School of Computing and Information Technology

B.Tech. Computer Science and Information Technology

2021-25 Batch

HANDBOOK

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

REVA UNIVERSITY
Bengaluru, India

SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

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Chancellor's Message

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

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

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

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

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

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

Dr. P. Shyama Raju
The Founder and Honorable Chancellor, REVA University

Vice-Chancellor 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 endeavour 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.M.Dhanamjaya

Vice-Chancellor, REVA University

Director Message

I congratulate and welcome all the students to the esteemed school of Computing and Information Technology (CS& IT)). You are in the right campus to become a computer technocrat. The rising needs of automation in Industry 4.0 and improvising living standards have enabled rapid development of computer software and hardware technologies. Thus providing scope and opportunity to generate more human resources in the areas of computers and IT. The B.Tech, M.Tech and Ph.D. programs offered in the school are designed to cater the requirements of industry and society. The curriculum is designed meticulously in association with persons from industries (TCS, CISCO, AMD, MPHASIS, etc.), academia and research organizations (IISc, IIIT, Florida University, Missouri S & T University, etc.). 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 in the curriculum focus on skill development, innovation and entrepreunership.

This handbook presents the B.Tech in Computer Science and Information Technology program curriculum. The program is of 4 years duration and split into 8 semesters. The courses are classified into foundation core, hard core, and soft core courses. Hard core courses represent fundamentals study requirements of B.Tech CSIT program. Soft courses provide flexibility to students to choose the options among several courses as per the specialization, such as, Artificial Intelligence, Fuzzy Logic and Systems, Cognitive science and predictive analytics etc. Theoretical foundations of engineering, science, and Information Science are taught in first two and half years. Later, advanced courses and recent technologies are introduced in subsequent semesters for pursuing specialization. The important features of the B.Tech CSIT are as follows:

1) Choice based course selection and teacher selection, 2) Studies in emerging areas like Machine Learning, Artificial Intelligence, Data Analytics, Cloud Computing, Python/R Programming, NLP, IoT and Cloud security, 3) Short and long duration Internships 4) Opportunity to pursue MOOC course as per the interest in foundation and soft core courses, 5) Attain global and skill certification as per the area of specialization, 6) Self-learning components, 7) Experiential, practice, practical, hackathons, and project based learning, 8) Mini projects and major projects with research orientation and publication, 9) Soft skills training and 10) Platform for exhibiting skills in cultural, sports and technical activities through clubs and societies. The school has well qualified faculty members in the various areas of computing and IT including cloud computing, security, IOT, AI, ML and DL, software engineering, computer networks, information technology, cognitive computing, block chain technology etc. State of art laboratories are available for the purpose of academics and research.

Dr. Mallikarjun Kodabagi

Director, School of Computing and Information Technology

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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, set up in 2002 with the objective of promoting, establishing and conducting academic activities in the fields of Arts, Architecture, Commerce, Education, Engineering, Environmental Science, Legal Studies, Management and Science & Technology, among others. In furtherance of these objectives, the Trust has set up the REVA Group of Educational Institutions comprising of REVA Institute of Technology & Management (RITM), REVA Institute of Science and Management (RISM), REVA Institute of Management Studies (RIMS), REVA Institute of Education (RIE), REVA First Grade College (RFGC), REVA Independent PU College at Kattigenahalli, Ganganagar and Sanjaynagar and now REVA University. Through these institutions, the Trust seeks to fulfil 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 dated 7thFebruary, 2013. The University is recognised by UGC under Sec 2 (f) and empowered under Sec.22 of the UGC Act, 1956 to award degrees in any branch of knowledge. The Programs of the University are approved by All India Council for Technical Education (AICTE), University Grants Commission (UGC), Bar Council of India (BCI), and Council of Architecture (COA) .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, auditoriums, seminar halls, custom-built teaching facilities, fully air-conditioned library and central computer centre, 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 26 Post Graduate Degree programs, 35 Undergraduate 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 19 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 on 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 importance 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, Big data analytics, Information Retrieval,VLSIand Embedded Systems, Wireless Sensor Networks, Artificial Intelligence, 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 Lighting, 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, Nano 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 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 and Dean, and supported by well experienced Trainers, Counsellors and Placement Officers. The University also has University-Industry Interaction (UIIC) and Skill Development Centre headed by a Senior Professor and 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, Entrepreneurship activities, and IPR workshops. UIIC has established REVA NEST, an incubation centre for promoting start up industries.

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, University of California Berkeley, Arkansas State University, Columbia University, 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 I.I.Sc., 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 on 6th January of every year in presence of dignitaries, faculty members and students gathering. The first "**REVA Life Time Achievement Award**" for the year 2015 has been awarded to Shri. Kiran Kumar, Chairman ISRO, followed by Shri. Shekhar Gupta, renowned Journalist for the year 2016, Dr K J Yesudas, renowned play back singer for the year 2017. REVA also introduced "**REVA Award of Excellence"** in the year 2017 and the first Awardee of this prestigious award is Shri Ramesh Aravind, Actor, Producer, Director, Screen Writer and Speaker.

REVA organizes 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 REVOTHASAVA 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 ShubhaVidaaya, - Graduation Day for the final year students of all the programs, wherein, the outgoing students are felicitated and are addressed by eminent personalities to take their future career in a right spirit, to be the good citizens and dedicate themselves to serve the society and make a mark in their respective spheres of activities. During this occasion, the students who have achieved top ranks and won medals and prizes in academic, cultural and sports activities are also recognized 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 every day to students, faculty members, administrative staff and their family members and organizes yoga camps for villagers around.

Within short span of time, REVA University has been recognised as a fast growing university imparting quality higher education to the youth of the country and received many awards, ranks, and accolades from various agencies, institutions at national and international level. These include: Asia's Greatest 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, 6TH Rank in the Super Excellence category by GHRDC, 6TH 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.

REVA UNIVERSITY

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

Mission

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

Objectives

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

ABOUT THE SCHOOL OF COMPUTING AND INFORMATION TECHNOLOGY

The School has a rich blend of experienced and committed 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 four full-time undergraduate programs, B.Tech in Computer Science and Engineering (Artificial Intelligence and Machine Learning), B.Tech in Computer Science and Information Technology, B.Tech in Computer Science and Systems Engineering, B.Tech in Information Science and Engineering and the following two postgraduate programs: M.Tech in Artificial Intelligence and M.Tech in Cyber security. In addition, the school has a research centre in which students can conduct cutting edge research leading to a Ph.D degree.Curriculum 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 aims to create quality 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 Artificial Intelligence and Information Technology 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.

School Vision

To produce excellent quality technologists and researchers of global standards in computing 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, strong moral and ethical values.

School Mission

- To create state of the art computing labs infrastructure and research facilities in information technology.
- To provide student-centric learning environment in Computing and Information technology through innovative pedagogy and education reforms.
- To encourage research, innovation and entrepreneurship in computing and information technology through industry/academia collaborations and extension activities
- Organize programs through club activities for knowledge enhancement in thrust areas of information technology.
- To enhance leadership qualities among the youth and enrich personality traits, promote patriotism, moral and ethical values.

Quality Policy

The School of computing and Information Technology is committed to excellence through following policies.

1. Impart quality education by providing state of art curriculum, experimental learning, and state of the art labs.
2. Enhance skill set of faculty members through faculty development programs and interaction with academia and industries.
3. Inculcate the competency in software/hardware design and programming through co-curricular activities like Hackathon, Project exhibition, Internship and Entrepreneurship Program.
4. Provide soft skill and skill development training for personality development and better placement.
5. Promote innovation and research culture among students and support faculty members for better research and development activity.

MEMBERS OF BOARD OF STUDIES

Sl. No.	Name		Correspondence Address
1	**Dr. Mallikarjun M Kodabagi** Professor and Director School of Computing and Information Technology REVA University	Chairperson	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
2.	**Dr. Vishwanath R Hulipalled** Professor School of C&IT	Member	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
3.	**Dr. Udaya Rani V** Professor School of C&IT	Member	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
4.	**Dr. Parthasarathy G** Associate Professor, School of C&IT	Member	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
5.	**Dr. M.Thurai Pandian** Associate Professor, School of Computing and Information Technology	Member	Rukmini Knowledge Park, Kattigenahalli, Yelahanka, Bengaluru, Karnataka 560064
6.	**SreenivasaRamanujamKanduri** Academic Relationship Manager, TCS	Member (Industry Expert)	Academic Relationship Manager, Tata Consultancy Services, Bangalore.
7.	**Dr. Sundar K S** Associate Vice-President & Head, IMS Academy at Infosys	Member (Industry Expert)	Associate Vice-President & Head, IMS Academy at Infosys, Mysore
8.	**Dr. RamabrahmamGunturi** Consultant, TCS	Industry Expert	Tata Consultancy Services, Hyderabad.
9.	**Dr. S. A. Angadi** Professor, School of CSE,VTU	Academic Expert	Professor, School of CSE Visvesvaraya, Belagavi
10.	**Dr. Bharati Arakeri** Professor**,** School of CSE BMSIT, Bangalore.	Academic Expert	Professor**,** School of CSE BMSIT, Bangalore
11.	**Abhishek Revanna Swamy** Associate Project Manager, Robert Bosch	Alumni-Member	Associate Project Manager, Robert Bosch, Bangalore
12.	**Prasad Chitta** Solution Architect, TCS Bangalore	Member (Industry Expert)	Solution Architect, TCS Bangalore

B. Tech Computer Science and Information Technology

Program 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 technology 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 program to create motivated, innovative, creative and thinking graduates to fill ICT positions across sectors who can conceptualize, design, analyze, 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 program, 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 program,

advanced teaching and learning resources and experience of the faculty members with their strong connections with ICT sector makes this program 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.

REVA University Academic Regulations

B. Tech Degree Programs

(Applicable for the programs offered from 2021-22 Batch)

(Framed as per the provisions under Section 35 (ii), Section 7 (x) and Section 8 (xvi) & (xxi) of the REVA University Act, 2012)

Title and Commencement:

These Regulations shall be called "REVA University Academic Regulations – B. Tech, Degree Program 2020-21 Batch subject to amendments from time to time by the Academic Council on recommendation of respective Board of Studies and approval of Board of Management

These Regulations shall come into force from the date of assent of the Chancellor.

The Programs:

These regulations cover the following B. Tech, Degree programs of REVA University offered during 2020-21

B. Tech in:

Bioelectronics Engineering
Civil Engineering
Computer Science and Engineering
Computer Science and Information Technology
Computer Science and Systems Engineering
Computer Science and Engineering (AI and ML)
Electrical and Electronics Engineering
Electrical and Computer Engineering
Electronics and Communication Engineering
Electronics and Computer Engineering
Information Science and Engineering
Mechanical Engineering
Mechatronics Engineering

Duration and Medium of Instructions:

Duration: The duration of the B. Tech degree program shall be FOUR years comprising of EIGHT Semesters. A candidate can avail a maximum of 16 semesters - 8 years as per double duration norm, in one stretch to complete B. Tech degree, including blank semesters, if any. Whenever a candidate opts for blank semester, he/she has to study the prevailing courses offered by the School when he/she resumes his/her studies.

The medium of instruction shall be English.

Definitions:

Course: "Course" means a subject, either theory or practical or both, listed under a program; Example: "Fluid Mechanics" in B.Tech Civil Engineering program, Engineering Thermodynamics in B.Tech, Mechanical program are examples of courses to be studied under respective programs.

Every course offered will have three components associated with the teaching-learning process of the course, namely:

    L   Lecture

    T   Tutorial

    P   Practice

Where:

L stands for Lecture session consisting of classroom instruction.

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

P stands for Practice session and it consists of Hands on Experience / Laboratory Experiments / Field Studies / Case Studies / Project Based Learning or Course end Project/Self Study/ Online courses from listed portals that equip students to acquire the much required skill component.

4.2 Classification of Courses

Courses offered are classified as: Core Courses, Open Elective Courses, Project work/Dissertation

Core Course: A course which should compulsorily be studied by a candidate choosing a particular program of study.

Foundation Course (FC): The foundation Course is a mandatory course which should be completed successfully as a part of graduate degree program irrespective of the program of study.

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

Soft Core Course (SC) (also known as Professional Elective Course)

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

Open Elective Course (OE):

An elective course chosen generally from other discipline / subject, with an intention to seek exposure to the basics of subjects other than the main discipline the student is studying is called an Open Elective Course.

Project Work / Dissertation:

Project work / Dissertation work is a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problems to solve a multivariable or complex engineering problems. The project will be conducted in two phases, Phase-I (7th Semester), consists of literature survey, problem identification, formulation and

methodology. In Phase-II (8th Semester) student should complete the project work by designing or creating an innovative process or development of product as an outcome. A project work carrying TWO, FOUR or SIX credits is called Minor Project work / Dissertation. A project work of SIX, EIGHT, or TEN, credits is called Major Project work / Dissertation. A Minor Project work may be a hard core or a Soft Core as decided by the BOS / concerned. But the Major Project shall be Hard Core.

"Program" means the academic program leading to a Degree, Post Graduate Degree, Post Graduate Diploma Degree or such other degrees instituted and introduced in REVA University.

Eligibility for Admission:

5.1. The eligibility criteria for admission to B. Tech Program of 4 years (8 Semesters) is given below:

Sl. No.	Program	Duration	Eligibility
1	Bachelor of Technology (B. Tech)	4 Years (8 Semesters)	Passed 10+2 examination with Physics and Mathematics as compulsory subjects, along with any one of the following subjects, namely, Chemistry, Bio-Technology, Computer Science, Biology, Electronics and Technical Vocational subject Obtained at least 45% marks (40% in case of candidate belonging to SC/ST category) in the above subjects taken together.
2	Bachelor of Technology (B. Tech)	Lateral entry to second year	(A) Passed Diploma examination from an AICTE approved Institution with at least 45% marks (40% in case of candidates belonging to SC/ST category) in appropriate branch of Engineering / Technology. (B) Passed B. Sc Degree from a recognized University as defined by UGC, with at least 45% marks (40% in case of candidates belonging to SC/ST category) and passed XII standard with mathematics as a subject. (C) Provided that in case of students belonging to B. Sc. Stream, shall clear the subjects of Engineering Graphics / Engineering Drawing and Engineering Mechanics of the first year Engineering program along with the second year subjects.
			(D) Provided further that, the students belonging to B. Sc. Stream shall be considered only after filling the seats in this category with students belonging to the Diploma stream. (E) Provided further that student, who have passed Diploma in Engineering & Technology from an AICTE approved Institution or B. Sc., Degree from a recognized University as defined by UGC, shall also be eligible for admission to the first year Engineering Degree courses subject to vacancies in the first year class in case the vacancies at lateral entry are exhausted. However the admissions shall be based strictly on the eligibility criteria as mentioned in A, B, D, and E above.

3	Bachelor of Technology (B. Tech)	Lateral entry to fourth year (final year)	(F) Any candidate with genuine reason from any University / Institution in the country upon credit transfer could be considered for lateral admission to the respective semester in the concerned branch of study, provided he/she fulfils the University requirements.
5	B. Tech. in Bioelectronics		Pass in PUC /10+2 examination with Physics, Biology/Biotechnology as compulsory along with at least one of the Chemistry/Mathematics / Computer Science / Electronics obtained minimum 45% marks (40% in case of candidates belonging to SC / ST category) in the above subjects taken together of any board recognized by the respective State Government / Central Government / Union Territories or any other qualification recognized as equivalent there to.

 Provided further that the eligibility criteria are subject to revision by the Government Statutory Bodies, such as AICTE, UGC from time to time.

Courses of Study and Credits

Each course of study is assigned with certain credit value

Each semester is for a total duration of 20 weeks out of which 16 weeks dedicated for teaching and learning and the remaining 4 weeks for final examination, evaluation and announcement of results

The credit hours defined as below

In terms of credits, every one hour session of L amounts to 1 credit per Semester and a minimum of two hour session of T or P amounts to 1 credit per Semester or a three hour session of T / P amounts to 2 credits over a period of one Semester of 16 weeks for teaching-learning process.

Credit = 13 credit hours spread over 16 weeks or spread over the semester

The total duration of a semester is 20 weeks inclusive of semester-end examination.

The following table describes credit pattern

Table -2: Credit Pattern					
Lectures (L)	Tutorials (T)	Practice (P)	Credits (L:T:P)	Total Credits	Total Contact Hours
4	2	0	4:1:0	5	6
3	2	0	3:1:0	4	5
3	0	2	3:0:1	4	5
2	2	2	2:1:1	4	6
0	0	6	0:0:3	3	6
4	0	0	4:0:0	4	4

The concerned BoS will choose the convenient Credit Pattern for every course based on size and nature of the course

Different Courses of Study:
Different Courses of Study are labeled as follows:
Core Course (CC)

Foundation Course (FC)

Hard Core Course (HC)

Soft Core Course (SC)

Open Elective Course (OE)

Project Work / Dissertation:

A project work carrying TWO, FOUR or SIX credits is called Minor Project work / Dissertation. A project work of EIGHT, TEN, TWELVE or SIXTEEN credits is called Major Project work / Dissertation. A Project work may be a hard core or a Soft Core as decided by the BoS / concerned.

These are defined under Section 4 of these regulations.

Credits and Credit Distribution

A candidate has to earn 160 credits for successful completion of B. Tech degree with the distribution of credits for different courses as given in table below:

Course Type	Credits (Range) For B. Tech Degree (8 Semesters)
Foundation Core Course	A minimum of 06 but not exceeding 12
Hard Core Course	A minimum of 118 but not exceeding 121
Soft Core Course	A minimum of 15 but not exceeding 21
Open Elective	A minimum of 04 but not exceeding 12

8.2. The concerned BOS based on the credits distribution pattern given above shall prescribe the credits to various types of courses and shall assign title to every course including project work, practical work, field work, self-study elective, as Foundation Course (FC), Hard Core (HC) or Soft Core (SC), Open Elective (OE).

8.3.   Every course including project work, practical work, field work, self-study elective should be entitled as Foundation Course (FC), Hard Core (HC) or Soft Core (SC) or Open Elective (OE) or Core Course (CC) by the BoS concerned. However, following shall be the Foundation Courses with credits mentioned against them, common to all branches of study.

Sl. No.	Course Title	Number of Credits
	Foundation Courses	
1	English for Technical Communication / Communication Skills	2
2	Environmental Studies / Environmental Science	2
3	Indian Constitution and Professional Ethics	2
4	MOOC / Internship /Soft Skill Training	6-15

8.4. The concerned BOS shall specify the desired Program Educational Objectives, Program Outcomes, Program Specific Outcomes and Course Outcomes while preparing the curriculum of a particular program.

8.5.　A candidate can enrol for a maximum of 28 credits and a minimum of 19 credits per Semester. However he / she may not successfully earn a maximum of 28 credits per semester. This maximum of 28 credits does not include the credits of courses carried forward by a candidate.

Only such full time candidates who register for a minimum prescribed number of credits in each semester from I semester to VIII semester and complete successfully 160 credits in 8 successive semesters shall be considered for declaration of Ranks, Medals, Prizes and are eligible to apply for Student Fellowship, Scholarship, Free ships, and such other rewards / advantages which could be applicable for all full time students and for hostel facilities.

Add- on Proficiency Certification:

To acquire Add on Proficiency Certification a candidate can opt to complete a minimum of 4 extra credits either in the same discipline /subject or in different discipline / subject in excess to 160 credits for the B. Tech Degree program.

Add on Proficiency Diploma / Minor degree/ Honor Degree:

To acquire Add on Proficiency Diploma/ Minor degree/ Honor Degree:, a candidate can opt to complete a minimum of 18 extra credits either in the same discipline /subject or in different discipline / subject in excess to 160 credits for the B. Tech Degree program.

The Add on Proficiency Certification / Diploma/ Minor degree/ Honor Degree: so issued to the candidate contains the courses studied and grades earned.

Assessment and Evaluation

The Scheme of Assessment will have two parts, namely;

Internal Assessment (IA); and

Semester End Examination (SEE)

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

The 50 marks of internal assessment shall comprise of:

Internal Test	30 marks
Assignments / Seminars / Model Making / Integrated Lab / Project Based Learning / Quizzes etc.	20 marks

There shall be two Internal Tests conducted as per the schedule announced below. The students shall attend both the Tests compulsorily.

1st test is conducted for 15 marks during 6th week of the semester;

2nd test is conducted for 15 marks during 12th week of the of the semester;

The coverage of syllabus for the said tests shall be as under:

Question paper of the 1st test should be based on first 40 %of the total syllabus;

Question paper of the 2nd test should be based on second 40 %of the total syllabus;

An assignment must be designed to cover the last 20% of the syllabus.

There shall be one Assignment / Project Based Learning / Field Visit / Quiz test carrying 20 marks covering the last 20% of the syllabus.

The Semester End Examination for 50 marks shall be held in the 18th and 19th week of the beginning of the semester and the syllabus for the semester end examination shall be entire syllabus.

A test paper is set for a maximum of 30 marks to be answered in 1 hour duration. A test paper can have 4 main questions. Each main question is set for 10 marks. The main question can have 2-3 sub questions all totalling 10 marks. Students are required to answer any three main questions. Each question is set using Bloom's verbs. The questions must be set to assess the students outcomes described in the course document.

The question papers for internal test shall be set by the internal teachers who have taught the course. If the course is taught by more than one teacher all the teachers together shall devise a common question paper(s). However, these question papers shall be scrutinized by the Question Paper Scrutiny Committee to bring in the uniformity in the question paper pattern and as well to maintain the necessary standards.

The evaluation of the answer scripts shall be done by the internal teachers who have taught the course and set the test paper.

