schmaltzier and Tobias Hollerer. Augmented Reality: Principles and Practice, Addison-Wesley, 2006.*

2. *Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.*

Reference books

1. *Sherman, William R. and Alan B. Craig, Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann, 2002.*
2. *Fei GAO, Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.*
3. *Guangran LIU, Virtual Reality Technology, Tsinghua Press, Jan. 2011.*
4. *International Journal of Virtual and Augmented Reality (IJVAR).*
5. *Springer, Virtual Reality.*

Mapping COs with POs (Program outcomes):

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3									3			2	
CO2	3	3	3		3					3				
CO3	3	3	3		3					3	2		3	
CO4	3									3	2		2	3

where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments:

5. Build a Virtual Reality application for the promotion of a tourist destination of your choice. This could be an application providing information about a particular destination, providing 360-degree pictures and videos of the location.
   The user should be able to navigate scene-by-scene through the destination that you have built the tour for.

6. Build an Augmented Reality application for making your syllabus topics interactive and fun to learn. This could be an application providing information about particular topics or subject.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs./Wk.
B19IT8033	**Natural Language Processing**	SC-12	4	0	0	0	4	4

Prerequisites:

Finite Automata and Formal Language [B19IT6041] and Artificial Intelligence [B19IT7063].

Course Description

The course provides the basics of Natural-language processing (NLP), which is an area of computer science and artificial intelligence concerned with the interactions between computers and human (natural) languages, in particular how to program computers to fruitfully process large amounts of natural language data. Natural language processing (NLP) is the ability of a computer program to understand human language as it is spoken. NLP is a component of artificial intelligence (AI). Challenges in natural-language processing frequently involve speech recognition, natural-language understanding, and natural-language generation.

Course Objectives:

The objectives of this courses are to:

1. Explain the different linguistic components in a given sentence.

2. Describe the features of automatic Speech Recognition.

3. Demonstrate the design of a parse tree using context free grammar for a given sentence.

4. Illustrate the semantic and pragmatic interpretation.

Course Outcomes

Upon completion of this course, the student should be able to:

CO1: Identify the different linguistic components in a given sentence.

CO2: Develop a program for implementing automatic Speech Recognition.

CO3: Create a parse tree using context free grammar for a given sentence.

CO4: Apply the semantic and pragmatic interpretation.

Course Content:

UNIT - 1:

Morphology and part-of speech processing: Introduction –Regular Expressions and Automata- Non-Deterministic FSAs. Tranducers –English Morphology - Finite-State Morphological Parsing - Porter Stemmer - Tokenization- Detection and Correction of Spelling Errors. N-grams – Perplexity - Smoothing - Interpolation - Backoff. Part-of- Speech Tagging – English Word Classes - Tagsets - Rule-Based - HMM - Transformation-Based Tagging - Evaluation and Error Analysis.

UNIT - 2:

Speech processing: Phonetics – Articulatory Phonetics - Phonological Categories - AcousticPhonetics and Signals - Speech Synthesis – Text Normalization – Phonetic and Acoustic Analysis - Diphone Waveform synthesis – Evaluation- Automatic Speech Recognition –Architecture - MFCC vectors - Acoustic Likelihood Computation - Evaluation. Triphones – Discriminative Training - Modeling Variation. Computational Phonology-Finite-State Phonology.

UNIT - 3:

Syntax analysis : Formal Grammars of English – Constituency - Context-Free Grammars –GrammarRules – Treebanks - Finite-State and Context-Free Grammars - Dependency Grammars. Syntactic Parsing – Parsing as Search - Ambiguity - Dynamic Programming Parsing Methods –CKY- Earley and Chart Parsing- Partial Parsing-Evaluation. Statistical Parsing – Probabilistic Context-Free Grammars – Probabilistic CKY Parsing of PCFGs –Probabilistic Lexicalized CFGs –Collins Parser. Language and Complexity

UNIT - 4:

Semantic and pragmatic interpretation : Representation of Meaning – Desirable Properties -Computational Semantics -Word Senses - Relations Between Senses – WorldNet - Event Participants-Proposition Bank -Frame Net -– Metaphor. Computational Lexical Semantics – Word Sense Disambiguation.