Assignment/seminar/Project based learning/simulation based problem solving/field work should be set in such a way, students be able to apply the concepts learnt to a real life situation and students should be able to do some amount self-study and creative thinking. While setting assignment care should be taken such that the students will not be able to plagiarise the answer from web or any other resources. An assignment / Quiz can be set for a maximum of 20. Course instructor at his/her discretion can design the questions as a small group exercise or individual exercise. This should encourage collaborative learning and team learning and also self-study.

Internal assessment marks must be decided well before the commencement of Semester End examinations.

Semester End Examination: The Semester End Examination is for 50 marks shall be held in the 18th and 19th week of the semester and the entire course syllabus must be covered while setting the question paper.

Semester End Examination paper is set for a maximum of 100 marks to be answered in 3 hours duration. Each main question be set for a maximum of 25 marks, main questions can have a 3-4 sub questions. A total of 8 questions are set so that students will have a choice.   Each question is set using Bloom's verbs. The questions must be set to assess the students outcomes described in the course document. (Please note question papers have to be set to test the course outcomes)

There shall be three sets of question papers for the semester end examination of which one set along with scheme of examination shall be set by the external examiners and two sets along with scheme of examination shall be set by the internal examiners. All the three sets shall be scrutinized by the Board of Examiners. It shall be responsibility of the Board of Examiners particularly Chairman of the BOE to maintain the quality and standard of the question papers and as well the coverage of the entire syllabus of the course.

There shall be single evaluation by the internal teachers who have taught the subject. However, there shall be moderation by the external examiner. In such cases where sufficient number of external examiners are not available to serve as moderators internal senior faculty member shall be appointed as moderators.

Board of Examiners, question paper setters and any member of the staff connected with the examination are required to maintain integrity of the examination system and the quality of the question papers.

There shall also be an Program Assessment Committee (PAC) comprising at-least 3 faculty members having subject expertise who shall after completion of examination process and declaration of results review the results sheets, assess the performance level of the students, measure the attainment of course outcomes, program outcomes and assess whether the program educational objectives are achieved and report to the Director of the School. The Examination Review Committee shall also review the question papers of both Internal Tests as well Semester End Examinations and submit reports to the Director of the respective School about the scope of the curriculum covered and quality of the questions.

The report provided by the Examination Review Committee shall be the input to the Board of Studies to review and revise the scheme of instruction and curriculum of respective program

During unforeseen situation like the Covid-19, the tests and examination schedules, pattern of question papers and weightage distribution may be designed as per the convenience and suggestions of the board of examiners in consultation with COE and VC

University may decide to use available modern technologies for writing the tests and SEE by the students instead of traditional pen and paper

Any deviations required to the above guidelines can be made with the written consent of the Vice Chancellor

Online courses may be offered as per UGC norms.

For online course assessment guidelines would be as follows:

If the assessment is done by the course provider, then the School can accept the marks awarded by the course provider and assign the grade as per REVA University norms.

If the assessment is not done by the course provider then the assessment is organized by the concerned school and the procedure explained in the regulation will apply

In case a student fails in an online course, s/he may be allowed to repeat the course and earn the required credits

IAs for online courses could be avoided and will remain the discretion of the School.

The online platforms identified could be SWAYAM, NPTEL, Coursera, Edx.org, Udemy, Udacity and any other internationally recognized platforms like MIT online, Harvard online etc.

Utilization of one or two credit online courses would be:

4 week online course – 1 credit

8 week online course / MOOC – 2 credits

12 week online course / MOOC – 3 credits

Summary of Internal Assessment, Semester End Examination and Evaluation Schedule is provided in the table given below.

Summary of Internal Assessment and Evaluation Schedule

Sl. No.	Type of Assessment	when	Syllabus Covered	Max Marks	Reduced to	Date by which the process must be completed
1	Test-1	During 6th	First 40%	30	15	7th week

		week				
2	Test -2	During 12th Week	Second 40%	30	15	13th Week
3	Assignment / Quiz	15th Week	Last 20%	20	20	16th Week
4	SEE	18/19th Week	100%	100	50	20th Week

Assessment of Students Performance in Practical Courses

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

a) Knowledge of relevant processes;

b) Skills and operations involved;

c) Results / products including calculation and reporting.

The 50 marks meant for Internal Assessment (IA) of the performance in carrying out practical shall further be allocated as under:

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

10.2   The 50 marks meant for Semester End Examination (SEE), shall be allocated as under:

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

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

For MOOC and Online Courses assessment shall be decided by the BOS of the School.

For > 3 credit courses

i	IA-I	25 marks

ii	IA-2	25 marks
iii	Semester end examination by the concern school board (demo, test, viva voice etc.)	50 marks
Total		**100 marks**

For 1 & 2 credit courses

i	IA-I	15 marks
ii	IA-2	15 marks
iii	Semester end examination by the concern school board (demo, test, viva voice etc.)	20 marks
Total		**50 marks**

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

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

Component – I	Periodic Progress and Progress Reports (25%)
Component – II	Demonstration and Presentation of work (25%)
Component – III	Evaluation of Report (50%)

Requirements to Pass a Course:

A candidate's performance from IA and SEE will be in terms of scores, and the sum of IA and SEE scores will be for a maximum of 100 marks (IA = 50 , SEE = 50) and have to secure a minimum of 40% to declare pass in the course. However, a candidate has to secure a minimum of 25% (13 marks) in Semester End Examination (SEE) which is compulsory.

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

Marks, P	Grade, G	Grade Point (GP=V x G)	Letter Grade
90-100	10	v*10	O
80-89	9	v*9	A+
70-79	8	v*8	A
60-69	7	v*7	B+
55-59	6	v*6	B
50-54	5.5	v*5.5	C+
40-49	5	v*5	C
0-39	0	v*0	F
ABSENT			AB

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

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

Computation of SGPA and CGPA

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

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student in a given semester, i.e : SGPA (Si) = $\sum(C_i \times G_i) / \sum C_i$ where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

Illustration for Computation of SGPA and CGPA

Illustration No. 1

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade)
Course 1	3	A+	9	3X9=27
Course 2	3	A	8	3X8=24
Course 3	3	B+	7	3X7=21
Course 4	4	O	10	4X10=40
Course 5	1	C	5	1X5=5
Course 6	2	B	6	2X6=12
Course 7	3	O	10	3X10=30
	19			159

Thus, SGPA = 159 ÷ 19 = 8.37

Illustration No. 2

Course	Credit	Grade letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	4	A	8	4X8=32
Course 2	4	B+	7	4X7=28
Course 3	3	A+	9	3X9=27
Course 4	3	B+	7	3X7=21
Course 5	3	B	6	3X6=18
Course 6	3	C	5	3X5=15
Course 7	2	B+	7	2X7=21
Course 8	2	O	10	2X10=20
	24			175

Thus, SGPA = 175 ÷ 24 = 7.29

Illustration No.3

Course	Credit	Grade Letter	Grade Point	Credit Point (Credit x Grade point)
Course 1	4	O	10	4 x 10 = 40
Course 2	4	A+	9	4 x 9 = 36
Course 3	3	B+	7	3 x 7 = 21
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	B+	7	3 x 7 = 21
Course 7	2	A+	9	2 x 9 = 18
Course 8	2	A+	9	2 x 9 = 18
	24			**199**

Thus, SGPA = 199 ÷ 24 = 8.29

Cumulative Grade Point Average (CGPA):

Overall Cumulative Grade Point Average (CGPA) of a candidate after successful completion of the required number of credits (160) for B. Tech degree in Engineering & Technology is calculated taking into account all the courses undergone by a student over all the semesters of a program, i. e : CGPA = $\sum(C_i \times S_i) / \sum C_i$

Where S_i is the SGPA of the ith semester and C_i is the total number of credits in that semester.

Illustration:

CGPA after Final Semester

Semester (ith)	No. of Credits (Ci)	SGPA (Si)	Credits x SGPA (Ci X Si)
1	19	6.83	19 x 6.83 = 129.77
2	21	7.29	21 x 7.29 = 153.09
3	22	8.11	22 x 8.11 = 178.42
4	22	7.40	22 x 7.40 = 162.80
5	22	8.29	22 x 8.29 = 182.38
6	22	8.58	22 x 8.58 = 188.76
7	22	9.12	22 x 9.12 = 200.64
8	10	9.25	10 x 9.25 =92.50
Cumulative	**160**		**1288.36**

Thus, CGPA = 19x6.83+21x7.29+22x8.11+22x7.40+22x8.29+22x8.58+22x9.12+10x9.25 = 8.05

Conversion of grades into percentage:

Conversion formula for the conversion of CGPA into Percentage is:
Percentage of marks scored = CGPA Earned x 10
Illustration: CGPA Earned 8.05 x 10=80.5

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

Classification of Results

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

CGPA	Grade (Numerical Index) G	Letter Grade	Performance	FGP Qualitative Index
9 >= CGPA 10	10	O	Outstanding	Distinction
8 >= CGPA < 9	9	A+	Excellent	Distinction
7 >= CGPA < 8	8	A	Very Good	First Class
6 >= CGPA < 7	7	B+	Good	First Class
5.5> = CGPA < 6	6	B	Above average	Second Class
>5 CGPA< 5.5	5.5	C+	Average	Second Class
>4 CGPA<5	5	C	Satisfactory	Pass
< 4 CGPA	0	F	Unsatisfactory	Unsuccessful

.

Overall percentage=10*CGPA

Provisional Grade Card: The tentative / provisional grade card will be issued by the Controller of Examinations at the end of every semester indicating the courses completed successfully. The provisional grade card provides Semester Grade Point Average (SGPA).

Final Grade Card: Upon successful completion of B. Tech Degree a Final Grade card consisting of grades of all courses successfully completed by the candidate will be issued by the Controller of Examinations.

14.   Attendance Requirement:

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

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

14.3   Any student with less than 75% of attendance in aggregate of all the courses including practical courses / field visits etc, during a semester shall not be permitted to appear to the end semester examination and such student shall seek re-admission

15.   Re-Registration and Re-Admission:

15.1   In case a candidate's class attendance in aggregate of all courses in a semester is less than 75% or as stipulated by the University, such a candidate is considered as dropped the semester and is not allowed to appear for semester end examination and he / she shall have to seek re-admission to that semester during subsequent semester / year within a stipulated period.

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

Absence during Internal Test:

In case a student has been absent from an internal tests due to the illness or other contingencies he / she may give a request along with necessary supporting documents and certification from the concerned class teacher / authorized personnel to the concerned Director of the School, for conducting a separate internal test. The Director of the School

may consider such request depending on the merit of the case and after consultation with course instructor and class teacher, and arrange to conduct a special internal test for such candidate(s) well in advance before the Semester End Examination of that respective semester. Under no circumstances internal tests shall be held / assignments are accepted after Semester End Examination.

17.   Provision for Appeal

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

18.   **Grievance Committee:**

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

The Controller of Examinations - Ex-officio Chairman / Convener

One Senior Faculty Member (other than those concerned with the evaluation of the course concerned) drawn from the school / department/discipline and/or from the sister schools / departments/sister disciplines – Member.

One Senior Faculty Members / Subject Experts drawn from outside the University school / department – Member.

Eligibility to Appear for Semester End Examination (SEE)

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

Provision for Supplementary Examination

In case a candidate fails to secure a minimum of 25% (13 marks) in Semester End Examination (SEE) and a minimum of 40% marks together with IA and SEE to declare pass in the course, such candidate shall seek supplementary examination of only such course(s) wherein his / her performance is declared unsuccessful. The supplementary examinations are conducted after the announcement of even semester examination results. The candidate who is unsuccessful in a given course(s) shall appear for supplementary examination of odd and even semester course(s) to seek for improvement of the performance.

Provision to Carry Forward the Failed Subjects / Courses:

The student who has failed in a maximum of 4 courses in odd and even semesters together shall move to next semester of succeeding year(s) of study till 8th semester. And he / she shall appear for Semester End examination of failed courses of previous semesters concurrently with odd semester end examinations and / or even semester end examinations of current year of study.

Examples:-

Student "A" has failed in 1 Course in First Semester and 3 Courses in Second Semester. He / she is eligible to seek admission for Third Semester and appear for Semester End Examination of 1 failed Course of First Semester

concurrently with Third Semester end examination. Likewise, he / she is eligible to appear for Semester End Examination of 3 failed Courses of Second Semester concurrently with Fourth Semester end examination.

Student "B" has failed in 2 Courses of First Semester and 2 Courses in Fourth Semester and has passed in all Courses of First and Second Semesters. He / she is eligible to seek admission to Fifth Semester and appear for Semester End Examination of 2 failed Courses of First Semester concurrently with Fifth Semester end examination. Likewise he / she is eligible to appear for Semester End Examination of 2 failed Courses of Fourth Semester concurrently with Sixth Semester end examination.

Student "C" has failed in one course in Second Semester one course in third semester and two courses in fifth semester and has cleared all other courses from first semester to Sixth Semester. He / She has also passed all the courses of First to Sixth Semesters. Student "C" is eligible to seek admission for Seventh Semester and appear for Semester End Examination of one failed Course of Second Semester, one course of third semester and two courses in fifth semester concurrently with Seventh Semester end examination. However, he / she has to pass all the failed courses of Second Semester, Third Semester and Fifth Semester along with Seventh and Eighth Semesters courses to earn B. Tech Degree.

Student "D" failed in three courses in first semester and one course in second semester, but has passed in all the courses of second to sixth semester. Student "D" is also eligible to seek admission for 7th Semester and appear for Semester End Examination of 3 failed courses of 1st Semester and one course of second semester concurrently with 7th Semester and 8th semester end examinations. However, he / she has to pass three failed courses of first semester and one failed course of second semester along with Seventh and Eighth Semester courses to earn B. Tech Degree.

The Student failed in any course(s) in any of the first to eight semester has to pass all the failed courses of all Semesters within the double duration to earn B. Tech Degree failing which he / she has to seek re-admission to the program afresh.

Challenge Valuation:

a) A student who desires to apply for challenge valuation shall obtain a photo copy of the answer script(s) of semester end examination by paying the prescribed fee within 10 days after the announcement of the results. He / She can challenge the grade awarded to him/her by surrendering the grade card and by submitting an application along with the prescribed fee to the Controller of Examinations within 10 days after the announcement of the results. This challenge valuation is only for semester end examination.

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

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

All assessments must be done by the respective Schools as per the guidelines issued by the Controller of Examinations. However, the responsibility of announcing final examination results and issuing official transcripts to the students lies with the office of the Controller of Examinations.

School of Computing and Information Technology
Scheme of Instructions (2021 – 2025 Batch)
B. Tech CS & IT

I SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/ SC/ OE	L	T	P	Credits	Contact Hours/ Week
1	B20AS0105	Multivariable Calculus and Linear Algebra	HC	3	0	0	3	3
2	B20EE0101	Basics of Electrical and Electronics Engineering	HC	3	0	1	4	5
3	B20CI0101	Introduction to Python Programming	FC	2	0	1	3	4
4	B20AS0104	Engineering Chemistry	HC	3	0	0	3	3
		TOTAL		**11**	**0**	**2**	**13**	**15**
		Practical /Term Work / Practice Sessions /MOOCs						
5	B20ME0102	Design Thinking	FC	1	0	1	2	3
6	B20AS0109	Biology for Engineers	FC	1	0	0	1	1
7	B20ME0101	Computer Aided Engineering Drawing	HC	2	0	1	3	4
		TOTAL		**4**	**0**	**2**	**6**	**8**
		TOTAL SEMESTER CREDITS					**19**	
		TOTAL CUMULATIVE CREDITS					**19**	
		TOTAL CONTACT HOURS					**23**	

II SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/ SC/ OE	L	T	P	Credits	Contact Hours/ Week
1	B20AS0204	Probability and Statistics	HC	4	0	0	4	4
2	B20AS0106	Physics for Computer Science	HC	3	0	0	3	3
3	B20CS0101	Introduction to Data Science	FC	2	0	1	3	4
4	B20CE0201	Basics of Civil and mechanical Engineering	HC	3	0	1	4	5
5	B20CS0102	Programming for Problem Solving	HC	3	0	1	4	5
		TOTAL		**15**	**0**	**3**	**18**	**21**
		Practical /Term Work / Practice Sessions /MOOCs						
6	B20EC0101	IoT and Applications	FC	1	0	1	2	3
7	B20ME0104	Entrepreneurship	FC	1	0	0	1	1
		TOTAL		**2**	**0**	**1**	**3**	**4**
		TOTAL SEMESTER CREDITS					**21**	
		TOTAL CUMULATIVE CREDITS					**40**	
		TOTAL CONTACT HOURS					**25**	

III SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/ SC/ OE	L	T	P	Credits	Contact Hours/ Week
				Credit Pattern & Credit Value				
1	B20CI0301	Analog and Digital Electronics	HC	3	0	0	3	3
2	B20CI0302	Programming with JAVA	HC	3	0	0	3	3
3	B20CI0303	Data Structures	HC	3	0	0	3	3
4	B20AS0302	Discrete Mathematics and Graph Theory	HC	3	0	0	3	3
5	B20CI0304	Agile Software Development and DevOps	HC	3	0	0	3	3
6	B20CI0305	Analog and Digital Electronics Lab	HC	0	0	1	1	2
7	B20CI0306	Programming with JAVA Lab	HC	0	0	1	1	2
8	B20CI0307	Data Structures Lab	HC	0	0	1	1	2
		TOTAL		**15**	**0**	**3**	**18**	**21**
		Practical /Term Work / Practice Sessions /MOOCs						
9	B20MGM301	Management Science	FC	2	0	0	2	2
10	B20AS0301	Environmental Science	FC	2	0	0	2	2
11	B20AHM301 OR B20AHM302	Advanced Kannada OR Basics of Kannada	MC	0	0	0	0	0
		TOTAL		**4**	**0**	**0**	**4**	**4**
		TOTAL SEMESTER CREDITS						**22**
		TOTAL CUMULATIVE CREDITS						**62**
		TOTAL CONTACT HOURS						**25**

IV SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/ SC/ OE	L	T	P	Credits	Contact Hours/ Week
				Credit Pattern & Credit Value				
1	B20CI0401	Design and Analysis of Algorithms	HC	3	0	0	3	3
2	B20CI0412	Operating System	HC	3	0	0	3	3
3	B20CI0403	Database Management System	HC	3	0	0	3	3
4	B20EJ0401	Computer Organization and Architecture	HC	3	0	0	3	3
5	B20EJ0402	Theory of Computation	HC	3	0	0	3	3
6	B20AS0401	Numerical Methods and Optimization Techniques	HC	3	0	0	3	3
7	B20CI0404	Design and Analysis of Algorithms Lab	HC	0	0	1	1	2
8	B20CI0405	Operating System Lab	HC	0	0	1	1	2
9	B20CI0406	Database Management System Lab	HC	0	0	1	1	2
		TOTAL		**18**	**0**	**3**	**21**	**24**
		Practical /Term Work / Practice Sessions /MOOCs						
10	B20AH0301	Communication Skills	FC	2	0	0	2	2
11	B20LS0301	Indian Constitution and Professional Ethics	FC	2	0	0	2	2
12	B20AHM401	Universal human values	MC	0	0	0	0	0
		TOTAL		**4**	**0**	**0**	**4**	**4**
		TOTAL SEMESTER CREDITS						**25**
		TOTAL CUMULATIVE CREDITS						**87**
		TOTAL CONTACT HOURS						**28**

V SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/ OE	L	T	P	Credits	Contact Hours/ Week
				Credit Pattern & Credit Value				
1	B20EJ0501	Web Technologies and Applications	HC	3	0	0	3	3
2	B20EJ0502	Big Data Analytics	HC	3	0	0	3	3
3	B20CI0501	Computer Networks	HC	3	0	0	3	3
4	B20CI0502	Machine Learning	HC	3	0	0	3	3
5	B20EXS5(01-06)	Professional Elective-I	SC	3	0	0	3	3
6	B20XXO5XX	Open Elective-I	HC	3	0	0	3	3
7	B20EJ0504	Web Technologies and Applications Lab	HC	0	0	1	1	2
8	B20CI0505	Machine Learning Lab	HC	0	0	1	1	2
9	B20CI0506	Computer Networks Lab	HC	0	0	1	1	2
			TOTAL	18	0	3	21	24
		Practical /Term Work / Sessions						
10	B20CI0503	Technical Documentation	FC	1	0	0	1	1
11	B20EJ0503	Software Testing	HC	1	0	1	2	3
			TOTAL	2	0	1	3	4
		TOTAL SEMESTER CREDITS					24	
		TOTAL CUMULATIVE CREDITS					111	
		TOTAL CONTACT HOURS					28	

VI SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/ OE	L	T	P	Credits	Contact Hours/ Week
1	B20EJ0601	Information and Network Security	HC	3	0	0	3	3
2	B20EJ0602	Cloud Computing	HC	3	0	0	3	3
3	B20EXS6(01-06)	Professional Elective-II	SC	3	0	0	3	3
4	B20EXS6(07-09)	Professional Elective-III	SC	3	0	0	3	3
5	B20EXS6(10-012)	Professional Elective-IV	SC	3	0	0	3	3
6	B20XXO6XX	Open Elective-II	HC	3	0	0	3	3
7	B20EJ0603	Information and Network Security Lab	HC	0	0	1	1	2
8	B20EJ0604	Cloud Computing Lab	HC	0	0	1	1	2
			TOTAL	18	0	2	20	22
		Practical /Term Work / Sessions						
10	B20CI0601	Research Based Mini Project	HC	0	0	2	2	4
11	B20PA0501	Indian Tradition and Culture	FC	1	0	0	1	1
12	B20EQ0603	Modern Database	HC	1	0	1	2	3
			TOTAL	2	0	3	5	8
		TOTAL SEMESTER CREDITS					25	
		TOTAL CUMULATIVE CREDITS					136	
		TOTAL CONTACT HOURS					30	

VII SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/ OE	L	T	P	Credits	Contact Hours/ Week
1	B20EXS7 (01-03)	Professional Elective-V	SC	3	0	0	3	3
2	B20XXO7XX	Open Elective-III	OE	3	0	0	3	3
			TOTAL	6	0	0	6	6
	Practical /Term Work / Sessions							
3	B20CI0701	Summer Internship/Global Certification	HC	0	0	3	3	6
4	B20CI0702	Project Phase-I	HC	0	0	4	4	8
			TOTAL	0	0	7	7	14
	TOTAL SEMESTER CREDITS						13	
	TOTAL CUMULATIVE CREDITS						149	
	TOTAL CONTACT HOURS						20	

VIII SEMESTER

Sl. No	Course Code	Title of the Course	HC/FC/SC/ OE	L	T	P	Credits	Contact Hours/ Week
1	B20CI0801	Capstone-Project Phase-II	HC	0	0	8	8	16
	TOTAL			0	0	8	8	16
	Practical /Term Work / Practice Sessions /MOOCs							
2	B20XXO8XX	Open Elective-IV	OE	3	0	0	3	3
	TOTAL			3	0	0	3	3
	TOTAL SEMESTER CREDITS						11	
	TOTAL CUMULATIVE CREDITS						160	
	TOTAL CONTACT HOURS						19	

Professional Electives

Professional Electives with specialization in CSIT stream						
Semester /Soft-core	**Code**	**Course**	**Code**	**Course**	**Code**	**Course**
PE-I/V sem	B20EJS501	Advanced Database systems	B20EJS503	Mobile Application Development	B20EJS505	Digital communication
	B20EJS502	System Software	B20EJS504	Human Computer Interaction	B20EJS506	Software Testing
PE-II/ VI sem	B20EJS601	Information Retrieval Systems	B20EJS603	UI/Ux Design	B20EJS605	Modern Computing
	B20EJS602	Management Information Systems	B20EJS604	Block Chain Technology	B20EJS606	Neural Networks and Deep learning
PE-III/ VI sem	B20EJS607	Computer Vision and Applications	B20EJS608	C# and.NET	B20EJS609	Compiler Design
PE-IV/ VI sem	B20EJS610	Natural Language Processing in AI	B20EJS611	Advanced Internet Technology	B20EJS612	Wireless and Sensor Networks
PE-V/ VII sem	B20EJS701	Multimedia Systems	B20EJS702	Augmented and Virtual Reality	B20EJS703	Soft Computing systems

Open Electives Offered to Other schools											
5TH SEM /OE-I			**6th SEM /OE-II**			**7th SEM /OE-III**			**8th SEM /OE-IV**		
Course code	Course Name	Teaching School	Course code	Course Name	Teaching School	Course code	Course Name	Teaching School	Course code	Course Name	Teaching School
B20CIO501	Introduction to AI	CIT	B20CIO601/602	Data Mining/Machine Learning	CIT	B20CIO701	Python for data science	CIT	B20CIO801	IoT Programming	CIT
B20CIO502/503	OOPS with c++/Web technology	CIT	B20CIO603	Neural Networks	CIT	B20CIO702	Deep Learning	CIT	B20CIO802	Reinforcement Learning	CIT

Detailed Syllabus
Semester1

Course Title	Multivariable Calculus and Linear Algebra				Course Type		Theory	
Course Code	B20AS0105	**Credits**	**3**		**Class**		**I Semester**	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	IA	SEE
	Tutorial	-	-	-				
	Total	**3**	**3**	**3**	**39**	**-**	**50%**	**50%**

COURSE OVERVIEW:

The course Differential Calculus deals with the basic aspect's differential calculus. The students of Computer Science are equally benefited with this course as stepping stone to the broad areas of calculus. This course familiarizes students with important concepts coming under differential calculus and to develop strong foundations on these concepts. In Computer Science, Calculus is used for machine learning, data mining, scientific computing, image processing, and creating the graphics and 3D visuals for simulations. Calculus is also used in a wide array software program that require it. Linear algebra provides concepts that are crucial to many areas of computer science, including graphics, image processing, cryptography, machine learning, optimization, graph algorithms, information retrieval and web search.

COURSE OBJECTIVE (S):

The 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 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)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply Taylor's and Maclaurin's series for finding series expansions of functions and approximating values. expansions of functions and approximating values.	1-6	1,2
CO2	Identify and evaluate the radius of curvature of the given curve. Also evaluate the given indeterminate form using L' Hospital rule.	1-6	1,2
CO3	Make use of Gauss elimination and Gauss Jordon method for solving the system of equations, if the given system of equations is consistent.	1-6	1,2
CO4	Determine the Eigen values, the corresponding Eigen vectors and diagonalizable the given square matrix.	1-6	1,2
CO5	Learn new tools and technologies in the linear algebra and apply for suitable application development.	12	1,2
CO6	Develop solutions in the linear algebra to the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	5, 9, 10	2, 3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyse(L4)	Evaluate(L5)	Create(L6)
CO1			✔			
CO2			✔		✔	
CO3			✔			
C04			✔			
CO5			✔			
CO6			✔	✔		

COURSE ARTICULATIONMATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	1							3	3	
CO2	3	3	3	3	3	1							3	3	
CO3	3	3	2	2	3	1							2	2	
C04	2	3	2	3	3	1							1	1	
CO5												2	2	2	
CO6					2				2	2				2	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT – 1
Introduction to Vector Differentiation: Introduction, Scalar and vector point functions, velocity, acceleration, Gradient, Divergence, Curl, Laplacian, Solenoidal and Irrotational vectors, Vector identities**.**   **Differential Calculus-1**:Successive differentiation- nth derivatives of standard functions (no proof) simple problems, Leibnitz Theorem (without proof) and problems, Taylor's 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.

TEXTBOOKS:

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.

JOURNALS/MAGAZINES

https://www.sciencedirect.com/journal/linear-algebra-and-its-applications

SWAYAM/NPTEL/MOOCs:

1. https://youtu.be/XzaeYnZdK5o
2. https://youtu.be/KSntcGOFdUc
3. https://youtu.be/LJ-LoJhbBA4

SELF-LEARNINGEXERCISES:

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

Course Title	Basic Electrical and Electronics Engineering				Course Type		Integrated	
Course Code	B20EE0101	Credits	4		Class		I Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	1	2	2	Theory Hours	Practical Hours	CIE	SEE
	Tutorial	-	-	-				
	Total	**4**	**5**	**5**	**39**	**26**	**50%**	**50%**

COURSE OVERVIEW

Basic Electrical & Electronics Engineering covers basic concepts of electrical engineering and electromagnetism. This course introduces the student to the working AC and DC Machines. It also helps the student to understand the 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 OBJECTIVE (S):

1. Explain the basics of electrical and electronics engineering terminologies.
2. Distinguish the single and three phase systems.
3. Illustrate the different building blocks in digital electronics using logic gates and explain simple logic functions using basic universal gates.
4. Discuss the applications of diode in rectifiers, filter circuits and wave shaping.
5. To build a broad concept for hands on experience in various types of electrical apparatus, tools and instrumentation with electrical safety norms.
6. To analyze the schematics for making electrical connection and to interpret experimental data for various electrical appliances.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Summarize the basics of electrical engineering terminology and the usage.	1-6	1
CO2	Analyze the concepts and applications of DC & AC Machines.	1-5	1
CO3	Apply the concept of domestic wiring, importance of safety and sensing devices	1-5,10	1
CO4	Analyze the different building blocks in digital electronics using logic gates and applications of diode in rectifiers, filter circuits and wave shaping.	1-5	1
CO5	Interpret, Identify and use appropriate electrical tools for electrical connections and to repair electrical equipment's.	1-7, 9,10	1,2
CO6	Compare experimental results with theoretical analysis and the ability to critically evaluate the performance of electrical appliances.	1-7, 9,10	1,2

BLOOM'S LEVELOF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√				
CO2				√		
CO3			√			
CO4				√		
CO5			√			
CO6				√		

COURSE ARTICULATIONMATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	1	2	1							1		
CO2	1	3	2	2	1								1		
CO3	2	2	2	2	1					2			1		
CO4	3	3	3	1	1								1		
CO5	2	2	1	3	1	3	1		3	1			3	3	
CO6	2	2	1	3	1	3	1		3	1			3	3	

Note:1-Low,2-Medium,3-High

COURSE CONTENT:
THEORY:

CONTENTS
UNIT-1
Electrical Circuits: Basic definitions, Types of elements, Ohm's Law, Kirchhoff's Laws, Resistive, Inductive, capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations, Network Theorems (Superposition, Thevenin's & Norton's) Generation of an alternating Emf–average and rms values of alternating quantity–representation of alternating quantities by phasors–single phase series and parallel circuits (simple problems), three phase systems and power calculations
UNIT-2
DC-Machines: Construction and Principle of operation of DC Machines–Emf & Speed equations-types–applications. AC-Machines: Principle of operation of single phase transformers–Emf equation–losses– efficiency and regulation-Construction and working principle of induction motors–Slip–torque characteristics–applications-Construction and Principle of operation of alternators applications.
UNIT-3
Instruments: Basic Principle of indicating instruments–PMMC&MI instruments. Tariff, Protective Devices and Sensors: Tariff schemes, basic concepts of domestic wiring and types, Earthing, protective fuses, MCB, sensors: pressure sensors, strain gage, proximity sensors, displacement sensors, Rotary encoder and ultrasonic sensors and civil engineering applications.
UNIT-4
Diodes: Introduction, Physical operation of p-n junction diodes, Characteristics of p-n junction diodes, Zener diode, Rectifier circuits (half-wave, full-wave, bridge and peak rectifiers),Light emitting diodes. Digital Electronic Principles: Introduction, Binary digits, Logic levels and Digital waveforms, Introduction to basic logic operation, Number system, Decimal numbers, Binary numbers, Decimal-to-Binary conversion, Simple binary arithmetic.

PRACTICE:

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability

1.	Electrical Safety Training. a) To Study the importance of Earthing during accidental shorting of line wire and the body of equipment. b) To conduct experiment and to know the Importance and mechanism of FUSE c) To study the Importance and mechanism of MCB.	Trainer kitOhms Law Fall of resistance	Importance & applications of Earthing, Fuse & MCB
2.	Home Electrical Wiring Demonstration. a) To study & verify the connection procedure for fluorescent lamp wiring. b) To study the connection of Fan with switch and regulator.	Fluorescent Lamp wiring Panel Fan with switch and regulator Kit	Connection & Trouble shooting of fluorescent lamp wiring & Fan with switch and regulator
3.	Two-way switch/ staircase wiring. To study & verify the connection procedure for two-way switch or staircase wiring	Two-way switch or staircase wiring Kit	Connection, Working & application of Two-way switch
4.	Behaviour of current and voltage in series and parallel circuits. a)To study and verify the behaviour of current and voltage in series circuit. b) To study and verify the behaviour of current and voltage in parallel circuit.	Series and parallel circuits Kit	Connection & behaviour of current & voltage in series, parallel circuit
5	Polarity test on single phase transformer. a)To determine the additive polarity of a single-phase transformer. b) To determine the subtractive polarity of a single-phase transformer.	Transformer Kit	Polarities of single phase transformer
6	Determination of VI characteristics of Zener Diode	VI characteristics of Zener Diode kit	VI characteristics of Zener Diode
7	Determination of VI characteristics of Silicon Diode	VI characteristics of Silicon Diode kit	VI characteristics of Silicon Diode
8	Analyze the Half Wave and Full Wave rectifiers using Diode with and without filter	Rectifier kit	Determine the efficiency, Voltage regulation, ripple
9	Determine the Characteristics of BJT in Common Emitter Configuration	Characteristics of BJT in Common Emitter	Input & Output Characteristics of BJT
10	Determine the Characteristics of JFETin Common Source Configuration	Characteristics of JFET in Common	Input & Output Characteristics of JFET
11	Realization of Universal gates using basic logic gates.	Trainer kit	Universal gates will be realized using basic gates

TEXTBOOKS:
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.

REFERENCEBOOKS:
1. Theodore Wildi, "Electrical Machines, Drives, and Power, 5thSystems", Pearson Edition, 2007.
2. Hughes, "Electrical Technology", International Students 9th Edition, Pearson, 2005.

JOURNALS/MAGAZINES

1. International Journal of Electrical Power and Energy Systems (https://www.journals.elsevier.com/international-journal-of-electrical-power-and-energy-systems)
2. Journal of Electrical Engineering (https://link.springer.com/journal/202)

SWAYAM/NPTEL/MOOCs:

1. https://nptel.ac.in/courses/108/108/108108076/
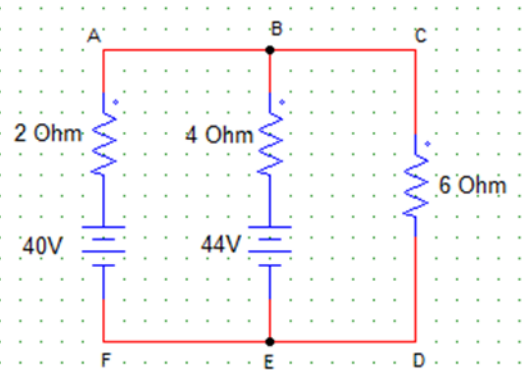
SELF-LEARNINGEXERCISES:

1. Build an electrical circuit using BJT as a switch
2. Identifying the practical application of Electromagnetic Induction

PROBLEMBASEDLEARNING

No	Problems
1	A current of 20A flows through two ammeter A and B in series. Potential difference across A is 0.2V and across B is 0.8 V. Find how the same current will divide between A and B when they are joined in parallel.
2	For the given circuit calculate the current supplied by each battery and current in 6 ohm resistor.
3	Two 12V batteries with internal resistances 0.2 ohm and 0.25 ohm respectively are joined in parallel and a resistance of 1 ohm is placed across the terminals. Find the current supplied by each battery.

4	A 6 pole induction motor is connected to a 50 Hz supply. It is running at a speed of 970 R.P.M. Find the synchronous speed and the slip
5	If A= $(1011)_2$ and B = $(1110)_2$, perform the following arithmetic operations. i)Addition ii) subtraction ii) Multiplication
6	Simplify the given Boolean expression and implement using logic gates. i)Y=AB+ABC+AB(D+E) ii) Y=ABCD+ABD iii) Y=AB+A(B+C)+B(B+C)
7	Simplify the given Boolean Expression: i) Y= $XY+XYZ+XY\bar{Z}+\overline{XYZ}$ ii) $Y = \bar{A}\bar{B}C+\bar{A}B\bar{C}+\bar{A}BC$ iii) Y= $AC+C(A+\bar{A}B)$

8	a) Perform the following operations:
	  (i)Convert $(01110111)_2$ to decimal
	  (ii) Convert $(21)_{10}$ to binary
	  (iii) Add: $(1010)_2$ and $(0011)_2$
	  (iv) Subtract: $(111.111)_2$ from $(1010.01)_2$
	  (v) Divide: $(101101)_2$ by $(110)_2$

PROJECTBASEDLEARNING

To enhance the skill set in the integrated course, the students are advised to execute course-based
Design projects. Some sample projects are given below:

	Suggested Projects
1.	Design & Development of a rectifier circuit
2.	Identify the types of wiring
3.	Electricity bill calculation
4.	Identify the types of motors used in domestic & industrial application with nameplate details.
5.	Identification of different transformer based on their rating used for various applications.

Course Title	Introduction to Python Programming				Course Type		Integrated	
Course Code	B20CI0101	Credits	3		Class		I Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	2	2	2				
	Practice	1	2	2	Theory	Practical	IA	SEE
	Tutorial	-	-	-				
	Total	3	4	4	26	26	50	50

COURSE OVERVIEW:

Python is a Programming 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 and exception handling, It can parse the strings using regular expressions. It can be used for implementing the machine learning algorithms to develop solutions for interdisciplinary problems apart from any general problems leading to automation.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Explain the fundamentals of python programming language constructs and their applications.
2. Inculcate knowledge of parsing of regular expressions and their usage in various application domains.
3. Gain expertise in Object oriented programming and NumPy package.
4. Discuss the files, Pandas and Data Virtualization concepts.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of language constructs to solve real world problems using python programming.	1- 4, 8, 9, 12	1
CO2	Develop programs for text processing and other application domains by making use of regular expressions.	1-3, 5,9,12	2
CO3	Apply features of object oriented and NumPy package to develop computationally intensive programming to analyze and interpret the	1- 5, 9, 12	3
CO4	Create data science solutions with the help of files, Pandas and Data Visualization.	1,4,5,9,12	1-3
CO5	Learn new tools and technologies in the python and apply for suitable application development.	12	1,2
CO6	Develop solutions in the python 1to the complex problems, either individually or as a part of the team and report the results with proper	5, 9, 10	2,3

BLOOM'S LEVELOF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√	√		
CO4			√	√	√	√
CO5			√			
CO6			√	√		

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2				1	1			1	3		
CO2	3	2	3		2				1			1		3	
CO3	3	1	2	1	2				1			1			
CO4	3			2	2				1			1	3	3	3
CO5												1	2	2	
CO6					2				1	1				2	2

Note:1-Low,2-Medium,3-High

COURSE CONTENT THEORY

Contents
UNIT-1
Introduction to Computer Fundamentals: Computer Components, accessories, specifications of computers and external devices. Flowchart symbols and guidelines, types and advantages, Algorithm design.   **Python Fundamentals:** Introduction to Python: History, Applications, Your First Python Program, Constants, Variables, Naming conventions, simple data types, Type casting, Assignment statements, expressions, Boolean data type, Trigonometry functions, operators, precedence of operators, libraries, keywords, Python Collections, I/O statements, conditional statements, loops, functions, user defined functions. Introduction to GitHub and applications.
UNIT-2
Strings: Unicode, Formatting Strings, Format Specifiers, other Common String Methods, Slicing a String.   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.
UNIT-3
Object Oriented Programming: Defining Classes, The init() Method, Instantiating Classes, OOP features: Abstraction. Encapsulation, Single Inheritance, Polymorphism.   Files: Reading from Text Files, Writing to text files, Reading and Writing the Binary Files.
UNIT-4
NumPy: Introduction to NumPy, Creating arrays, Indexing Arrays, Array Transposition, Universal Array

Function, Array Processing, Array Input and Output.
Pandas and Data Visualization: Introduction, Series and Data Frames in pandas and Data Visualization.

PRACTICE:

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability
	Part-A		
1.	a). "LIST1" is a list that contains "N" different SRN of students read using a user defined function with the help of input () function. It is required to add SRN of "M" more students that are to be appended or inserted into "LIST1" at the appropriate place. The program must return the index of the SRN entered by user.	Windows/Linux OS, IDE, Jupiter	Create and perform operations on list.
	b)"TUPLE1" and "TUPLE2" are two tuples that contain "N" values of different data types read using the user defined function "READ" with the help of input() function. Elements of "TUPLE1" and "TUPLE2" are to be read one at a time and the "larger" value among them should be placed into "TUPLE3". Display all tuples.	Windows/Linux OS, IDE, Jupyter	Create and perform operations on Tuples.
2.	a)SET1 and SET2 are two sets that contain unique integers. SET3 is to be created by taking the union or intersection of SET1 and SET2 using the user defined function Operation (). Perform either union or intersection by reading choice from user. Do not use built in functions union () and intersection () and also the operators "|" and "&".	Windows/Linux OS, IDE, Jupyter	Create and perform Union and Intersection, Operations on Sets.
	b)The Dictionary "DICT1" contains N Elements and each element in dictionary has the operator as the KEY and operand's as VALUES. Perform the operations on operands using operators stored as keys. Display the results of all operations.		Create dictionary and perform operation using user defined function.
3.	a)A substring "Substr" between index1 and index2 is to be extracted from the given input string "Str1", which is read using input(). Display the substring "Substr" using a user defined function if available in string "Str1", otherwise display NULL.	Windows/Linux OS, IDE, Jupyter	String operations.
	b) A string containing multiple words is to be read from the user one at a time, after reading perform following operations. Convert all the strings to uppercase and display Split the words of a string using space as the separation character and display.		
4.	a)Consider the text file, "Std.txt", with the details of students like SRN, NAME, SEMESTER, SECTION AND AVG_MARKS. Read the file, "Std.txt" and display the details of all the students of 4th Semester "A" Section who have scored more than 75%.	Windows/Linux OS, IDE, Jupyter	File Handling.

	b)Consider the text file "Emp.txt", with the details of Employees like EMP_CODE, EMP_NAME, BASIC_SALARY, DA, GROSS_SALARY, NET_SALARY, LIC, PF and TOTAL-DEDUCTIONS. Read EMP_CODE, EMP_NAME, BASIC_SALARY, DA, LIC and PF from the user using input() and compute the following: TOTAL_DEDUCTIONS= (LIC+PF) GROSS_SALARY= BASIC_SALARY+ DA NET_SALARY= GROSS_SALARY – TOTAL_DEDUCTIONS. Write the above data to file for each employee. Read the content of "Emp.txt" and display the details of each employee		File Handling.
5.	a). A "CAR" has the attributes COMPANY_NAME, MODEL, COLOR, MANUFACUTING_YEAR and PRICE. A Class is required to be created for "CAR" to store the above attributes and perform the following operations: Get the details of "CAR" object from user and store into Array of objects Display the details of "CAR" object based on "COMPANY", "MODEL" and "PRICE".	Windows/Linux OS, IDE, Jupyter	Classes and objects usage.
	b). Airline Reservation System contains the attributes of passengers such as NAME, PAN_NO. MOBILE_NO, EMAIL_ID, SOURCE, DESTINATION, SEAT-NO, AIR-FARE and TRAVEL_DATE. A Class is required to be created for "Airlilne" with the above attributes and perform the following operations: Get the details of "Airline" object from user and store into Array of objects List details of all the passengers who travelled From "Bengaluru to London". List details of all the passengers who travelled From "Chicago to Beijing" on 10th of Feb, 2020.		
6.	a). "Arr_1" is an integer array of size M x N. Size and content of the array is to be read using input() by using the user defined function READ_DATA(). It is required to display the Diagonal elements of"Arr_1" Elements of mth row (row no should be entered by user) Elements of nthcolumn (column no should be entered by user)	Windows/Linux OS, IDE, Jupyter	NumPy arrays usability.
	b)The dictionary "DICT1" contains the pass percentage of each semester of B. Tech in CSE, where, "Semester" acts as the key and "Pass Percentage" acts as the value. A Python Pandas dataframe is required to be created using the dictionary "DICT1" and display it using a user defined function.		Pandas Series usability.
	Part-B (Mini Project: Library Management System)		
1.	Develop a program to create the class "USER" with the attributes USER_NAME, USER_ID, SCHOOL_NAME, ADDRESS, PHONE_NO, EMAIL_ID, DOB and AGE. The functions add user (), delete user (), edit user (), search user () should be part of the class. Instantiate "User" class with 10 objects. Read the attributes of each "User" object using input () and store them in the file	Windows/Linux OS, IDE, Jupyter	Create a class user to read the attributes of user and store them in a file.