Applications: Information Extraction – Named Entity Recognition - Relation Detection and Classification – Temporal and Event Processing - Template-Filling, Properties of Human Conversations - Basic Dialogue Systems - VoiceXML - Information- State and Dialogue Acts, Machine Translation –Issues in Machine Translation - Classical MT and the Vauquois Triangle - Statistical MT - Phrase-Based Translation Model.

Self-learning Components:

Syllabification - Learning Phonology and Morphology, Summarization - Single and Multi-Document Summarization - Focused Summarization - Evaluation. Dialog and Conversational Agents, Alignment in MT – IBM Models –Evaluation

Text books:

1. *Jurafsky and Martin, "Speech and Language Processing", Pearson Prentice Hall, Second Edition, 2008.*
2. *Christopher D. Manning and HinrichSchütze, "Foundations of Statistical Natural Language Processing", MIT Press, First edition, 1999.*

Reference books:

1. *Stevan Bird, "Natural Language Processing with Python", Shroff, 2009. 4. James Allen, "Natural Language Understanding", Addison Wesley, Second Edition, 2007.*
2. *Nitin Indurkhya, Fred J. Damerau, "Handbook of Natural Language Processing", (Chapman & Hall/CRC Machine Learning & Pattern Recognition), Second Edition, 2010.*
3. *Alexander Clark, Chris Fox, Shalom Lappin, "The Handbook of Computational Linguistics and Natural Language Processing", Wiley-Blackwell, Second edition, 2012.*
4. *IEEE/ACM Transactions on Audio, Speech, and Language Processing.*
5. *Elsevier Journal of Computer Speech and Language.*

6. *Springer Journal of Natural Language Processing.*

Mapping COs with POs (Program outcomes)

Course Outcomes	Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01
CO1		2	3					1	2	2	2		
CO2					1				1	1			
CO3					1					1		2	
CO4			1							2			

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments for Internal Assessment:

1. Indexes are a common way to access the words of a text, or, more generally, the elements of any list. Develop a program to determine the topic of an article or a book
2. Some of the methods we used to access the elements of a list also work with individual words, or strings. Develop a program to decide if an email is spam or not
3. A collocation is a sequence of words that occur together unusually often. Thus *red wine* is a collocation, whereas *the wine* is not. A characteristic of collocations is that they are resistant to substitution with words that have similar senses. Develop a program to determine who wrote a text
4. Most programming languages permit us to execute a block of code when a conditional Expression. Write a program to determine the meaning of a word in a particular context
5. Read in the texts of the State of the Union addresses, using the state_union corpus reader. Write a program to Count occurrences of men, women, and people in each document.
6. Create a variable phrase containing a list of words. Develop a program with the operations addition, multiplication, indexing, slicing, and sorting.
7. Write a function to process a large text and plot word frequency against word rank using pylab.plot. Do you confirm Zipf's law? (Hint: it helps to use a logarithmic scale.) What is going on at the extreme ends of the plotted line?
8. Generate random text, e.g., using random. Choice ("abcdefg "), taking care to include the space character. You will need to import random first. Use the string concatenation operator to accumulate characters into a (very) long string. Then tokenize this string, generate the Zipf plot as before, and compare the two plots. What do you make of Zipf's Law in the light of this?

9. Non-deterministic search using simulated annealing: Begin searching with phrase segmentations only; randomly perturb the zeros and ones proportional to the "temperature"; with each iteration the temperature is lowered and the perturbation of boundaries is reduced.
10. Save some text into a file corpus.txt. Define a function load(f) that reads from the file named in its sole argument, and returns a string containing the text of the file.

a. Use nltk.regexp_tokenize() to create a tokenizer that tokenizes the various kinds of punctuation in this text. Use one multiline regular expression inline comments, using the verbose flag (?x).

b. Use nltk.regexp_tokenize() to create a tokenizer that tokenizes the following kinds of expressions: monetary amounts; dates; names of people and organizations.