2	Develop a program to get the name of the "User" object whose details are to be deleted. Read the "User_File.txt" and delete the "User" object if found. Display the contents of "User_File.txt"	Windows/Linux OS, IDE, Jupyter	Create a class user to read the attributes and
3	Develop a program to get the name of the "User" object whose details are to be edited (modified). Edit the details of the user object in the file "User_File.txt" and display the contents after	Windows/Linux OS, IDE, Jupyter	To create a class and edit the file.
4	Develop a program to create the class "BOOK" with the attributes TITLE, AUTHOR, PUBLISHER, YEAR, PRICE, SCHOOL_NAME and the functions add book(), delete book(), edit book() and search book(). Instantiate "Book" class with 10 objects. Read the attributes of each "BOOK" object using input ()	Windows/Linux OS, IDE, Jupyter	Create a class book to read the attributes of user and store them in a file.
5	Develop a program to get the name of the "BOOK" object whose details are to be deleted. Read the "Book_File.txt" and delete the "BOOK" object whose details match with the data entered. Display the contents of "Book_File.txt" after deletion.	Windows/Linux OS, IDE, Jupyter	Create a class book to read the attributes and delete the object.
6	Develop a program to get the name of the "BOOK" object whose details are to be edited (modified). Edit the details of the "Book" object in the file "Book_File.txt" and display the contents after modification.	Windows/Linux OS, IDE, Jupyter	To create a class and edit the file.
7	Develop a program to create the class "TRANSACTION" with the attributes USER_ID, USER_NAME, AUTHOR, TITLE, EDITION, ISSUE_DATE,DUE_DATE and RETURN_DATE and the functions issue book(), return book() and search book(). Instantiate "Transaction" class with 10 objects. Read the attributes of each "Transaction" object using input () and store them in the file "TransactionFile.txt". Develop a program to issue the book as requested by the user. Update the attributes in "Transaction	Windows/Linux OS, IDE, Jupyter	Create class and perform string operations.
8	Develop a program to return the book. Edit the details of the user like USER_ID, USER_NAME, AUTHOR, TITLE, EDITION, ISSUE_DATE, DUE_DATE and RETURN_DATE in "TransactionFile.txt" and display the contents after modification. Compute the fine amount to be paid if return date is not same as due date. If both return date and due date are same and put zero	Windows/Linux OS, IDE, Jupyter	Create class and perform string operation.
9	Develop a program to search for a book using its "author". Display the message "available" if search is successful otherwise display the message "not available".	Windows/Linux OS, IDE, Jupyter	Create class and object, perform file operations and regular expressions.
10	Develop a program to get a list of users by referring to "User_File.txt" and "Transaction_File.txt".	Windows/Linux OS, IDE, Jupyter	Create class and object, perform file operations and regular expressions.
11	Develop a program to get List of Books in stock by referring to "Book_File.txt" and "Transaction_File.txt".	Windows/Linux OS, IDE, Jupyter	Create class and object, perform file operations and regular expressions.
12	Develop a program to get List of Books Issued by referring to "User File", "Book File" and "Transaction File".	Windows/Linux OS, IDE, Jupyter	Create class and object, perform file operations and
13	Develop a project by integrating User, Books, Transaction and Reports Modules.	Windows/Linux OS, IDE, Jupyter	Module integration and project

TEXTBOOKS:

1. Mark Pilgrim, "Dive into Python 3", A press special edition, second edition, 20l5.
2. Travis E. Oliphant, "Guide to NumPy", Trelgol publishers, 2006.

REFERENCEBOOKS:

1. A B Choudhary, "Flowchart and Algorithms Basics" Mercury Learning and Information,2020
2. Mark Lutz, "Learning Python", Oreilly. 2003.
3. John M. Zelle, "PYTHON Programming: An Introduction to Computer Science", Franklin, Beedle&Associates , 2004.
4. Michael Dawson, "Python Programming for the Absolute Beginners", 3rd Edition, CENAGE Learning.
5. Wesley J. Chun, "Core Python Programming", 2nd Edition, Prentice Hall.
6. Steve Holden and David Beazley, "Python Web Programming", New Riders, 2002. Springer, Kent D. Lee, "Python Programming Fundamentals", 2nd Edition.
7. John V. Guttag, "Introduction to Computation and Programming using Python", MIT Press, 2016.
8. https://www.tutorialspoint.com/computer_fundamentals/computer_fundamentals_tutorial.pdf

JOURNALS/MAGAZINES

1. https://www.codemag.com/Magazine/ByCategory/Python
2. http://ijaerd.com/papers/special_papers/IT032.pdf
3. https://iopscience.iop.org/article/10.1088/1742-6596/423/1/012027
4. https://ieeexplore.ieee.org/document/4160250

SWAYAM/NPTEL/MOOCs:

1. Coursera – Python for everybody, University of Michigan
2. Coursera – Python Basics, University of Michigan
3. https://nptel.ac.in/courses/106/106/106106182/
4. https://www.edx.org/learn/python

SELF-LEARNINGEXERCISES:

1. Explore PYTHON library for IOT programming
2. More exploration on GitHub
3. Data Visualization packages
4. C modules interface

Course Title	Engineering Chemistry				Course Type		Theory	
Course Code	B20AS0104	**Credits**	3		**Class**		I semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	0	0	0	Theory	Practical	IA	SEE
	Tutorial	0	0	0				
	Total	**3**	**3**	**3**	**39**	**0**	**50%**	**50%**

COURSE OVERVIEW:

Engineering chemistry covers very relevant topics compatible with ECE, EEE and C&IT students and make them aware of importance of various aspects of basic science in engineering. The subject of Engineering chemistry covers area of light and matter interaction, clean energy storage and conversion devices, corrosion phenomenon and control which is widely an interdisciplinary subject of discussion. Further the course focus on the chemistry of engineering materials, and various applications. This area of science is very much interdisciplinary in its nature and gives a platform for students to strengthen their engineering knowledge to enlighten on the energy conversion and storage devices, which have become very attractive field of research in engineering stream. The subject deals with various engineering materials, their properties and applications in the field of engineering.

COURSE OBJECTIVE

The Engineering chemistry course is designed to fulfil the following objective;

1. Engineering chemistry covers the very basic knowledge required for engineering students to understand its importance of science in technology.
2. It provides the basic knowledge on Interaction of light and matter to know the electronic transitions in materials and storage and conversion devices.
3. Corrosion and metal finishing, explains the phenomenon of corrosion and its Prevention. It also covers the importance of metal finishing in various industries and fabrication of PCB
4. Polymers are all about the properties of various polymeric materials and their Commercial significance. The chapter reveals about technical and commercial Importance of composite materials.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Understand the phenomenon of light and matter interaction to study the materials	1,2, 4,7,11	2
CO2	Demonstrate the electrode processes in Batteries and conversion devices.	6,11	2
CO3	Describe Corrosion phenomenon and precautions to be taken in the selection of materials in controlling corrosion, Fabrication of PCB and industrial applications.	2,4,7,11	2
CO4	Illustrate the properties of polymers, nano materials, composite materials and their applications in various fields.	1,2, 11,12	2
CO5	Learn new tools and technologies in the engineering chemistry and apply for suitable application development.	12	1,2
CO6	Develop solutions in the engineering chemistry to the complex problems, either individually or as a part of the team and report the results with proper analysis	5, 9, 10	2,3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyse (L4)	Evaluate (L5)	Create (L6)
CO1	√					
CO2		√		√		
CO3		√	√			
CO4	√	√		√		
CO5			√			
CO6			√	√		

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3		1			2				1			2	
CO2						2					2	3		2	
CO3	2	2		2		1	2							2	
CO4		2		2			2				3			2	
CO5												2	2	2	
CO6					2				2	2				2	2

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Light and matter interaction: Electro-magnetic spectrum-Applications in Engineering, Interaction of EM radiation with matter, work function of matter, Electrons in matter. Bonding theories: MOT, Band structure of matters HOMO-LUMO. Photochemical and thermal reactions: Laws of photochemistry, quantum yield, high and low quantum yield reactions. Jablonski diagram - photophysical and photochemical processes, photo-sensitization, photo- polymerization and commercial application of photochemistry.
UNIT-2
CLEAN ENERGY STORAGE AND CONVERSION DEVICES: Introduction to electrochemistry, basic concepts of Batteries and characteristics. Classification: Primary (Dry cell, Li-MnO2) and Secondary (Pb-acid, Li-ion) batteries. Super capacitors: classification, construction and applications in hybrid vehicles. Fuel cells: Alkaline fuel cells, Solid oxide fuel cells and phosphoric acid fuel cell. Photo-conversion devices: Photovoltaic cell, antireflective coating, panels and arrays. Production of single crystal semiconductor by Crystal pulling technique (Czochralski pulling technique), zone refining process (of Si).   Problems: Calculation of energy and power density, capacity of a Battery and capacitance of super capacitors for electric vehicle applications.
UNIT-3
Corrosion: Electrochemical theory of corrosion, types of Corrosion- differential metal corrosion, differential aeration corrosion, boiler corrosion, and grain boundary corrosion, Corrosion studies on Al, Fe with pourbiax diagram, Factors affecting rate of corrosion-Primary, secondary. Corrosion control: Galvanizing & tinning, cathodic protection & Anodic Protection.   **Metal Finishing:** Theory of electroplating, Factors required to study electroplating Effect of plating variables in electroplating process, Electroplating of gold (acid, neutral and alkaline cyanide bath). Electro less plating of copper and PCB manufacture by Electro less plating of copper. (Applications/case studies).

UNIT-4

CHEMISTRY OF ENGINEERING MATERIALS: Polymer composites: Carbon fiber, Kevlar synthesis and applications, Conducting polymers: synthesis, electron transport mechanism and applications in polyacetylene and polyaniline. Liquid crystals: Introduction classification and applications in electronic display devices. Nanomaterials: Introduction, classification based on dimensionality, quantum confinement. Size dependent properties- surface area, magnetic properties (GMR phenomenon), and thermal properties. Synthesis, Properties and applications of Fullerenes, CNT and Graphene. Sensors: Physical and chemical sensors, Biosensors for bioelectronic applications.

TEXTBOOKS:
1. R.V.Gadag&Nithyanandashetty,"Engineering Chemistry", Ik International Publishing house.
2. S.S. Dara ,"Text Book of Engineering Chemistry", S. Chand & Co.
3. S.S.Chawla,"Text Book of Engineering Chemistry",DhanpatRaiPub.Co.

REFERENCE BOOKS:
1. P.W. Atkins,"Physical Chemistry", 5thedition Oxford.
2. Callister W.D., "Materials Science and Engineering", John Wiley & Sons.
3. R.Gopalan, D.\/enkappaya, S.Nagarajan,"Engineering Chemistry", Vikas Publication.

JOURNALS/MAGAZINES:
1. https://www.sciencedirect.com/journal/water-science-and-technology
2. https://iwaponline.com/wst
3. https://www.scitechnol.com/nanomaterials-molecular-nanotechnology.php
4. https://www.journals.elsevier.com/journal-of-energy-storage

SWAYAM/NPTEL/MOOCs
1. https://nptel.ac.in/courses/105/105/105105201/
2. https://nptel.ac.in/courses/112/108/112108150/

PROLEM BASED LEARNING

No	Problems
1	Calculation of wavelength and frequencies of the radiations
2	Calculation of band structure by HOMO and LUMO
3	Determination of cell potentials
4	Calculation of energy density and power density of a battery.
5	Determination of capacitance of a super capacitor
6	Crystal field stabilization energy

PROJECT BASED LEARNING
To enhance the skill set in the integrated course, the students are advised to execute course-based

Design projects. Some sample projects are given below

No.	Suggested Projects
1.	Collection of literature for the materials for the semi conducting applications
2.	Synthesis of a semiconductor materials for the electronic applications
3.	Construction of a PCB for the electronic device
4.	Synthesis of conducting polymers
5.	Synthesis of Energy storage materials
6.	Fabrication of efficient aqueous battery or super capacitor

Course Title	Design Thinking		Course Type			Integrated	
Course Code	B20ME0102	Credits	2		Class		I Semester
Course structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage
	Theory	1	1	1			
	Tutorial	0	0	0	Theory	Practical	IA	SEE
	Practice	1	2	2				
	Total	2	3	3	13	26	50%	50%

COURSE OVERVIEW:

Today, innovation is everyone's business. At every level, in every kind of organization, design thinking provides the tools that one needs to become an innovative thinker and uncover creative opportunities. For example, companies like Procter, Gamble and GE have incorporated Design Thinking into their strategy and marketing. The course draws on methods from engineering and design, and combines them with ideas from the arts, tools from the social sciences, and insights from the business world.In this course, students start in the field, where they discover the needs of the target audience. They then iterate ideas on teams to develop a range of promising possible solutions, create rough prototypes to take back out into the field, and learn to test with real people in the target audience.

COURSE OBJECTIVE:

1. To impart knowledge on design thinking process for understanding designs.

2. To provide design skills to analyze design thinking issues and apply the tools and techniques of design.

3. To inculcate attitude to solve societal problems using design thinking tools.

COURSE OUTCOMES (CO's):

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

CO#	Course Outcomes	POs	PSOs
CO1	Identify the problems that fall under the purview of human centered design process for creative problem solving.	1,2, 9,10,12	1,2
CO2	Create empathy maps to visualize user attitudes and develop innovative products or services for a customer base using ideation techniques	1,2,9,10,12	2
CO3	Build simple prototypes for problems using gathered user requirements.	1,3, 9,10,12	1,2
CO4	Improve prototype by testing it with a specific set of users for making it sustainable by following ethics.	1,4,8,9,10,12	1,2
CO5	Learn new tools, technologies and apply for suitable application development.	12	1, 2
CO6	Develop solutions to the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	5, 9, 10	2, 3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	✓					
CO2			✓			
CO3			✓			
CO4				✓		
CO5			✓			
CO6			✓	✓		

COURSE ARTICULATIONMATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2							2	2		2	3	2	
CO2	1	3							2	3		2		2	
CO3	2		3						3	3		2	2	3	
CO4	2			2				1	3	2		2	2	3	
CO5												2	2	2	
CO6					2				2					2	2

Note:1-Low,2-Medium,3-High

Course Content
Theory

Contents
UNIT-1
Design Thinking Process: Types of the thinking process, Design thinking: Definition, Origin of design thinking, Importance of design thinking, Design vs Design thinking. Problem Exploration, Case Studies from Embrace-Stanford Innovation Challenge, IDEO, GE Healthcare, The Good Kitchen- Denmark Program etc, identifying the target users for the problem selected, Survey on existing solutions for the problem identified.
Empathizing: Powerful Visualizing tool – a method to connect to the user, Creating Empathy maps – Case studies.
UNIT-2
Defining the problems: POV statements from User perspective. Idea generation: Methods to spark the innovative ideas – Brainstorming, Mind map, Story board, Provocation etc.
What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype
Prototyping for digital products: What's unique for digital, Preparation; Prototyping for physical products: What's unique for physical products, Preparation; Testing prototypes with users.
PRACTICE:

Sl.No	Name of the Practice Session	Tools and Techniques	Expected Skill /Ability
1	Identifying the problem that can be solved using Design Thinking approach	Observation and survey	Develop identifying human centered problems
2	Build the empathy maps for simple problems like single user	Visualization	Develop ability to understand other's emotions
3	Build the detailed empathy maps for problem identified in the teams formed	Visualization	Develop ability to understand other's emotions
4	Presentation by student teams	PPT	Develop ability to express their views
5	Obtain the insights into user's problems and make PoV statement	Understanding	Develop making problem statements from user perception
6	Presentation by student teams	PPT	Develop ability to express their views
7	Carry out Brain storming between the groups and generate as many as ideas possible	Ideation tools	Develop innovative mind set
8	Prototype for best 3 ideas selected	Sketching, simple model making etc	Develop prototyping techniques
9	Presentation by student teams	PPT	Develop ability to express their plan
10	Test the developed prototype with set of identified users	Google forms, cold calls, social media etc.	Develop understanding of various testing methods
11	Pitching final solution	PPT	Develop ability to express their views

TEXT BOOKS:

1. Gavin Ambrose, "Paul Harris, Basics Design-Design Thinking", AVA Publishing, 2010
2. Kathryn McElroy, "Prototyping for Designers: Developing the best Digital and Physical Products", O'Reilly,2017.

REFERENCE BOOKS:
1. Michael G. Luchs, Scott Swan, Abbie Griffin, "Design Thinking – New Product Essentials from PDMA", Wiley, 2015.
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", 2012.

JOURNALS/MAGAZINES/ADDITIONAL SOURCES

1. Leonard, D., and Ray port, J. F. 1997. Spark Innovation through Empathic Design. In Harvard Business Review, November-December 1997, 102-113.
2. https://www.ideo.com
3. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
4. https://www.ibm.com/design/thinking/page/toolkit
5. https://www.interaction-design.org/literature/article/define-and-frame-your-design-challenge- by-creating-your-point-of-view-and-ask-how-might-we
6. https://www.culturepartnership.eu/en/article/ten-tools-for-design-thinking
7. https://youtu.be/M66ZU2PCIcM
8. https://thisisdesignthinking.net/2017/07/innogy_energy_ecarsharing/

SWAYAM/NPTEL/MOOCs:
1. https://nptel.ac.in/courses/109/104/109104109/
2. https://nptel.ac.in/courses/110106124/

Course Title	Biology For Engineers				Course Type		Theory	
Course Code	B20AS0109	**Credits**	**1**		**Class**		I semester	
Course Structure	**TLP**	**Credits**	**Contact Hours**	**Work Load**	**13Hrs/ Semester**		**Assessment in Weightage**	
	Theory	1	1	1				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	**1**	**1**	**1**	**13**	**0**	**50%**	**50%**

COURSE OVERVIEW:

Understanding biological systems, principles and concepts in order to create usable, tangible, economically viable product or process has become need of the hour. Hence irrespective of the parent engineering discipline, knowledge and expertise from pure and applied sciences is necessary to create product or process related to healthcare, agriculture, environmental issues and many more. Any engineer will have a high probability of using biology related skills and concepts to create products and processes beneficial to the mankind and as well for the sustainable environmental friendly approach. For example, the knowledge can be used to create medical devices, diagnostic equipment's, bioreactor designing, agriculture related equipment/instruments or anything related to surface science, fluid mechanism and polymer science. This course is designed to lay foundation in the field of Cell biology, Molecular biology and Genetics, so that anyone who is interested can design better product/process to enhance the overall quality of life.

COURSE OBJECTIVES:

1. To inculcate the basic concepts of biology from engineering perspective among students
 2. To understand the interplay between biology and engineering disciplines
3. To conceptualize the engineering design/process/product for life science challenges

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Understand and explain the biology concepts from engineering perspective.	1	1
CO2	Apply the principles of Biology either for the process/product development from the engineering perspective.	1,2	1,2

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√				
CO2	√	√	√			

COURSE ARTICULATIONMATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2												2	
CO2	2	2											2	1

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY:

CONTENTS
Introduction to Biology, Evolution and Origin of Life, Bio molecules-Lipids, Bio molecules: Carbohydrates, Water, Bio molecules: Amino acids, Proteins, Bio molecules: Enzymes, Bio molecules: Nucleotides, Cell structure and function – Prokaryotes, Cell structure and function – Eukaryotes, Cell cycle-Mitosis and Meiosis, Mendelian genetics: Mendelian inheritance, Genetic diseases and Mendelian inheritance, Central Dogma – Replication, Transcription and Translation.

TEXTBOOKS:

1. G.K. Suraishkumar, "Biology for Engineers", Oxford University Press, 2019.
2. "Biology for Engineers:As per AICTE curriculum", Wiley publication.
3. Dr.Sohini Singh, Dr.Tanu Allen, "Biology for Engineers", Vayu Education of India.

REFERENCE BOOKS:

1. P.S.Verma and V.K. Agarwal, "Cell Biology, Genetics, Molecular Biology", Evolution and Ecology ,2018.
2. Sambamurthy, "Handbook of Genetics", Friends Publisher, 2010 .

JOURNALS/MAGAZINES
1. Current Sciences

SWAYAM/NPTEL/MOOCs:

1. https://onlinecourses.nptel.ac.in/noc19_ge31/preview
2. Coursera: Biology everywhere

SELF-LEARNINGEXERCISES:

1. Case study: Computational biology in agriculture and Health Care
2. Artificial Intelligence in health care
3. Image processing for medical applications

PROBLEMBASEDLEARNING

No.	Case Study
1	Case study: Computational biology in agriculture and Health Care
2	Case study: Artificial Intelligence in health care

Course Title	Computer Aided Engineering Drawing				Course Type		Integrated	
Course Code	B20ME0101	**Credits**		3	**Class**		**I Semester**	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	2	2	2				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	0	-	-				
	Total	**3**	**4**	**4**	**26**	**26**	**50**	**50**

COURSE OVERVIEW:

Engineering Graphics or drawing is known as language of engineers. All phases of engineering process require the conversion of new ideas and design concepts into the basic line language of graphics. There are many areas such as civil, mechanical, electrical, architectural, computer, electronics and industrial applications where knowledge and skills of the drawing play major roles in the design and development of new products or construction. This course emphasizes on projection of point, line, surfaces and solids. It also provides knowledge about representing the object in terms of 3d view and also development of the object.

COURSE OBJECTIVE (S):

1. To introduce the students to various concepts like dimensioning, conventions and standards of engineering drawings in order to become professionally efficient
2. To enable students to learn about the software tool to prepare engineering drawings
3. To teach the students about the concepts and principles of orthographic projections, development of lateral surfaces and isometric projection of simple solids
4. To communicate the concept/idea with others through the language of technical drawing and sketching.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Construct the simple 2D drawings manually and also by using CAD software	1,5,10,12	1
CO2	Draw orthographic projection of point, line, plane surfaces and simple solids	1,3,5,10, 12	1
CO3	Draw sectional views of a prisms, pyramids, cone and cylinder	1,3,5,10, 12	1
CO4	Develop the lateral surfaces of the solids	1-3,5,10, 12	1,2,3
CO5	Create isometric view of the solids	1,3,5,10, 12	1
CO6	Develop solutions in the CAD to the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	5, 9, 10	2, 3

BLOOM'S LEVELOF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√			
CO4				√		
CO5				√		
CO6			√	√		

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				3					3		2	3		
CO2	3		2		3					3		2	3		
CO3	3		2		3					3		2	3		
CO4	3	2	2		3					3		3	3	3	2
CO5	3		2		3					3		3	3	2	1
CO6					2				2	2				2	2

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY:

CONTENTS
UNIT – 1
Introduction – Geometrical constructions, engineering drawing standards, Introduction to CAD Software. Orthographic projection of points in first and third Quadrant only. Orthographic projection of straight lines inclined to both horizontal and vertical planes. Orthographic projection of regular plane surfaces when the surface is inclined to both HP and VP.
UNIT-2
Orthographic projection of regular solids like prisms, pyramids cone and cylinder when the axis is inclined to both HP and VP.

	UNIT-3
	Sections of solids – Drawing sectional views and true shape of section, Development of surfaces- Parallel line method for prisms and cylinders, Radial line method for pyramids and cones.

	UNIT-4
	Isometric projections of simple and combined solids.

PRACTICE:

No	Practice	Tools and Techniques	Expected Skill /Ability
1.	Use of solid edge software and familiarization of tools	Solid Edge Software	Use of commands to draw the drawings
2.	Draw the projection of point locating in first and third quadrant	Solid Edge Software	Analyzing and software skill
3.	Draw the projection of lines locating in first quadrant	Solid Edge Software	Draw the views of the line and software skill
4.	Draw the projection of rectangular and pentagonal lamina inclined to both HP and VP	Solid Edge Software	analyzing and software skill
5.	Draw the projection of hexagonal and circular lamina inclined to both HP and VP	Solid Edge Software	analyzing and software skill
6.	Draw the projection of prisms inclined to both HP and VP	Solid Edge Software	interpretation and software skill
7.	Draw the projection of pyramids inclined to both HP and VP	Solid Edge Software	interpretation and software skill
8.	Draw the projection of cone and cylinder inclined to both HP and VP	Solid Edge Software	interpretation and software skill
9	Draw the projection of section of solids in simple position	Solid Edge Software	analyzing and software skill
10	Develop the lateral surface of prisms and cylinder	Solid Edge Software	Creative and software skill
11	Develop the lateral surface of pyramids and cone	Solid Edge Software	Creative and software skill
12	Draw the isometric projection of simple plane surface and simple solids	Solid Edge Software	Analyzing and software skill
13	Draw the isometric projection of two co-axial solids	Solid Edge Software	Analyzing and software skill

TEXT BOOKS:
1. K. R. Gopala krishna, "Engineering Graphics", Subhas Publications, 2012.
2 Bhatt N.D., Panchal V.M. & Ingle P.R., "Engineering Drawing", Charotar Publishing House,2014.

REFERENCE BOOKS:

1. Luzadder and Duff, "Fundamental of Engineering Drawing", Prentice hall of India Pvt Ltd. 11thEdition, 2001.

2. Shah, M.B. & Rana B.C., "Engineering Drawing and Computer Graphics", Pearson Education,2008.

SWAYAM/NPTEL/MOOCS:

1. https://nptel.ac.in/courses/112/103/112103019/
2. https://www.udemy.com/course/ed/

PROBLEM BASEDLEARNING

Sl. No	Problems
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 in front of VP. Draw the projections of the points and state the Quadrants in which the points are situated.
2	A point 'A' is 30 mm in front of VP & 40 mm above HP. Another point B is 20 mm behind VP & 35 mm below HP. The horizontal distance between the points measured parallel to XY line is 60 mm. Draw the three projections of the points. Join their front and top views.
3	A point P is on HP and 35 mm in front of VP. Another point Q is on VP and below HP. The line joining their front views makes an angle of 300 to XY line, while the line joining their top views makes an angle of 450 with XY line. Find the distance of the point Q from HP.
4	A point is 35 mm below HP, 20 mm behind VP and 25 mm behind / in front / from RPP. Draw its projections and name the side view.
5	A line AB 80 mm long is inclined to HP at 30 degree and inclined to VP at 45degree. Draw front and top views of line and determine their lengths. Also, measure the perpendicular distance of end B from both HP & VP.
6	A line AB has its end A 20 mm above the HP and 30 mm in front of VP. The other end B is 60 mm above HP and 45 mm in front of VP. The distance between end projectors is 70 mm. draw its true length and apparent inclinations.
7	The top view pq of a straight line is 70 mm and makes an angle of 60 degree with XY line. The end Q is 10 mm in front of VP and 30 mm above HP. The difference between the distances of P and Q above HP is 45 mm. draw the projections. Determine its true length and true inclinations with HP and VP.
8	The top view of a line 75 mm long measures 50 mm. The end P is 30 mm in front of VP and 15 mm above HP. The end Q is 15 mm in front of VP and above HP. Draw the projections of the line and find its true inclinations with HP and VP.
9	The distance between the end projectors through the end points of a line AB is 60 mm. the end A is 10 mm above HP and 15 mm in front of VP. The end B is 35 mm in front of VP. The line AB appears 70 mm long in the front view. Complete the projections. Find the true length of the line and its inclinations with HP and VP.
10	The point B of a line AB is on the horizontal plane, the top view of the line makes an angle of 30 degree with XY line, being 80mm. the point A is on the vertical plane and 50 mm above the horizontal plane. Draw the top and front views of the line and obtain the true length of the line. Also find the inclinations of the line with two planes.
11	The end A of a line AB is in HP and 25 mm in front of VP. The end B is 10 mm in front of VP and 50 mm above HP. The distance between the end projectors when measured parallel to the line of intersection of HP and VP is 80 mm, Draw the projection of the line AB and determine its true length and true inclination with HP and VP.
12	Find the true length and true inclination of a line AB with HP having one of its ends 20 mm in front of VP and 30 mm above the HP. The line is inclined at 40 degree to VP and left side view of the line is 60 mm long and inclined at 60degree to the x1y1 line. Draw all the three views of the line.
13	An equilateral triangular lamina of 25mm side lies with one of its edges on HP such that the surface of the lamina is inclined to HP at 60degree. The edge on which it rests is inclined to VP at 60degree. Draw its projections.

Sl. No	Problems
14	A 30 degree-60degree setsquare of 60mm longest side is kept such that the longest side is in HP, making an angle of 30 degree with VP. The set square itself is inclined at 450 to HP. Draw the projections of the setsquare.
15	A square lamina ABCD of 40mm side rests on corner C such that the diagonal AC appears to be at 45 degree to VP. The two sides BC and CD containing the corner C make equal inclinations with HP. The surface of the lamina makes 30 degree with HP. Draw its top and front views.
16	A mirror 30 mm x 40 mm is inclined to the wall such that its front view is a square of 30 mm side. The Longer sides of the mirror appear perpendicular to both HP and VP. Find the inclination of the mirror with the wall.
17	A pentagonal lamina of sides 25 mm is resting on one of its edges on HP with the corner opposite to that edge touching VP. This edge is parallel to VP and the corner, which touches VP, is at a height of 15 mm above HP. Draw the projections of the lamina and determines the inclinations of the lamina with HP and VP and the distance at which the parallel edge lies from VP.
18	A pentagonal lamina of sides 25 mm is having a side both on HP and VP. The corner opposite to the side on which it rests is 15 mm above HP. Draw the top and front views of the lamina.
19	Draw the top and front views of a hexagonal lamina of 30mm sides having two of its edges parallel to both vertical and horizontal planes and one of its edges is 10 mm from each of the planes of projection. The surface of the lamina is inclined at an angle of 60° to the HP.
20	A hexagonal lamina of sides 30 mm has one of its comers in VP and its surface inclined at an angle of 30° with VP. The diagonal passing through that corner which is in VP appears to be inclined at 45° to HP. Draw the projections of the lamina.
21	A hexagonal lamina of sides 25 mm rests on one of its corners on HP. The corner opposite to the corner on which it rests is 35mm above HP and the diagonal passing through the corner on which it rests is inclined at 30° to VP. Draw its projections. Find the inclination of the surface with HP.
22	Draw the projections of a circular plate of negligible thickness of 50 mm diameter resting on HP on a point A on the circumference, with its plane inclined at 45° to HP and the top view of the diameter passing through the resting point makes 60° with VP.
23	A circular lamina inclined VP appears in the front view as an ellipse of major axis 30 mm and minor axis 15 mm. The Major- axis is parallel to both HP and VP. One end of the minor axis is in both the HP and VP. Draw the projections of the lamina and determine the inclination of the lamina with the VP.
24	A square prism 35mm side of base & 60mm axis length rests on HP on one of its edges of the base which is inclined to VP at 30°. Draw the projections of the prism when the axis is inclined to HP at 45°
25	A pentagonal prism 25mm sides of base & 60mm axis length rests on HP on one of its edges of the base. Draw the projections of the prism when the axis is inclined to HP at 40° & VP at 30°
26	A Hexagonal prism 25mm sides of base and 50mm axis length rests on HP on one of its edges. Draw the projections of the prism when the axis is inclined to HP at 45° & appears to be inclined to VP 40°.
27	A cone 40 mm diameter and 50 mm axis is resting on one generator on HP which makes 30° inclination with VP. Draw its projections.
28	A pentagonal pyramid 25mm sides of base and 50mm axis length rests on HP on one of its edges of the base which is inclined to VP at 30º.Draw the projections of the pyramid when the axis is inclined to HP at 45º
29	A hexagonal pyramid 30mm sides of base and axis 70mm long is resting on its base on HP with one of the edges of the base parallel to VP. It is cut by sectional plane, perpendicular to VP, inclined at 30° to HP and bisects the axis. Draw the front view, sectional top view & true shape of the section.

Sl. No	Problems
30	A vertical cylinder of base diameter 50 mm and axis 65 mm long rests on HP. It is cut by a section plane perpendicular to VP, inclined at 45 degree to HP and at a height of 30mm from the base. Draw its sectional top view and true shape of the section.
31	A hexagonal pyramid 30mm sides of base and axis 70mm long is resting on its base on HP with one of the edges of the base parallel to VP. It is cut by sectional plane, perpendicular to VP, inclined at 30° to HP and bisects the axis. Draw the front view, sectional top view & true shape of the section.
32	A square pyramid base 40mm side and axis 65mm long has its base on HP and all the edges of the base are equally inclined to VP. It is cut to with an inclined plane so as the truncated surface at 45 degree to axis, bisecting it. Draw the development of the truncated pyramid.
33	A Hexagonal prism of base side 30mm and axis length 60mm resting on HP in such a way that two of its edges are parallel to VP. The prism is cut by a section plane which is perpendicular to the VP and inclined at 30º to the HP at a height of 35mm from the base. Draw the development of the lateral surface of the prism.
34	A pentagonal prism, 30 mm base side & 50 mm axis is standing on HP on its base whose one side is perpendicular to VP. It is cut by a section plane 45 degree inclined to HP, through mid-point of axis. Draw FV, sectional top view& sec. Side view. Also draw true shape of section and Development of surface of remaining solid.
35	A hexagonal pyramid 25mm side of base and axis 65mm long is resting on its base on HP with one of the edged of the base parallel to VP. It is cut by a section plane inclined at 60º to HP and perpendicular to VP and intersecting the axis at 30mm above the base. Draw the development of the remaining portion of the pyramid.
36	A cone of base diameter 40 mm and height 50 mm is placed centrally on the top of a square slab side 60 mm and height 25 mm. Draw the isometric projection of the combination.
37	A sphere of diameter 45mm rests centrally over a frustum of cone of base diameter 60mm, top diameter 40mm and height 50mm. Draw its isometric projections.
38	A cube of 35 mm placed centrally on a square slab of 50 mm and thickness 30 mm. Draw the isometric projection of the combination.
39	Draw the isometric projection of the combination. Draw isometric projection of a hexagonal prism of side of base 40mm and height 60mm with a right circular cone of base 40mm as diameter and altitude 50mm, resting on its top such that the axes of both the solids are collinear.
40	A rectangular pyramid of base 40mmx25mm and height 50mm is placed centrally on a rectangular slab side 100mmx60mm and thickness 20mm. Draw the isometric projection of the combination.

PROJECT BASED LEARNING

To enhance the skill-set in the integrated course, the students are advised to execute course-based design projects.

No.	Suggested Projects
1.	Model making of different solids by using Hardbound sheet.
2.	Using Hardbound sheet, prepare the different solids models by development and section methods.
3.	Prepare a demo model to show the principle of orthographic projection.
4.	Prepare the models for showing the method of Isometric projection.
5.	Problem based on Practical approach in view of orthographic projection of lines and planes.
6.	Collection or Interpretation of Engineering Drawing sheets Related to Manufacturing, Civil construction, Layouts, Plans and other Applications.
7.	Study on Comparison of 3D views and isometric Views.
8.	Drawing the Plan of students Home or building (2D)

Detailed Syllabus
Semester 2

Course Title	Probability and Statistics				Course Type		Theory	
Course Code	B20AS0204	Credits	4		Class		II semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	4	4	4				
	Practice	-	-	-	Theory	Practical	IA	SEE
	Tutorial	-	-	-				
	Total	**4**	**4**	**4**	**52**	**-**	**50%**	**50%**

COURSE OVERVIEW:

The course Probability and Statistics for Computer Science treats the most common discrete and continuous distributions, showing how they find use in decision and estimation problems, and constructs computer algorithms for generating observations from the various distributions. Probability in the design and analysis of randomized algorithms. Common randomized algorithms are things like Quick sort and Quick select. Probabilistic method can also useful to prove various important results. Probabilistic methods used to prove some partition theorems that were then used to create efficient data structure.

COURSE COBJECTIVE (S):

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 sciences 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.
5. Learn new algorithms and methods in probability and statistics and apply for suitable problem solving methods.
6. Create solutions for problem solving methods using algorithms to the complex problems, either individually Or as a part of the team and report the results with proper analysis.

COURSEOUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Solve the problems of Curve fitting and regression in various problems in Computer Science & Engineering fields.	1-6	1,2
CO2	Apply the concepts of Probability and statistics in various computer science engineering fields like data mining, classification problems etc.	1-6	1,2
CO3	Develop a stochastic problem as Markov model as a problem solving methods for systematic model buildings.	1-6	1,2
CO4	Make use of sampling theory concepts to solve various engineering problems like structured and unstructured data models.	1-6	1,2
CO5	Learn new algorithms and methods in probability and statistics and apply for suitable problem solving methods.	1-6	1,2
CO6	Create solutions for problem solving methods using algorithms to the complex problems, either individually or as a part of the team and report the results with proper analysis.	1-5,9	1

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1			✓			
CO2			✓		✓	
CO3			✓			
C04			✓	✓		
C05		✓				
C06			✓			

COURSE ARTICULATIONMATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3	1							3	3
CO2	3	3	3	3	3	1							3	3
CO3	3	3	2	2	2	1							2	2
CO4	2	3	2	2	3	1							1	1
CO5	3	3	2	2	1	1							2	1
CO6	2	3	3	3	1	1							2	1

Note:1-Low,2-Medium,3-High

COURSE CONTENT

 THEORY

Contents
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
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.

TEXTBOOKS:
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, 19thprint edition, 2013.
2. R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics", Narosa PublishingHouse, 4th edition, 2016.
3. V.Sundarapandian, "Probability, Statistics and Queuing 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

JOURNALS/MAGAZINES

1. https://www.hindawi.com/journals/jps/
2. https://www.journals.elsevier.com/statistics-and-probability-letters
3. http://www.isoss.net/japs/

SWAYAM/NPTEL/MOOCs:

1. https://www.coursera.org/browse/data-science/probability-and-statistics\
2. https://nptel.ac.in/courses/111/105/111105041/

SELF-LEARNINGEXERCISES:

1. Curve fitting for application problems, Regression analysis for a bivariate data.
2. Probability distribution- Geometric, gamma- distributions, Joint probability distributions of continuous random variables.

Course Title	Physics for Computer Science				Course Type		Theory	
Course Code	B20AS0106	Credits	3		Class		II Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	0	0	0	Theory	Practical	IA	SEE
	-	-	-	-				
	Total	3	3	3	39	-	50	50

COURSE OVERVIEW

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 fibers, EM wave and spectrum, Display Technology and Quantum computation. The subject has basic laws, expressions and theories which help to increase the scientific knowledge to analyze upcoming technologies.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Impart the knowledge about wave mechanics, electromagnetic waves, and its applications

2.Demonstrate the different applications of lasers, and optical fibers

3.Discuss different types of display technologies, touch screen techniques and its applications

4.Explain the importance of quantum computation as an emerging technology.

5. Learn new tools and technologies Physics and its applications to Computer Science Engineering and

 Apply for suitable technologies.

6.Increase the scientific knowledge to analyze upcoming technologies.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply knowledge of wave mechanics, its importance, and applications	1-4	1
CO2	Classify EM waves based on the frequency range, optical fibers and derive expression for NA, number of Modes and attenuation.	1-4	1
CO3	Summarize capacitive and resistive Display Technologies.	1-4	2
CO4	Analyze the working and application of quantum computation	1-3	1
CO5	Learn new tools and technologies Physics and its applications to Computer Science Engineering and apply for suitable technologies.	1-4	2
CO6	Increase the scientific knowledge to analyze upcoming technologies.	1-3	1

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1			√			
CO2		√				
CO3		√				
CO4			√			
CO5		√	√			
CO6				√		

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1									3		
CO2	3	3	2	1									3		
CO3	3	3	2	1										3	
CO4	3	2	1										3		
CO5	3	2	2										3		
CO6	3	2	2										3		

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT
THEORY

Contents
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: 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, semiconductor laser and its applications. Electromagnetic Waves: Basic idea of displacement current, Electromagnetic waves, their characteristics, Electromagnetic spectrum (7 types of EM waves) including elementary facts. Uses of EM waves in communications.
UNIT-3
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-4
Display technology: Touch screen technologies: Resistive and capacitive touch screen and Displays: CRT, Field emission display, Plasma display, LED display, OLED display, LCD display. 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.

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 textbook of Engineering Physics", S. Chand and Company, New Delhi, 2014.
5. EM Waves and Fields: P. Lorrain and O. Corson.

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. Chen, Wayne Cranton, Mark Fihn, "Handbook of Visual Display Technology", Springer Publication, Second edition 2012.

JOURNALS/MAGAZINE

1. https://www.codemag.com/Magazine/ByCategory/Python
2. http://ijaerd.com/papers/special_papers/IT032.pdf
3. https://iopscience.iop.org/article/10.1088/1742-6596 / 423 / 1 / 012027
4. https://ieeexplore.ieee.org/document/4160250
5. Python for scientific computing

SWAYAM/NPTEL/MOOCs:

1. https://www.mooc.org/
2. https://www.coursera.org/

Course Title	Introduction to Data Science			Course Type		Integrated	
Course Code	B20CS0101	Credits	3	Class		II semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	2	2	2				
	Practice	1	2	2	Theory	Practical	IA	SEE
	Tutorial	-	-	-				
	Total	3	4	4	26	26	50%	50%

COURSE OVERVIEW:

Data Science is an interdisciplinary, problem-solving oriented subject that is used to apply scientific techniques to practical problems. The course orients on preparation of datasets and programming of data analysis tasks. This course covers the topics: Set Theory, Probability theory, Tools for data science, ML algorithms and demonstration of experiments by using MS-Excel.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Explain the fundamental concepts of Excel.