Course Code	Course Title	Course Type	L	T	P	J	C	Hrs/ Wk
B19IT8034	Human Computer Interaction	SC-12	4	0	0	0	4	4

Prerequisites:

Object oriented Programming with Java [B19IT3030], Computer Graphics and Animation [B19IT6063]

Course Description:

This course presents the foundations of Human Computer Interaction (HCI). The contents are structured into phases comprising: Basic definitions and motivations of HCI, interaction paradigms, design principles and models, User-centred design methods comprising user studies, design approaches for interfaces and interaction, evaluation methods and techniques for data analysis, Research frontiers of HCI, including accessibility, universal design, and pervasive computing (ubiquitous, mobile and wearable computing).

Course Objectives:

The overall objective of the Course is as follows:

1. Explain the capabilities of both humans and computers from the viewpoint of human information processing.
2. Describe typical human–computer interaction (HCI) models and styles, as well as various HCI paradigms.
3. Demonstrate the use of an interactive design process and universal design principles in designing HCI systems.
4. Illustrate the use of different evaluation methods.

Course Outcomes (Cos):

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

CO1: Identify the suitable positioning and pointing device to be used for a given application.

CO2: Select an effective style for a specific application

CO3: Make use of UI design rules to develop a user interface for a real world applicaiton.

CO4: Analyse the different evaluation techniques used to measure the quality of User Interface.

Course Content:

UNIT- 1

Introduction to Human and the Computer: Human: Input–output channels, Human memory,

Thinking: reasoning and problem solving, Emotion, Individual differences, Psychology and the design of interactive systems. The computer: Positioning, pointing and drawing, Display devices, Devices for virtual reality and 3D interaction, Physical controls, sensors and special devices, Paper: printing and scanning, Memory, Processing and networks.

UNIT -2

The interaction and Paradigms: Models of interaction, Frameworks and HCI, Ergonomics,Interaction styles, Elements of the WIMP interface, Interactivity, The context of the interaction. Paradigms: Paradigms for interaction. Interaction design basics: The process of design, User focus, Scenarios, Navigation design, Screen design and layout, Iteration and prototyping.

UNIT- 3

HCI in the software process and Design rules: The software life cycle, Usability engineering,Iterative design and prototyping. Principles to support usability, Standards, Guidelines, Golden rules and heuristics, HCI patterns. Universal designs.

UNIT- 4

Evaluation techniques: Goals of evaluation, Evaluation through expert analysis, Evaluation throughuser participation, choosing an evaluation method.

Self-learning component:

Designing user support systems, Ubiquitous computing applications research, Hypertext, multimedia and the World Wide Web.

Text books:

1. *Alan Dix, Janet Finlay, Gregory Abowd & Russell Beale, Human-Computer Interaction. 3rd Edition. Prentice Hall, 2004.*

2. *Julie A. Jacko, Human-Computer Interaction Handbook, 3rd Edition, CRC Press, 2012.*
3. *Ben Shneiderman, Catherine Plaisant, Designing the User Interface, 6th Edition, Addison Wesley, 2017.*

Reference books

1. *Jonathan Lazar, Jinjuan Heidi Feng, & Harry Hochheiser Research Methods in Human-Computer Interaction, Wiley, Second edition, 2010.*
2. *ACM, International Journal of Human-Computer Studies.*
3. *IEEE, Transactions on Human-Machine Systems.*
4. *Elsevier, International Journal of Human-Computer Studies.*

Mapping COs with POs (Program outcomes)

Course Outcomes	**Program Outcomes**													
	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PO8	PO9	PO10	PO1 1	PO12	PS01	PS02
CO1	3			1	2			1			3	3	3	3
CO2								2				2		1
CO3		2	2					1			3	3	3	3
CO4	1	3	3	2	2			1			3	3	3	3

Where, L (Low), M (Medium) and H (High) represents strength of correlation between CO and PO.