2. Illustrate the use of basic concepts of Data Science in the real world applications.

3. Demonstrate the use of SQL commands in real world applications.

4. Discuss the functional components of Data Science for real world applications

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of the concepts of Data Science in developing the real world applications.	1-4,11	1,2
CO2	Apply the SQL commands in developing the real-world applications.	1,2	2, 3
CO3	Build the data analytics solutions for real world problems, perform analysis, interpretation and reporting of data.	1-4	1, 2, 3
C04	Create the real world AI based solutions using different machine learning algorithms	1-4	1, 2
C05	Learn new tools and technologies in Data Science and apply for suitable application development.	1-5	1,2
C06	Develop solutions in the Data Science to the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation	1-3	1,2

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1			✔			
CO2			✔			
CO3			✔	✔		
C04			✔	✔	✔	✔
C05		✔	✔			
C06			✔	✔		

COURSE ARTICULATIONMATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2							3	3	3	3	
CO2	2	2									2	2		3	3
CO3	3	3	3	3							3	3	3	3	2
C04	3	3	3	3							3	3	3	3	
C05	3	3	3	3									3	3	
C06	3	3	3	1									3	3	2

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Introduction to Microsoft Excel
Creating Excel tables, understand how to Add, Subtract, Multiply, Divide in Excel. Excel Data Validation, Filters, Grouping. Introduction to formulas and functions in Excel. Logical functions (operators) and conditions. Visualizing data using charts in Excel. Import XML Data into Excel How to Import CSV Data (Text) into Excel, How to Import MS Access Data into Excel, Working with Multiple Worksheets.
UNIT-2
Introduction to Data Science
What is Data Science? Probability theory, Bayes theorem, Bayes probability; Cartesian plane, equations of lines, graphs; exponents.
Introduction to SQL
SQL: creation, insertion, deletion, retrieval of Tables by experimental demonstrations. Import SQL Database
UNIT-3
Data science components
Tools for data science, definition of AI, types of machine learning (ML), list of ML algorithms for classification, clustering, and feature selection. Description of linear regression and Logistic Regression. Introducing the Gaussian, Introduction to Standardization, Standard Normal Probability Distribution in Excel, Calculating Probabilities from Z-scores, Central Limit Theorem, Algebra with Gaussians, Markowitz Portfolio Optimization, Standardizing x and y Coordinates for Linear Regression, Standardization Simplifies Linear Regression, Modeling Error in Linear Regression, Information Gain from Linear Regression.
UNIT-4
Data visualization using scatter plots, charts, graphs, histograms and maps
Statistical Analysis: Descriptive statistics- Mean, Standard Deviation for Continuous Data, Frequency, Percentage for Categorical Data
Applications of Data Science
Data science life cycle, Applications of data science with demonstration of experiments either by using Microsoft Excel.

PRACTICE:

No	Title of the Experiment	Tools and Techniques	Expected Skill/Ability
1	The height (in cm) of a group of fathers and sons are given below, Find the lines of regression and estimate the height of son when the height of father is 164 cm. Plot the graph. <table><tr><td>Hgt of Fathers</td><td>158</td><td>166</td><td>163</td><td>165</td><td>167</td><td>170</td><td>167</td><td>172</td><td>177</td><td>181</td></tr><tr><td>Hgt of Sons</td><td>163</td><td>158</td><td>167</td><td>170</td><td>160</td><td>180</td><td>170</td><td>175</td><td>172</td><td>175</td></tr></table>	MS Excel	Create and perform operations on Excel data set by applying Linear regression
2	Using the data file DISPOSABLE INCOME AND VEHICLE SALES, perform the following: Plot a scatter diagram. Determine the regression equation. Plot the regression line (hint: use MS Excel's Add Trend line feature). Compute the predicted vehicle sales for disposable income of $16,500 and of $17,900. Compute the coefficient of determination and the coefficient of correlation	MS Excel	Perform prediction and visualization of data
3	Managers model costs in order to make predictions. The cost data in the data file INDIRECT COSTS AND MACHINE HOURS show the indirect manufacturing costs of an ice-skate manufacturer. Indirect manufacturing costs include maintenance costs and setup costs. Indirect manufacturing costs depend on the number of hours the machines are used, called machine hours. Based on the data for January to December, perform the following operations. Plot a scatter diagram. Determine the regression equation. Plot the regression line (hint: use MS Excel's Add Trend line feature). Compute the predicted indirect manufacturing costs for 300 machine hours and for 430 machine hours.	MS Excel	Perform prediction and visualization of data
4	Apply multiple linear regression to predict the stock index price which is <table><tr><td>year</td><td>month</td><td>interest rate</td><td>unemployment rate</td><td>stock index price</td></tr><tr><td>2020</td><td>10</td><td>2.75</td><td>5.3</td><td>1464</td></tr></table>	MS Excel	Perform prediction and visualization of data
5.	Calculate the total interest paid on a car loan which has been availed from HDFC bank. For example, Rs.10, 00,000 has been borrowed from a bank with annual interest rate of 5.2% and the customer needs to pay every month as shown in table below. Calculate the total interest rate paid for a loan availed of Rs.10, 00,000 during 3 years. <table><tr><td>Sl No.</td><td>A</td><td>B</td></tr><tr><td>1</td><td>Principal</td><td>Rs.10,00,000</td></tr><tr><td>2</td><td>Annual interest rate</td><td>5.20%</td></tr><tr><td>3</td><td>Year of the loan</td><td>3</td></tr><tr><td>4</td><td>Starting payment number</td><td>1</td></tr><tr><td>5</td><td>Ending payment number</td><td>36</td></tr><tr><td>6</td><td>total interest paid during period</td><td>?</td></tr></table>	MS Excel	Create Excel data and perform EMI estimator

6	Create a supplier database of 10 records with SUPPLIER_ID as primary key, SUPPLIER_NAME, PRODUCTS, QUANTITY, ADDRESS, CITY, PHONE_NO and PINCODE, Where SUPPLIER_NAME, PRODUCTS, QUANTITY and PHONE_NO, should not be NULL.	SQL	Creating Tables
7	Create the customer database of a big Market with CUSTOMER_ID as primary key, CUSTOMER_NAME, PHONE_NO, EMAIL_ID, ADDRESS, CITY and PIN_CODE. Store at least twenty customer's details where CUSTOMER_NAME and PHONE_NO are mandatory and display the customer data in alphabetical order.	SQL	Creating and retrieving Tables
8	Apply linear regression to find the weather (temperature) of a city with the amount of rain in centimeters. Create your own database with following details. CITY Temperature in Rain in Centigrade Centimeters	MS Excel	Apply Linear regression
9	Use the linear regression technique to compare the age of humans with the amount of sleep in hours. Name Age in Years Sleep in hours Create your own database with above details.	MS Excel	Apply Linear regression
10	Apply the linear regression, compare the average salaries of batsman depending on the run rate scored/ recorded in the matches. Assume your own database.	MS Excel	Apply Linear regression
11	Design the ER diagram and create schema of the REVA library management system.	Entity Relationship	Entity Relationship
12	Design the ER diagram and create schema for Hospital Management system.	Entity Relationship	Schema design

TEXT BOOKS:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43nd edition, 2015.
2. Ramakrishnan and Gehrke, "Database Management systems", Third Edition, McGraw HillPublications,2003.
3. Mastering Data Analysis in Excel - https://www.coursera.org/learn/analytics-excel.
4. Kenneth N. Berk, Carey, "Data Analysis with Microsoft Excel", S. Chand & Company, 2004.

REFERENCE BOOKS:

1. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publications, 19th edition, 2013.
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
4. Hill Professional, 1998.

JOURNALS/MAGAZINES

1. https://www.journals.elsevier.com/computational-statistics-and-data-analysis
2. https://www.springer.com/journal/41060- International Journal on Data Science and Analytics
3. https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=8254253-IEEE Magazine on Big data &Analytics

SWAYAM/NPTEL/MOOCs:

1. Excel Skills for Business: Essentials, Macquarie University (https://www.coursera.org/learn/excel-
2. Essentials)
3. SQL for Data Science, University of California, Davis   (https://www.coursera.org/learn/sql-for-data-
4. science)
5. Data Science Math Skills, Duke University (https://www.coursera.org/learn/datasciencemathskills)
6. https://www.edx.org/course/subject/data-science
7. https://onlinecourses.nptel.ac.in/noc19_cs60/preview

SELF-LEARNINGEXERCISES:

1. Relational database management system.
2. Advanced MS-Excel

Course Title	Basics of Civil and Mechanical Engineering			Course Type		Integrated	
Course Code	B20CE0201	**Credits**	4	**Class**		II Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	1	2	2	Theory	Practical	IA	SEE
	-	-	-	-				
	Total	**4**	**5**	**5**	**39**	**26**	**50**	**50**

COURSE OVERVIEW

This course introduces the Mechanical and Civil Engineering concepts, underlying the fact that this knowledge is essential for all Engineers. The students are made to understand the concept of internal combustion engines and power transmission systems. The students are also exposed to the knowledge of mechanical machine tools with its operations on lathe, drilling, and CNC machines. The students are introduced to the domain of fabrication processes like Soldering, Welding and 3D printing technology. Along with this student are made to expose to scope of Civil engineering, role of civil engineers in different infrastructure & economic development of the country. Students will learn about basic concept of forces, friction, centroid and moment of inertia.

COURSE OBJECTIVE

This course enables graduating students

1. To develop the basic knowledge of IC engines, refrigeration-air conditioning and power
2. Transmission systems.
3. To incorporate the concepts of manufacturing processes using different machine tools, welding
4. Techniques, CNC and 3D printing technology.
5. To understand a broad concept of engineering mechanics.
6. To develop the basics of composition of coplanar forces and fluid mechanics
7. Learn concept of internal combustion engines and power transmission systems
8. Introduction to the domain of fabrication processes like Soldering, Welding and 3D printing technology.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Describe the fundamentals of IC engines, refrigeration-air conditioning and power transmission systems.	1,2	3
CO2	Explain the manufacturing processes using lathe, drilling, welding, CNC machines and 3D printing technology	1,2	3
CO3	Describe the moment of force and couples and equivalent force-couple system.	1,2	3
CO4	Solve numerical problems on composition of coplanar concurrent and non-concurrent force system and basics of fluid mechanics	1,2	3
CO5	Learn concept of internal combustion engines and power transmission systems	1,2	1
CO6	Introduction to the domain of fabrication processes like Soldering, Welding and 3D printing technology.	1,5	1

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		✓				
CO2		✓				
CO3	✓	✓	✓	✓	✓	
C04	✓	✓	✓			
C05		✓				
C06		✓				

COURSE ARTICULATION MATRIX:

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2													1
CO2	3	2													1
CO3	3	2													1
C04	3	2													1
C05	3	2													1
C06	3	2													1

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Introduction to Mechanical Engineering: Overview of Mechanical Engineering, Importance and applications of Mechanical Engineering in different fields.
Thermal Energy Systems: Introduction to IC Engines, Classification, parts of IC Engine, working of 4-stroke Petrol engine with PV-diagram. Simple numerical on calculation of IP, BP and Mechanical efficiency, Introduction to refrigeration system, working of vapour compression refrigeration and window spit air conditioning system. Applications of refrigeration systems

UNIT-2
Power Transmission System: Introduction to drives, classification, belt drives (open and crossed-No derivations) and gear drives and types of gear, Numerical on gear drives. Mechanical Machine Tools: Introduction- lathe, classification, major parts of engine lathe, operations, Drilling machine, classification working bench drilling machine and operations, CNC Machines-Block diagram and applications. Introduction to 3D Printing technology Joining processes-Welding: Working of electric arc welding and soldering, Differences between welding and

UNIT-3
Introduction to Civil Engineering: Scope of Civil Engineering, Types of Infrastructure, Effect of Infrastructure facilities, Role of Civil Engineers in the Infrastructure and Economic Development of Country. Introduction to Engineering Mechanics: Basic concepts, Newton laws of Motion Elements of force, system of forces, principles of physical Independence, superposition and Transmissibility of forces. Moment of force – Couple, Moment of couple and its characteristics, Equivalent Force – Couple system. Resolution and composition of forces. Coplanar Concurrent Force System: Parallelogram Law of forces, principle of resolved parts, composition of

UNIT-4
Coplanar Non – concurrent forces: Varignon's principle of Moments, Resultant of Non – Concurrent force systems, Equilibrium of Coplanar Concurrent Force System: Type's forces acting on the body, free body diagrams, Equations of Equilibrium, Lami's theorem, Equilibrium of Non – concurrent forces equilibrium equations Friction: Frictional forces, Law of friction, Angle of friction, Angle of Repose and Cone of Friction (Theory only) Centroid: Center of Gravity, Center of Gravity of Flat Plate, Centroid, difference between Center of gravity and Centroid, Uses of Axis Symmetry, simple problems Moment of Inertia: Moment of Inertia of Plane Figure, Polar Moment of Inertia and Moment of Inertia of Standard sections (Derivations not included). Simple problems. Fluid Mechanics: Introduction, methods of describing fluid motion, definitions of types of fluid flow, streamline, path line, stream tube. General Continuity equation (problems).

PRACTICE:

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability
1.	Dismantling and Assembly of 2-Wheeler (2–stroke) Engine	2-Stroke Engine (TVS Bike)	Hands on Experience
2	Study of Fitting tools and preparation of fitting model (1 Model)	Fitting tools	Hands on experience
3.	Study of sheet metal tools and development of Cylinder (1 Model)	Sheet metal tools and soldering tools	Hands on experience
4.	Study of sheet metal tools and development of Pen stand and funnel (2-Models)	Sheet metal tools and soldering tools	Creative Thinking
5.	Hands on training on basic welding joint (Butt Joint-1 Model)	Welding tools	Hands on experience
6.	To study the carpentry tools with one model (Half joint-Model)	Carpentry Tools (Marking, Sawing, Planning and Chiseling	Comprehend the different handling carpentry tools
7.	To study the carpentry tools with one model (Dovetail-Model)	Carpentry Tools (Marking, Sawing, Planning and Chiseling	Comprehend the different handling carpentry tools
8.	To study the carpentry tools with one model (T-Joint - Model)	Carpentry Tools (Marking, Sawing, Planning and Chiseling	Comprehend the different handling carpentry tools
9.	To Study the plumbing tools and to make threads on pipe and pipe fittings using plumbing tools	Plumbing Tools	Comprehend the different handling plumbing tools
10.	To Study the plumbing tools used for valves and sanitary fitting	Plumbing Tools	Comprehend the different handling plumbing tools

TEXTBOOKS:

1. K.R. Gopalkrishna ,"Elements of Mechanical Engineering", 12th Edition, Subhash Publishers, Bengaluru, 2012.
2. Roy & Choudhury, "Elements of Mechanical Engineering", Media Promoters & Publishers Pvt. Ltd, Mumbai, 2000.
3. Mikell P Groover : Automation, Production Systems, and Computer Integrated Manufacturing , Pearson India, 2007, 4th Edition

REFERENCE BOOKS:
1. SKH Chowdhary, AKH Chowdhary, Nirjhar Roy,"The Elements of Workshop Technology Vol I & II, 11th edition, Media Promotors and publisher, Mumbai, 2001.
2. AvikshitSaras, "3D Printing-Made Simple", BPB Publications-New Delhi.

JOURNALS/MAGAZINES

1. International Journal of Machine Tools and Manufacture
2. International Journal of Refrigeration.

SWAYAM/NPTEL/MOOCs:
1. https://nptel.ac.in/courses/112/103/112103262/#
2. https://www.my-mooc.com/en/mooc/fundamentals-manufacturing-processes-mitx-2008x/
3. https://www.coursera.org/learn/3d-printing-applications

Course Title	Programming for Problem Solving				Course Type		Integrated	
Course Code	B20CS0102	**Credits**	4		**Class**		II Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	1	2	2	Theory	Practical	IA	SEE
	-	-	-	-				
	Total	**4**	**5**	**5**	**39**	**26**	**50%**	**50%**

COURSE OVERVIEW:

Algorithms and flowcharts are the fundamental tools for problem solving which can be used by the computers. The computer programs can be developed using algorithms and flowcharts to provide solutions to problems. C Language is a general-purpose, structured and procedure oriented programming language. It is one of the most popular computer languages today because of its structure and higher-level abstraction C. This course introduces algorithms, flowcharts and various C Programming language constructs for the development of real world applications.

COURSE OBJECTIVE (S):
1. Explain algorithms, flowcharts and different programming constructs of C to be used for Development of applications.
2. Illustrate the use of iterative statements and conditional Statements for solving the real world problems.
3. Demonstrate the use of functions with parameter passing mechanisms for solving the real world problems.
4. Discuss the use of structures, unions, pointers and file operations for solving the real world Problems.
5. Learn new algorithms and technologies in C Programming and apply for suitable application development.
6. Develop solutions by using C Programming to the complex problems, either individually or as a part of team and report the results.

COURSE OUTCOMES (COs)

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

CO#	Course Outcomes	POs	PSOs
CO1	Identify the programming constructs of C language to solve a given problem.	1-6	1
CO2	Apply the concepts of matrices to develop data processing and analysis solutions in various application domains.	1-5	1
CO3	Develop text processing based applications using string operations.	1-5	2,3
CO4	Create solutions for real world problems using Pointers, Union, Structures and file operations.	1-5	2,3
CO5	Learn new algorithms and technologies in C Programming and apply for suitable application development	1-5	2,3

| CO6 | Develop solutions by using C Programming to the complex problems, either individually or as a part of the team and report the results | 1-5,9 | 2,3 |

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1				✓		
CO2			✓			
CO3			✓			
CO4						✓
CO5		✓	✓			
CO6						✓

COURSE ARTICULATIONMATRIX

CO#/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	1	2	1							3		
CO2	1	3	2	2	1								3		
CO3	2	2	2	2	1									3	3
CO4	3	3	3	1	1									3	3
CO5	3	3	3	2	2	1									
CO6	3	3	3	2	2	2							3	3	2

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Algorithm: Definition, Purpose of writing an algorithm, Rules for writing an algorithm, Advantage of writing algorithm and examples. Flowchart: Definition, Notations used to write a flow chart, Advantage and disadvantages of writing the flowchart and examples. Introduction to "C": Introduction to GitHub, Structure of C program with example, C language & its features, C tokens, data types in C, variables, constants, input and output functions
UNIT-2
Operators and Expressions: Unary operator, assignment operator, arithmetic operator, relational operators, logical operators &bitwise operator, conditional operator, increment and decrement operator, special operator. 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, for loop, differences between while, do-while and for loop.
UNIT-3
Arrays: one dimensional array, two dimensional array, Linear and binary search and bubble sorting. Functions: Structure of a function, types of functions, parameter passing mechanisms, Command line arguments. Strings: string operations with and without using inbuilt string functions.
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

PRACTICE:

PART A:			
No	**Title of the Experiment**	**Tools and Techniques**	**Expected Skill /Ability**
1	Consider Loan applications in a bank consisting of various customer details such as Name, Organization, salary and loan amount applied. Segregate the loan applications based on income (low: <=5 lpa, medium: >5lpa <10lpa and high:>10lpa)	Condition checking	Apply if-else and switch
	Two files DATA1 and DATA2 contain sorted lists of integers. Write a C program to merge the contents of two files into a third file DATA i.e., the contents of the first file followed by those of the second are placed in the third file. Display the contents of DATA.	Files operations	Apply File concepts
2	Statistical measures are used for data analysis and interpretation. Develop program to determine the mean and stand deviation of data stored in an array.	Statistical Computing	Use Array and loops
	Consider the details of Airline passengers such as Name, PAN-No., Mobile-no, Email-id, Source, Destination, Seat-No and Air-Fare. Develop a program to read the details of airline passengers, store them in the structure "Airline" and List details of all the passengers who travelled From "Bengaluru to London".	Search technique	Apply Structures

3	Assume that Mr. Peterson shopped N items at Big Market and his Cart comprises of name of the item, cost of the item per UNIT and quantity. Read the details of shopping and store them in the structure "Shop". Compute the total amount spent on shopping at Big Market and also find out the item with minimum and maximum cost.	Statistical measure	Apply Structure and if then else
	b. Write a C program to define a structure named Student with name and DOB, where DOB in turn is a structure with day, month and year. Read the details of student and store them in the structure "Student". Display name and date of birth of students using the concept of nested structures.	Nested Structures	Apply Nested Structures
4	Consider a set of N students with SRN, name, and marks scored in 8 subjects. Read the details of students and store them in the structure "Student_Marks". Compute total marks and average marks of each student and display them with suitable headings.	Average computation and visualization	Apply Structure, Array and Loops
	b. Create the structure "Book" with book_id, title, author_name and price. Write a C program to pass a structure as a function argument and print the book details.	Functions	Passing structures to function
5	Assume that Ms. Jassica shopped N items at Amazon and the Cart comprises of name of the item, cost of the item per UNIT and quantity. Arrange the items in the increasing order of cost of the item per UNIT.	Sorting	Apply sorting the contents of structure.
	Write a C program to compute the monthly pay of "N" employees using each employee's name, Basic_Pay, DA and HRA. The DA and HRA are 80% and 30% of the Basic_Pay respectively. Gross-salary is computed by adding DA and HRA to Basic_Pay. Store all the details in an array of structures and print the name and gross salary of each employee.	Reading and storing data	Use structures for reading and storing data
6	a. Consider the details of "N" Faculty members consisting of Name, EMP-ID,name of the school, address and salary. Create a file to store the above details. Retrieve the contents of the file to perform following operations: (i) Display the details of the faculty based on salary range entered. (ii) Display the details of the faculty based on the EMP-ID entered.	File operations	Create file, store data and display details.
	b. Write a C program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol using if else and switch case.	String operations	Apply string functions

PART B:			
	Project 1: Address Contact List with the following modules: User Add User(Name, Address, Primary contact number, secondary contact number, E-mail ID) Delete User Search for User Edit Find and replace the user name Edit the contact (Phone Number) details. Edit the Address of the user Report List of users based on the starting letter of their names. List of users based on first 2 digits of their mobile number. List of users based on the domain name of their E-mail ID.		
1	Develop a program in C to create the structure "Contact" with the fields, user_name, address, mobile, phone1 and email_id. Read the data into the structure "Contact" and store them in the file "Contact.txt".	Structures and Files	Develop the program using Structures and Files
2	Develop a program in C to open contact list from the file "Contact.txt" in read mode and delete contact details of the person based on name of the person by searching his/her details. Display the updated list.	String, File and Linear Search	Develop the program using String and File
3	Develop a program in C to input the string,"Str1"(which can be either a mobile no. or name of the user) and search for it in the file , "Contact.txt" and display the details if it is found else display an error.	String, File and Linear Search	Develop the program using String and File
4	Develop a program in C to input the name of the user into the string, "Str1" , search for it in the file "Contact.txt" and replace the content of "Str1" with the new data if found.	String, File and Linear Search	Develop the program using String, File and apply linear search
5	Develop a program in C to input the phone number of user into the string, "Str1", search for it in the file "Contact.txt" and edit it with new data if found and save the same.	String, File and Linear Search	Develop the program using String, File and apply linear search
6	Develop a program in C to input the address of the user and search for the same in the file, "Contact.txt" and edit the address with new address and save the same.	String, File and Linear Search	Develop the program using String, File and apply linear search
7	Develop a program in C to input a letter into "Letter", compare it with the details stored in "Contact.txt" and then display the list of the users whose name begin with "Letter ".	File operations	Develop the program using file
8	Develop a program in C to input first two digits of a mobile number into "Mobile", search for the same in "Contact.txt" and display the details of all the users whose mobile number begin with "Mobile".	File operations	Develop the program using file
9	Develop a program in C to input a domain name of email-id and search for the same in the file, "contact.txt" and list the details of the users whose email-id matches with the given domain name.	File operations	Develop the program using file

TEXT BOOKS:

1. B.W. Kernighan & D.M. Ritchie, "C Programming Language", 2nd Edition, PRENTICE HALL
2. SOFTWARE SERIES, 2005.
3. Herbert Schildt, "C: The Complete Reference", 4th edition, TATA McGraw Hill, 2000.
4. B.S. Anami, S.A. Angadi and S. S. Manvi, "Computer Concepts and C Programming: A
5. Holistic Approach", second edition, PHI,2008.

REFERENCE BOOKS:

1. Balaguruswamy," Programming in ANSI C", 4th edition, TATA MCGRAW Hill, 2008.

2. Donald Hearn, Pauline Baker," Computer Graphics C Version", second edition, Pearson Education, 2004.

JOURNALS/MAGAZINES:

1. https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=6294 (IEEE Journal/Magazine on IT Professional)
2. https://ieeexplore.ieee.org/document/1267572 (IEEE Computing in Science and Engineering)

SWAYAM/NPTEL/MOOCs:

1. https://online courses.nptel.ac.in/noc20_cs06/preview (Problem Solving through Programming in C)
2. https://www.edx.org/course/c-programming-getting-started (C Programming Getting started)
3. https://www.coursera.org/specializations/c-programming (Introduction to C programming)

SELF-LEARNINGEXERCISES

1. **Fundamentals of computer graphics**: output primitives–Line, Circle and Ellipse drawing algorithms-Attributes of output primitives.
2. **Inline Assembly Language Program:** Simple inline assembly, Extended Assembly Syntax Microsoft C Compiler.

Course Title		IoT and Applications				Course Type		Integrated	
Course Code	B20EC0101	**Credits**		**2**		**Class**		**II Semester**	
Course Structure		TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
		Theory	1	1	1				
		Practice	1	2	2	Theory	Practical	CIE	SEE
		Tutorial	-	-	-				
		Total	**2**	**3**	**3**	13	26	30%	30%

COURSE OVERVIEW

The Internet of Things (*IoT)* expands access to the world-wide web from computers, smart phones, and other typical devices to create a vast network of appliances, toys, apparel, and other goods that are capable of connecting to the Internet. This introductory course focuses on IoT architecture, its domains and communication protocols. The course is supported with hands on sessions that incorporates different types sensors interfaced with IoT board to build IoT projects to solve real time problems. The case study of deployment of IoT in various applications are provided.

COURSE OBJECTIVE(S):

The objectives of this course are to:

1. Explain the architecture of Internet of Things.
2. Inculcate knowledge of IoT devices, Sensors and Communication Protocols in various application domains.
3. Gain expertise in interface of various sensors to IoT Boards.
4. Discuss the various applications of IoT.
5. Learn new technologies in the IoT and apply for suitable application development.
6. Develop simple IoT projects and modules.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Describe the architecture of IoT eco-system	1	1,2
CO2	Identify IoT devices, architecture, sensors and Communication protocols	1	1,2
CO3	Demonstrate the interface of sensors to IoT board	1,5, 12	1,2
CO4	Realize various Applications of IoT through case studies	1,5, 12	1,2
CO5	Learn new technologies in the IoT and apply for suitable application development.	1,5,9, 12	1,2
CO6	Develop simple IoT projects and modules	1,5,6,9, 12	1,2

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√				
CO2		√				
CO3			√			
CO4				√	√	
CO5			√			√
CO6						√

COURSE ARTICULATIONMATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												3	3	
CO2	3												3	3	
CO3	3				3							3	2	2	
CO4	3				3							3	1	1	
CO5	3		2		3				2				1	1	1
CO6	3				3				2			3	3	3	

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-I
IoT Basics: Introduction to IoT, How does Internet of Things Works, Features of IoT, Advantages and Disadvantages of IoT, Embedded Devices in IoT, IoT eco-system **IoT Architecture and IoT Devices**: Components of IoT architecture, Stages of IoT solution architecture, Smart Objects, IoT Devices.
UNIT-II
IoT boards in Market: Arduino, Arduino UNO, ESP8266, Raspberry Pi **IoT Platform:** Amazon Web Services (AWS) IoT platform, Microsoft Azure IoT platform, Google Cloud Platform IoT, IBM Watson IoT platform, Thing Work IoT platform Technologies Used in IoT: Bluetooth, Wi-Fi, Li-Fi, RFID, Cellular, Z-Wave

PRACTICE:

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability
1.	Introduction to IoT Board Arduino UNO Arduino Nano Node MCU Ethernet Shield	Hardware	Identifications of various parts of Arduino and Node MCU boards Study of Ethernet shield and connection to the board
2.	Working with Arduino IDE (Integrated Development Environment)	Open source Arduino IDE	Download specified software Modify code as per the application
3.	a) Demonstration of Multi meter usage b) Demonstration of Breadboard connection for Voltage, Ground, series and parallel connections c) Exercise to read the value of resistor using Color code chart	Multi meter Breadboard Resistor packs	Measurement of voltage at various points in IoT boards Choose the value of Resistor for an application
4	Reading photo resistor sensor value connected to Arduino Board	Arduino UNO Arduino IDE LDR, Multi meter, Resistor	Interface of photo sensor to IoT board for light measurement applications
5	Reading temperature sensor value connected to Arduino Board	Arduino UNO, Arduino IDE, Temperature sensor, Multi meter	Interface of Temperature sensor to IoT board for temperature measurement application
6.	Reading motion detector sensor value connected to IoT board	Arduino UNO, ArduinoIDE, pyro-dielectric sensor,	Interface of Motion detector sensor to IoT board for motion detection applications
7	Reading distance measurement using Ultrasonic sensor Connected to IoT board	Arduino UNO, Arduino IDE, Ultrasonic sensor, Multi meter	Interface of Motion detector sensor to IoT board for motion detection
8	Interface relay to IoT board	Arduino UNO, Arduino IDE, relay Multi meter	Interface relay to IoT board for Switching applications
9	Connect Wifi-ESP8266 to Arduino UNO board , Send and receive data through smart phone.	Arduino UNO ESP8266, Arduino IDE Smart phone	Connect IoT board to Wifi network
9	Mini Projects Arduino Controlled Light intensity Thermometer Motion activated light lamp Touchless motion sensor trash can		

TEXTBOOK:

1. Vijay Madisetti, ArshdeepBahga," Internet of Things: A Hands-On- Approach", ISBN: 978 0996025515,2014.

REFERENCEBOOKS:

1. Raj Kamal," Internet of Things: Architecture & design Principle", McGraw Hill Education,2017.

SWAYAM/NPTEL/MOOCs:

1. https://www.coursera.org/learn/iot
2. https://www.coursera.org/learn/interface-with-arduino

SELF-LEARNINGEXERCISES:

a) Create Arduino project hub

Course Title	ENTREPRENEURSHIP				Course Type		Theory	
Course Code	B20ME0104	Credits	1		Class		II semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	1	1	1				
	Practice	-	-	-				
	Tutorial	-	-	-	Theory	Practical	CIE	SEE
	Total	**1**	**1**	**1**	**13**	**0**	**50%**	**50%**

COURSE OVERVIEW:

Course Description: This is an *introductory course* is designed to provide the foundational concepts of *entrepreneurship*, including the definition of *entrepreneurship*, the profile of the *entrepreneur*, and the role of venture creation in society. The course also provides a bird's eye view on the steps to start a venture, financing, marketing as well as support by various institutions towards entrepreneurship.

COURSE OBJECTIVE

1. To understand the basic terms, concepts in Entrepreneurship Development
2. To apply for the supporting schemes towards entrepreneurship

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Understand and explain the key terms, definitions, and concepts used in Entrepreneurship Development	1	1
CO2	Plan a startup and understand sources available for finance and the supporting schemes offered by state and central governments and other entrepreneurial development organizations	1,2	1,2

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√				
CO2	√	√	√			

COURSE ARTICULATIONMATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2												2		
CO2	2	2											2	1	

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY

Contents
UNIT-1
INTRODUCTION TO ENTREPRENEURSHIP Evolution of term 'Entrepreneurship', Factors influencing entrepreneurship', Psychological factors, Social factors, Economic factors, Environmental factors. Characteristics of an entrepreneur, Difference between Entrepreneur and Entrepreneurship, Types of entrepreneurs. New generations of entrepreneurship viz. social entrepreneurship, Edupreneurship, Health entrepreneurship, Tourism entrepreneurship, Women entrepreneurship etc., Barriers to entrepreneurship, Creativity and entrepreneurship, Innovation and inventions, Skills of an entrepreneur, Decision making and Problem Solving
UNIT-2
INSTITUTIONAL SUPPORT FOR ENTREPRENEURSHIP Organization Assistance to an entrepreneur, New Ventures, Industrial Park (Meaning, features, & examples), Special Economic Zone (Meaning, features & examples), Financial assistance by different agencies, MSME Act Small Scale Industries, Carry on Business (COB) licence, Environmental Clearance, National Small Industries Corporation (NSIC), e-tender process, Excise exemptions and concession, Exemption from income tax, The Small Industries Development Bank of India(SIDBI), Incentives for entrepreneurs

TEXTBOOKS:

1. K. Ramachandran," Entrepreneurship Development", Tata Mc. Graw Hill, 2008.
2. Sangeeta Sharma, "Entrepreneurship Development", PHI Publications, 2016.

REFERENCE BOOKS:
1. Baringer and Ireland, "Entrepreneurship", 11th Edition, Pearson,2020.
2. P. Narayana Reddy, "Entrepreneurship – Text and Cases", Cengage Learning India, Iedition,2010
3. Paul Burns," Corporate Entrepreneurship: Building The Entrepreneurial Organization", Palgrave Macmillan.
4. Drucker F Peter,:"Innovation and Entrepreneurship", 1985.Heinemann,London.
5. Doanld F Kuratko & Richard M ,"Entrepreneurship in the New Millennium", India Edition.

JOURNALS/MAGAZINES
1. International Small Business Journal: https://journals.sagepub.com/home/isb
2. Journal of Development Entrepreneurship: https://www.worldscientific.com/worldscinet/jde

SWAYAM/NPTEL/MOOCs:

1. Entrepreneurship: https://nptel.ac.in/courses/110/106/110106141/

SELF-LEARNINGEXERCISES:
1. Introverts participate. If you have a few vocal students asking questions and little participation from others, anonymous questions lower student anxiety, which makes it easier for everyone to participate.
2. You learn what students are thinking about. Anonymity provides cover for students to ask questions they may be too afraid to ask but are curious about.
3. Discussions start. Anonymity means you can invite students to pose "challenging" questions. If you encourage your students to question what they're learning, why it's important, or why they should have to do the work you're assigning, you spark discussions about how entrepreneurship is relevant, which can often be the key to increasing engagement.

PROBLEMBASEDLEARNING

No.	
1	How to write a Business Plan
2	Creating Marketing, Financial and Organizational Plans.
3	How to apply for financial assistance via various schemes
4	How to file taxes as a Small Business and understand the importance of GST

Detailed Syllabus
Semester -3

Course Title	Analog and Digital Electronics				Course Type		Theory	
Course Code	B20CI0301	Credits	3		Class		III Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3	Theory	Practical	CIE	SEE
	Practice	-	-	-				
	-							
	Total	3	3	3	39	-	50	50

is course covers basic concepts of Electrical Engineering. The course introduces the working of analog components and helps in understanding basics in digital electronics by applying the knowledge of logic gates and learning the applications of diodes and op amps. The course provides foundation on designing and implementation of logic circuits. Analog circuits are simulated using ORCAD tool and digital circuits using XILINX tool which helps in gaining experience in creating and testing of circuits.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Discuss the applications of diode in wave shaping circuits.

2. Discuss working principle of different types of oscillators.

3. Discuss performance parameters and applications of Operational amplifiers

4. Describe designing, building and testing of common combinational cicuits

5. Describe designing, building and testing of common sequential digital logic circuits.

6. Illustrate applications of Ring Counter and Jhonson Counter.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Analyze the use of diodes in clipping ,clamping wave and working principle of oscillators	1 to 4	1
CO2	Apply the basic knowledge used in operational amplifiers for specific engineering applications.	1 to 3	1
CO3	Identify the different families of digital integrated circuits and working principle of combinational circuits	1 to 2	2
CO4	Develop minimization techniques of combinational circuits using K-map	1 to 4	1
CO5	Analyze the working principle of sequential circuits such as Flip-Flops , Counters and shift registers.	1 to 3	1
CO6	Develop the ability to analyze and design adders, subtractors, multiplexers and demultiplexers.	1 to 4	3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1				√		
CO2			√			
CO3			√			
CO4				√		
CO5				√		
CO6			√			

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2									3		
CO2	3	2	3		2								3		
CO3	3	1	2	1	2									3	
CO4	3	1	1	2									3		
CO5	3	1	1	2									3		
CO6	3			2	2										3

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY:

UNIT – 1
Limiters and Oscillators: Clipping and clamping circuits using diodes, Oscillator operation, Phase shift Oscillator, Wien bridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (BJT Version Only) Simple design methods of Oscillators.

UNIT- 2
Operational Amplifiers: Ideal Opamp versus Practical Opamp, Performance Parameters, Some Applications: Peak Detector Circuit, Absolute Value Circuit, Comparator, Active Filters-First order LPF and HPF, Phase Shifters, Instrumentation Amplifier, Non-Linear Amplifier-Log and antilog amplifier.

UNIT – 3
Principle and Minimization Techniques of combinational Circuits: Introduction to combinational logic, Minimization Techniques: Min term, Max term, Sum of Products (SOP), Product of Sums (POS), 3 and 4 Variable Karnaugh map.

UNIT – 4
Analysis of Combinational and sequential Circuits: Half adder, full Adder, Half Subtractor, full Subtractor, multiplexers and De multiplexers.   Introduction to Sequential circuits: flip-flops: SR, JK, D, T Characteristic tables and equations; Application of Shift register (Ring Counter and Johnson counter) .

TEXT BOOKS:

1. Anil K Maini, Varsha Agarwal," Electronic Devices and Circuits", Wiley, 2009.
2. Jacob Millman, Christos Halkias, Chetan D Parikh," Millman's Integrated Electronics – Analog and Digital Circuits and Systems", 2nd Edition, Tata McGraw Hill, 2010.
3. Donald P Leach, Albert Paul Malvino&GoutamSaha," Digital Principles and Applications", 7th Edition, Tata McGraw Hill, 2010.

REFERENCE BOOKS:

1. Stephen Brown, ZvonkoVranesic," Fundamentals of Digital Logic Design with VHDL", 2nd Edition, Tata McGrawHill, 2005.
2. R D Sudhaker Samuel, "Illustrative Approach to Logic Design", Sanguine-Pearson, 2010.
3. Charles H. Roth," Fundamentals of Logic Design", Jr., 5th Edition, Cengage Learning, 2004.
4. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss," Digital Systems Principles and Applications", 10th Edition, Pearson Education, 2007.
5. M Morris Mano," Digital Logic and Computer Design", 10th Edition, Pearson Education, 2008.
6. Jacob Millman, Christos Halkias, "Analog and Digital Circuits and Systems", 2nd Edition, Tata McGraw Hill, 2010
7. R. D. Sudhaker Samuel," Electronic Circuits", Sanguine-Pearson, 2010

JOURNALS/MAGAZINES

1. https://ieeexplore.ieee.org/document/1085417
2. https://www.academia.edu/Documents/in/Digital_Electronics
3. https://www.mdpi.com/journal/electronics/special_issues/circuit_machine_learning

SWAYAM/NPTEL/MOOCs:

1. https://technobyte.org/digital-electronics-logic-design-course-engineering/
2. https://www.udemy.com/course/digital-electronics-logic-design/

Course Title	Programming with JAVA				Course Type		Integrated	
Course Code	B20CI0302	Credits	3		Class		III Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	-	-	-	-				
	Total	3	3	3	39	-	50	50

COURSE OVERVIEW

Java's unique architecture enables programers 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 OBJECTIVE (S):

The objectives of this course are to:

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.
5. Discuss object-oriented features and advance Java programming skills
6. Explain to create robust object-oriented applications with Java.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of array concepts in java to solve real world problems.	1 to 5	1
CO2	Apply the features of OOPS in java to solve the real-world problems.	1 to 5	1
CO3	Develop program for stack implementation using Exception Handling in java.	1 to 5	2, 3
CO4	Identify suitable data structures to solve real world applications.	1 to 5, 12	2
CO5	Discuss object-oriented features and advance Java programming skills	1 to 5	1
CO6	Explain to create robust object-oriented applications with Java.	1 to 5, 12	2,3

BLOOM'S LEVELOF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√	√		
CO4			√			
CO5		√				
CO6		√				

COURSE ARTICULATION MATRIX

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1								3		
CO2	3	3	2	2	1								3		
CO3	3	3	1	1	1									3	3
CO4	3	3	3	1	2							1	3		
CO5	3	3	3	1	2								3		
CO6	3	3	2	2	2									3	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY:

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 Super class; 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; Re throwing 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.

TEXT BOOKS:
1. Cay S. Horstmann," Core Java® SE 9 for the Impatient", Addison Wesley, Second Edition, 2018.
2. HerbertSchild," Java™: TheCompleteReference",McGraw-Hill,TenthEdition,2018.
3. David Gallardo, Ed Burnette, Robert Mcgovern," Eclipse in Action a guide for java developers", Manning Publications,2003.
4. Ed Burnette;" Eclipse IDE Pocket Guide: Using the Full-Featured IDE", O'Reilly Media, Inc, USA,2005.

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

JOURNALS/MAGAZINES
1. https://ieeexplore.ieee.org/document/5464387
2. https://files.eric.ed.gov/fulltext/EJ1075126.pdf
3. https://www.sciencedirect.com/science/article/pii/S0167642304000590
4. https://www.informingscience.org/Publications/4322?Source=%2FJournals%2FJITEIIP%2FArticles%3FVolume%3D0-0
5. https://www.javadevjournal.com/
6. https://blogs.oracle.com/javamagazine/

SWAYAM/NPTEL/MOOCs:
1. https://onlinecourses.nptel.ac.in/noc19_cs84/preview
2. https://www.classcentral.com/course/swayam-programming-in-java-12930
3. https://swayam.gov.in/explorer?searchText=java

Self-Learning Exercises:
1. The Eclipse-IDE
2. Streams
3. Concurrent Programming
4. Swing and JavaFX
5. Networking- JDBC, Database Access

Course Title	Data Structures					Course Type		Integrated	
Course Code	B20CI0303	Credits	3			Class		III Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage		
	Theory	3	3	3					
	Practice	-	-	-	Theory	Practical	CIE	SEE	
	-	-	-	-					
	Total	3	3	3	39	-	50	50	

COURSE OVERVIEW

The course focuses on basic and essential topics in data structures, including array-based lists, linked lists, recursion, stack, queues, and binary trees, heaps, sorting and searching algorithms. It also covers analysis and design of fundamental data structures and engages learners to use data structures as tools to algorithmically design efficient computer programs that will cope with the complexity of actual applications.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Discuss the concept of Abstract Data Types (ADT)
2. Provide the knowledge of stacks and queues.
3. Understand the importance of Linked lists
4. Illustrate the operations of trees
5. Demonstrate the use of appropriate of data structures for a given problem.
6. Design a data structure application for real time problems.