Sample Assignments for Internal Assessment:

1. Perform User Needs Analysis on any Interactive Website.
2. Implement different Mockups.
3. Illustrate parameter-based Analytical Evaluation of Interactive Websites.
4. Demonstrate Prototype Evaluation.
5. The so-called “Internet of things” (IoT) has led to increasing consideration of how technology can be embedded in our homes and automate them, creating “Smart Homes”. Commercial products such as `app’-controlled lights, or internet connected thermostats to control temperature, have been developed. Discuss the positive and negative aspects of such technologies. What are their failings or limitations, and what are the ethical issues in connected homes?

6. Pokemon GO is a game that uses augmented reality to allow players to move through the environment and “catch” virtual Pokemon with their mobile phone. But why is it so popular? What ethical issues have been illustrated by encouraging people to capture Pokemon? What opportunities does this present to benefit society at large, or tackle real world problems?

7. Increasingly we are moving to a “cashless” society, using bank and credit cards and other services, such as Apple Pay (http://www.apple.com/apple-pay/) to buy goods and services instead of paper notes and coins. However, so far we have not removed cash as a payment option of last resort. What are the implications if this happens? Who will this affect, and in what way? What are the positive and negative impacts? How might negative impacts be addressed?

Sample Projects:

1. Personal information management, or life histories:

A growing problem with modern proliferation of devices is keeping track of documents, photos, music, email, web favourites, calendars/schedules, blogs, etc. As people store more and more information on their computers and across multiple electronic devices, tools such as Windows explorer and the desktop are rapidly becoming unusable. How can we design better alternatives to these tools that will help people save, track, find, remember, and reuse their personal information more efficiently? Consider possible targeted user groups or data types, such as personal digital photo collections, email, calendars/schedules, or newsgroups.

And interesting related problem is the notion of personal life histories. Imagine if your entire life was continually captured in electronic form, including continuous video/audio, communications, documents, etc. What new kinds of scenarios could this afford? How would people use this to find their lost keys, share experiences, manage their productivity, or any such a thing?

2. Visualizing inter-personal communications:

Continuous inter-personal communications are becoming central to the lives of younger generations. While it is useful to maintain contact with colleagues, friends, relatives for personal or work-related activities, it can also lead to overwhelming inundation of email, voicemail,instant messages, etc. Bogus communications (spam) is making the process even more tiring. Additional forms of communication, such as phone messaging, snail mail, instant messaging, web forums, and other devices, only add to the confusion. Maintaining multiple asynchronous conversions with many different people over long periods of time can overwhelm a person’s memory capacity.

How can we design better user interfaces that will help people communicate effectively, manage communication overload, track conversation history, find previous communications, and locate other people?

3. Intelligence analysis:

Government intelligence analysts must sift through massive amounts of information to 'connect the dots' and catch terrorists, such as with the recent London arrests. Generally they receive tons of snippets such as police reports, news items, telephone intercepts, emails, etc, that they must piece together to infer terrorist social networks, communication patterns, money flow, and the who/what/when/where of potential terror attacks.

4. High-resolution office:

Imagine the office (or dorm room) of the future, which is completely coated in high-resolution display. How can people's lives be improved? What problems do people have with current limited display capability? How can such a future environment offer a new 'desktop'? How will windows, attention, notifications, tasks, personal information, etc., be managed on such a large detailed display? For examples, see the GigaPixel Display.

5. Student recruiting information management:

Academic departments have difficulty maintaining information about its students and new recruits (typically potential graduate students). New solutions are needed that enable new recruits to express interest, faculty to maintain contact with recruits and share information with each other about recruits, and for students and faculty to manage students' academic experience while a and evaluate overall performance. Potential users arefaculty, admissions personnel, graduate applicants, and students.

6. Visualizing bioinformatics stories:

Biologists are attempting to reverse engineer the biological processes of living organisms. The goal is to learn how the genes, encoded in the DNA, react to stimuli and interact with other biomolecules to cause the behaviour of an organism. For example, by what process do Pine trees respond to and survive drought conditions? Potentially, this information could be used to cultivate more hearty trees. Biologists pursue answers to these questions by performing controlled scientific experiments on the organisms and genes. They must integrate and make sense of a variety of different types of information to attempt to derive answers.

7. The HCI of computer security:

With the waves of malicious attacks by hackers, viruses, and worms, keeping a networked computer system secure is a challenging task. Automated tools can detect obvious known intrusions, but vigilance by the computer user or administrator is the only defence against the rest. System hardening can prevent intrusions (e.g. unplugging the system!), but can also render the system unusable by its users. Enabling useful features for the user (such as file sharing), also opens holes for attack. Hence, users must monitor their system closely

to ward off intruders. Methods for monitoring system events, running processes, open ports, incoming and outgoing packets, communications between processes, user status, etc., are needed to enable more secure systems and greater levels of trust.

How can users or administrators maintain a close watch over the internals of their system or entire sub-network? Can visualization be used to monitor this diverse array of information? How can these tools be designed to enable users to maintain alertness while working on other tasks without overly disrupting their work? How can the tools support in depth analysis of potential intrusions?

8. Digital Library for InfoVis Demos:

The following resource provides researchers, students, and practitioners of visualization with convenient access to interesting visualization demonstration software. These demos are useful for communicating new visualization design ideas for many different kinds of data. However, the current static page is difficult to maintain, out of date, and limited in scalability. A better approach is needed that will enable researchers and developers to submit, share, browse, search, and download software demos. This can become a Digital Library for Information Visualization Demos.

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:

- Willingness to learn
- Self motivation
- Team work
- Communication skills and application of these skills to real scenarios
- Requirement of gathering, design and analysis, development and testing skills
- Analytical and Technical skills
- Computer skills
- Internet searching skills
- Information consolidation and presentation skills
- Role play
- 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 improve 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 Electronics and Communication Engineering is efficient leaders of repute, who can deal the real time problems with 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, leadership, and strategic management 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 Electronics and Communication Engineering also has emphasised subject

based skill training through lab practice, internship, project work, 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 recognized skill development and industry relationship as its very important activities. Therefore, the University-Industry Interaction and Skill Development Centre headed by a Senior Professor & Director has been established 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 various skill/certification programs identified are as follows:

- Big-data and Cloud Computing, Internet of Things (IOT), Xilinx, NS-2, Cadence, ANSYS, Advanced C C++ and Internals of LINUX/UNIX
- Red-Hat certified programs on LINUX
- Management related programs like SAP, ERP and Business Analytics.
- Open Source software/hardware, Software Testing
- Advanced networking based CISCO / Microsoft technology.
- Web designing, System administration,
- IBM certified programs.

The University has 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.

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OUR 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.

OUR MISSION

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

BROAD OBJECTIVES

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

DO'S AND DON'TS

DO'S

1. Maintain discipline and respect the rules and regulations of the university
2. Be regular and punctual to classes
3. Study regularly and submit assignments on time
4. Be respectful to your Teaches/friends and hostel staff/management.
5. Read the notice board (both at your college and the hostel) regularly.
6. Utilize your Personal Computer for educational purpose only.
7. Follow the code of conduct.
8. Visit Health Center on the campus whenever you are unwell.
9. Be security conscious and take care of your valuables especially Cash, Mobile Phones, Laptop andother valuables.
10. Carry your valuables along with you whenever you proceed on leave/vacation.
11. Use electric appliances, lights and water optimally.
12. Keep the campus clean and hygienic.
13. Use decent dressing.

DON'TS

1. Ragging inside / outside the campus.
2. Possession of Fire arms and daggers etc.
3. Use of Alcohols, Toxic drugs, sheesha, gutkha and hashish/heroin etc.
4. Use of Crackers, explosives and ammUNIT - ion etc.
5. Smoking and keeping any kind of such items.
6. Misusing college & hostel premises/facilities for activities other than studies.
7. Playing loud music in the room which may disturb studies of colleagues / neighbours.
8. Making noise and raising slogans.
9. Keeping electrical appliances, other than authorized ones.
10. Involvement in politics, ethnic, sectarian and other undesirable activities.
11. Proxy in any manner.
12. Use of mobiles in the academic areas.

Note:
1. Rules are revised / reviewed as and when required.
2. Healthy suggestions are welcome for betterment of Institution