COURSE OUTCOMES (COs)

After thecompletion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Explain the Abstract Data Types, Structures.	1,3, 5,10,11	1
CO2	Formulate the solution for any computational problem using stacks and queues.	3,8	1,2
CO3	Analyze the importance of linked lists.	5,7,9	1,2
CO4	Solve real time problems using trees data structure.	1,2,7,8,9,10	1,2
CO5	Apply appropriate data structures to solve a given problem.	1 , 5,7,8,9,12	1
CO6	Compare the performance of various data structures.	2,7,8,9,12	1,2

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√				
CO2	√	√				
CO3				√		
CO4			√			
CO5			√			
CO6					√	

COURSE ARTICULATION MATRIX

CO#/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1		2					1	2				
CO2			1					1							
CO3					2		2		2						
CO4	3	3					2	1	2	1					
CO5	1				1		2	2	2			2			
CO6		1					2	2	2			2			

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY:

UNIT – 1
Introduction to Data structures and Algorithms: Data, Data Types, Abstract Data Types and Examples, Algorithms, Arrays: One Dimensional and Two Dimensional, Structures: Introduction to structures and nested structures.

UNIT – 2
Data Structures-1: Stacks, Evaluation of expressions: Infix, Prefix, postfix; Queues: Simple, circular and priority Queues.

UNIT – 3
Data Structures-2: Pointers; Dynamic memory allocation; Linked List: singly linked list, doubly linked list, stack using linked list, queue using linked list.

UNIT – 4
Data Structures-3: Trees: Binary Tree, Binary Tree Traversals, Binary search Tree

TEXTBOOKS:

1. Horowitz, Sahni, Anderson-Freed, Fundamentals of Data Structures in C, 2nd Edition, Universities Press, 2007.

2. Joshi, Data Structures and Algorithms In C, Tata McGraw-Hill Education, 2010.

REFERENCEBOOKS:

1. The design and analysis of computer algorithms, 4th Edition Addison-Wesley
2. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, Data Structures and Algorithms, Addison-Wesley, 1987.

3. Richard Gilberg, Behrouz Forouzan, Data Structures: A Pseudo code Approach with C, Cengage Learning, 2004.

4. ACM Transactions on   Data structures
5. ACM Journal of Algorithms and Computational Technology..

JOURNALS/MAGAZINES

1. https://www.imedpub.com/scholarly/data-structure-journals-articles-ppts-list.php
2. https://www.mdpi.com/journal/algorithms/special_issues/Efficient_Data_Structures
3. https://ieeexplore.ieee.org/document/4055607
4. https://ieeexplore.ieee.org/abstract/document/6312216
5. https://www.sciencedirect.com/science/article/pii/0022000083900065
6. https://www.sciencedirect.com/journal/journal-of-algorithms

SWAYAM/NPTEL/MOOCs:

1. Coursera – Data Structures and Algorithms Specialization
2. Coursera – Data Structures, University of California San Diego
3. Data Structures and Algorithms, National Research University Higher School of Economics
4. https://nptel.ac.in/courses/106/102/106102064/
5. https://nptel.ac.in/courses/106/106/106106127/
6. https://nptel.ac.in/courses/106/103/106103069/

Self-Learning Exercises:

1. Storing game entities in a array
2. Pseudo-random number generators
3. Reversing an array using a stack
4. Matching parentheses and HTML tags
5. Double ended queue
6. Application of tree traversals

Course Title	Discrete Mathematics and Graph Theory			Course Type		Theory	
Course Code	B20AS0302	Credits	3	Class		III Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	-	-	-	-				
	Total	3	3	3	39	-	50	50

COURSE OVERVIEW

Discrete Mathematics is the study of discrete objects. Discrete Mathematics is used to develop our ability to understand and create mathematical arguments and also used to provide the mathematical foundation for advanced mathematics and computer science courses. Graphs (abstract networks) are among the simplest mathematical structures, which are used in most of the areas of Computer Science to solve the complex problems.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Explain mathematical arguments using logical connectives and quantifiers.
2. Illustrate the operation on discrete structures such as sets, relations and functions.
3. Describe the theory and application 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 system.
5. Explain to provide the mathematical foundation for advanced mathematics
6. Illustrate to use discrete mathematics to solve the complex problems in most of the areas of Computer Science

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Construct mathematical arguments using logical connectives and quantifiers	1 to 4	2
CO2	Apply the operations like union and intersection on discrete structures such as sets, relations and functions	1 to 3, 5,6	2
CO3	Make use of graph and fundamental theorems in real world applications	1 to 6	2
CO4	Develop a model using advanced concepts of graph for real world applications	1,2,4,5,6	2
CO5	Apply the mathematical foundation for advanced mathematics	1 to 3, 5,6	2
CO6	Solve the complex problems in most of the areas of Computer Science	1,2,3,4	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√			
CO4			√			
CO5			√			
C06					√	

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2										3	
CO2	3	2	3		2	1								3	
CO3	3	1	2	1	2	3								3	
CO4	3	2		2	2	2								3	
CO5	3	2	3		2	1								3	
C06	3	2	3	3											3

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY:

UNIT – 1

Set Theory and Logic: Fundamentals of Sets, Sub sets, Venn diagram, Operations on sets, Laws of set theory, Countable and Uncountable sets, Addition Principle, Extended Addition Principle, Propositions, Logical Connectives and truth tables (Illustrative Examples), Logical equivalence, Laws of logic, Duality, NAND and NOR connectives (Circuits), Converse, Inverse and Contra positive, Rules of Inference, Open statements, Quantifier, 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 Examples), Matrices and Digraph of the relations, Properties of relations, Equivalence relations, Partial ordered relations, Posets, Hasse diagrams, Extremal elements in posets, Types of Functions, properties of Functions, The pigeon hole principle, composite functions, invertible functions, Floor and ceiling functions, Sterling number of second kind.

UNIT – 3
Introduction to graph theory: Konigsberg's bridge problems, Utilities problem, Seating Problem, Graphs, Representation of Graphs. Directed graphs, Incidence, Adjacency, Degree, In degree, Out degree, Regular graphs, Complete graphs, Null Graph, Bipartite Graphs, Isomorphism, Directed Graphs, Sub graphs, Walk, Trail, Path, Circuit, Cycle, Connected and disconnected graphs, Components, Weakley connected and Strongly connected Components, Complement of graphs, Partition and Decompositions.
UNIT – 4
Euler and Hamiltonian graphs and Graph colouring: Operation on graphs, Definition of Euler Trail, Euler Graphs, Hamiltonian path, Hamiltonian Cycle, Hamiltonian Graphs, Standard Theorems on Euler and Hamiltonian graphs, planar graph, detection of Planarity, Dual of planar graphs, Euler formula for planar graph, Graph colouring, Chromatic polynomial, Map coloring, Four Color Theorem, Five Color Theorem, Matching, Network flow, and its applications, Cut set, Cut vertex, Chord, Properties of Cut Sets, Max Flow Min Cut Theorem.

TEXT BOOKS:

1. Ralph P Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Education, 5th Edition, 2014.
2. Nasingh Deo, "Graph Theory with Applications to Engineering Computer Science", Prentice-Hall, 2014.

REFERENCE BOOKS:

1. Keneth H Rosen, "Discrete Mathematics and its applications", 5th Edition,, Tata McGraw Hill, 2014.
2. C L Liu, "Elements of Discrete Mathematics", 4th edition, Tata MacGraw Hill 2014.
3. Thomas Khoshy, "Discrete Mathematics with applications", Elsvier, 2012.
4. Ralph P Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Education, Asia, 2015.
5. Frank Harary, "Graph Theory", Norosa, 2013.
6. J. A. Bondy and V. S. R. Murthy,"Graph Theory with Applications", Macmillan, London, 2013.

JOURNALS/MAGAZINES

1. https://www.journals.elsevier.com/discrete-mathematics
2. http://www.math.iit.edu/~kaul/Journals.html
3. https://www.siam.org/publications/journals/siam-journal-on-discrete-mathematics-sidma
4. https://onlinelibrary.wiley.com/journal/10970118
5. https://iopscience.iop.org/article/10.1088/1742-6596/1175/1/012069/meta
6. https://iopscience.iop.org/article/10.1088/1742-6596/1188/1/012065/meta
7. https://www.worldscientific.com/worldscinet/jml
8. https://www.scimagojr.com/journalsearch.php?q=12000154480&tip=sid

SWAYAM/NPTEL/MOOCs:
1. https://nptel.ac.in/courses/111/107/111107058/
2. https://nptel.ac.in/courses/106/103/106103205/
3. https://onlinecourses.swayam2.ac.in/cec20_ma02/preview
4. https://onlinecourses.nptel.ac.in/noc20_ma05/preview
5. https://onlinecourses.swayam2.ac.in/cec20_ma03/preview
6. https://www.coursera.org/learn/graphs

Course Title	Agile Software Development and DevOps				Course Type		Theory	
Course Code	B20CI0304	Credits	3		Class		III Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	0	0	0	Theory	Practical	CIE	SEE
	-	-	-	-				
	Total	3	3	3	39	0	50	50

COURSE OVERVIEW

The course provides students with 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 OBJECTIVE (S):

The objectives of this course are to:

1. Discuss the importance of the software development process.

2. Demonstrate the workflow of Automating process.

3. Explain the development of a software using Agile method

4. Illustrate with case study, the importance of DevOps.

5. Discuss about importance of software testing process.

6. Explain essential software development activities.

COURSE OUTCOMES (COs)

After thecompletionof the course, the student will be able to:

CO#	Course Outcomes	Pos	PSOs
CO1	Apply software development process to solve complex problems of engineering	1	2
CO2	Make use of Agile principle for rapid software development	1,3	3
CO3	Distinguish between the traditional SDLC and agile ALM model for efficient and effective product delivery.	1,3,4	1
CO4	Develop the real-world applications using DevOps tools.	1,3	2,3
CO5	Discuss about importance of software testing process.	4	3
CO6	Explain software development activities.	4,6	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3				√		
CO4			√			
CO5				√		
CO6				√		√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3									3	
CO2	1	1	3	3	3										3
CO3	1	3	2	3	1								3		
CO4	1	1	3	2	2									3	3
CO5				2											3
CO6				2		3									3

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY:

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 Life cycle Defining Requirements, Managing Complexity and Change, Validity of Requirements, Testing Requirements ,Functional Requirements, Non functional 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 Life cycle Management: Goals of Agile Application Life cycle Management, Why Is Agile ALM Important? Where Do I Start? Understanding the Paradigm Shift, Rapid Iterative Development, Remember RAD?, Focuson12 Agile Principles, Agile Manifesto, Fixed Time box Sprints, Customer Collaboration, Requirements and Documentation.
UNIT – 3
Automating the Agile ALM: Goals of Automating the Agile ALM, Why Automating the ALMIs 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 Modelling 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, DevOp sinDev, 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.

TEXTBOOKS:

1. BobAiello and LeslieSachs, "Agile Application Life cycle Management Using DevOps to Drive Process Improvement", Addison Wesly, First printing, 2016.

REFERENCEBOOKS:

1. Roger S, "Software Engineering-A Practitioner's Approach", seventh edition, Pressman, 2010.
2. Roger Pressman, Ian sommerville, "Software Engineering", Pearson,9th edition,2010.
3. HansVanVliet, "Software Engineering: Principles and Practices", Wiley,2008.
4. Richard Fairley, "Software Engineering Concepts", McGraw-Hill ,2008
5. ACM Transactions on Software Engineering and Methodology(TOSEM).
6. IEEE Transactions on Software Engineering.

JOURNALS/MAGAZINES

1. Journal of Software Engineering Research and Development
2. International Journal of Agile and Extreme Software Development
3. A decade of agile methodologies: Towards explaining agile software development
4. Journal of Systems and Software

SWAYAM/NPTEL/MOOCs:

1. https://www.udemy.com/course/devops-core-fundamentals
2. https://www.scaledagile.com/certification/courses/safe-devops/
3. https://www.coursera.org/learn/devops-culture-and-mindset
4. https://www.coursera.org/learn/uva-darden-continous-delivery-devops

Self-Learning Exercises:

1. Case study on Critical system
2. Case study on ATM using agile method

Course Title	Analog and Digital Electronics Lab				Course Type		Theory	
Course Code	**B20CI0305**	Credits		1	Class		III semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	2	2	0	26	50%	50%

COURSE OVERVIEW

This course covers basic concepts of Electrical Engineering. The course introduces the working of analog components and helps in understanding basics in digital electronics by applying the knowledge of logic gates and learning the applications of diodes and opamps.The course provides foundation on designing and implementation of logic circuits. Analog circuits are simulated using ORCAD tool and digital circuits using XILINX tool which helps in gaining experience in creating and testing of circuits.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Discuss the applications of diode in wave shaping circuits.

2. Discuss working principle of different types of oscillators.

3. Discuss performance parameters and applications of Operational amplifiers

4. Describe designing, building and testing of common combinational cicuits

5. Describe designing, building and testing of common sequential digital logic circuits.

6. Illustrate applications of Ring Counter and Jhonson Counter.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Analyze the use of diodes in clipping ,clamping wave and working principle of oscillators	1 to 4	1
CO2	Apply the basic knowledge used in operational amplifiers for specific engineering applications.	1 to 3	1
CO3	Identify the different families of digital integrated circuits and working principle of combinational circuits	1 to 2	2
CO4	Develop minimization techniques of combinational circuits using K-map	1 to 4	1
CO5	Analyze the working principle of sequential circuits such as Flip-Flops , Counters and shift registers.	1 to 3	1
CO6	Develop the ability to analyze and design adders, subtractors, multiplexers and demultiplexers.	1 to 4	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1				√		
CO2			√			
CO3			√			
CO4				√		
CO5				√		
CO6			√			

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2									3		
CO2	3	2	3		2								3		
CO3	3	1	2	1	2									3	
CO4	3	1	1	2									3		
CO5	3	1	1	2									3		
CO6	3			2	2										3

Note: 1-Low, 2-Medium, 3-High

PRACTICE:

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability
	Part-A		
1	To simulate a positive clipper, double ended clipper & positive clamper circuits using diodes	Orcad	Simulation of clipper and clamper electronic
2	To simulate a rectangular wave form generator (Op-amp relaxation oscillator) and compare the frequency and duty cycle with the design specifications	Orcad	Simulation of rectangular waveform generator
3.	To simulate a Schmitt trigger using Op-amp and compare the UTP andLTP values with the given specification	Orcad	Simulation of Schmitt trigger
4.	To simulate a Wien bridge Oscillator	Orcad	Simulation of wein bridge oscillator
5.	To determine the working of a power supply and observe the waveforms	Orcad	Simulationof power supply
6.	To build and simulate CE amplifier (RC coupled amplifier) for itsfrequency response and measure the bandwidth.	Orcad	Simulation of RC coupled amplifier and determining the frequency response
7.	Realization of Half/Full adder and Half/Full Subtractors using logic gates	ICs, Trainer kit and patch cords Create and perform the adder and subtractor circuits	ICs, Trainer kit and patch cords Create and perform the adder and subtractor circuits
8.	Design and develop VHDL code to realize Full adder and Full Subtractors	Xilinx	Simulation knowledge of the mentioned adders an
9.	.Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC	ICs, Trainer kit and patch cords	Realization of a multiplexer
10.	Design and develop the VHDL code for an 8:1 multiplexer. Simulate and verify it's working	Xilinx	Simulation knowledge of combinational logic circuit
11.	Design and implement a ring counter using 4-bit shift register and demonstrate its working	ICs, Trainer kit and patch cords	Realization of shift register and ring counter
12.	Design and develop the Verilog / VHDL code for switched tail counter.	Xilinx	Simulation of ring counter

Course Title	Programming with JAVA Lab			Course Type		Theory	
Course Code	**B20CI0306**	Credits	1	Class		III semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	2	2	0	26	50%	50%

COURSE OVERVIEW

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 OBJECTIVE (S):

The objectives of this course are to:

7. Explain the basic data types and control structures of the Java language.
8. Illustrate the creation of classes and objects in Java.
9. Demonstrate the extending a class (inheritance) and use proper program anomaly handling structures.
10. Discuss the use of Java generics and collections.
11. Discuss object-oriented features and advance Java programming skills
12. Explain to create robust object-oriented applications with Java.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of array concepts in java to solve real world problems.	1 to 5	1
CO2	Apply the features of OOPS in java to solve the real-world problems.	1 to 5	1
CO3	Develop program for stack implementation using Exception Handling in java.	1 to 5	2, 3
CO4	Identify suitable data structures to solve real world applications.	1 to 5, 12	2
CO5	Discuss object-oriented features and advance Java programming skills	1 to 5	1
CO6	Explain to create robust object-oriented applications with Java.	1 to 5, 12	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√	√		
CO4			√			
CO5		√				
CO6		√				

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	1								3		
CO2	3	3	2	2	1								3		
CO3	3	3	1	1	1									3	3
CO4	3	3	3	1	2							1	3		
CO5	3	3	3	1	2								3		
CO6	3	3	2	2	2									3	3

Note: 1-Low, 2-Medium, 3-High

PRACTICE:

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability
	Part-A		
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	Windows/Linux OS, IDE	Understanding conditional operators and statements
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	Windows/Linux OS, IDE	Creating an array and performing some operations on array.
3.	To compute a square root of any positive number a, start with an initial guess x=x1 for √a; then calculate successive approximations x2,x3...,√a using the formula: $$x_i = \frac{x_{i-1} + \left(a / x_{i-1}\right)}{2}, i = 2, 3, \ldots$$	Windows/Linux OS, IDE	Understanding conditional statements (if, if..else, etc)
4.	Model a lamp as a Java object. Make a Lamp class. This will contain atleast 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:	Windows/Linux OS, IDE	Object and class creation and its usage
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	Windows/Linux OS, IDE	Creation of interfaces and its usage.

		Windows/Linux	
6.	The String class in JAVA has a static method compare To Ignore Case, 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 Arrays class to sort the strings by passing the compare To	Windows/Linux OS, IDE	Creation of string class and its usage
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 given of the following criteria: - Manager 10% of the basic salary, and Technicians 15% of basic. Develop the pay roll for XYZ. Implement a class	Windows/Linux OS, IDE	Creation multiple inheritance and its usage
8	Define a new Exception class named Odd Exception. Create a new class named Even Odd. Write a method called halfOf(), which takes an int as parameter and throws an Odd Exception 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),	Windows/Linux OS, IDE	Creation of exception class and its usage
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	Windows/Linux OS, IDE	Creation of exception class and its usage
10	Create a class Student that has instance variables as Name, Age, Address and access transmutation 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	Windows/Linux OS, IDE	Object and class creation and its usage
11	Use generics to build a class Sort. Implement the bubble sort algorithm to sort an array of any type.	Windows/Linux OS, IDE	Creation of generics class and its usage
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).	Windows/Linux OS, IDE	Creation of generics class and its usage

Sl. No.	Part B Mini Project

1	Develop a project for Airline reservation system List with the following modules:
	1. PASSENGER
	    a) Add member
	    b) Delete member
	    c) Search for member
	    d) Edit member
	2. FLIGHT
	    a. Add Flight
	    b. Delete Flight
	    c. Search Flight
	    d. Display Flights
	3. RESERVATION
	    a. Book
	    b. Cancel
	Title: Airline Reservation system
	Problem Definition:
	Airline Reservation System" main aim is to provide the online ticket & seat reservation of National and International Flights and give the information about flight departures.
	Solution:
	Develop a project to implement an Airline reservation system with the following modules:
	1. PASSENGER
	    a. Add member
	    b. Delete member
	    c. Search for member
	    d. Edit member
	2. FLIGHT
	    a. Add Flight
	    b. Delete Flight
	    c. Search Flight
	    d. Display Flights
	3. RESERVATION
	    a. Book
	    b. Cancel

List of Experiments:

Sl.No	Name of the Experiment

1	Create a passenger class with the attributes Adhar_number, Passenger_name, Email_id, Phone, Address, DOB and the methods to facilitate Addition, Deletion, Search and Modify the passenger data. Store the details of the 10 passenger objects in "Passenger.txt" and Display.
	    a. void Add_passenger()
	    b. Display_details()
	    c. void Delete_Passenger(Adhar_number)
	    d. void Search_Passenger(Adhar_number)
	    e. void Modify_Passenger(Adhar_number)

2	It is required to delete an existing passenger data based on the request from the passenger. Read adhar card number of the passenger to be deleted and delete the record from "passenger.txt" if found. Otherwise display an error message saying that "record does not exist". Develop a program to implement the above task.
3	It is required to modify an existing passenger data based on the request from the passenger. Read adhar card number of the passenger to be modified and modify the record from "passenger .txt" if found. Otherwise display an error message saying that "Record does not exist". Develop a program to implement the above task.

4	It is required to Search an existing passenger data based on the request from the passenger. Read Adhaar card number of the passenger to be searched for, search the record from "passenger .txt" and display the details of passenger if found. Otherwise display the error message "Record does not exist". Develop a program to implement the above task.
5	Create a Flight class with attributes Flight_number, Flight_name, Source, Destination, Departure_Timing and the methods Add_Flight(), Delete_Flight(), Search_Flight() and Display_Flight(). Store the details of any 5 Flights in a file called "Flights.txt" and display the same. Develop a program to achieve the above task.
6	It is required to delete the details a flight stored in "Flights.txt". Read the Flight_no and search for the same in "Flights.txt". If found, it should be deleted from "Flights.txt". Otherwise display the error message "Flight Does Not Exist". Develop a program to achieve the above task.
7	It is required to delete the search for a flight stored in "Flights.txt". Read the Flight_no and search for the same in "Flights.txt". If found, Display the details of Fllight, otherwise display the error message "Flight Does Not Exist". Develop a program to achieve the above task.
8	It is required to display the details of all the flights running from Source1 to Destination1. Read the name of source1 and destination1 and fetch from "Flights.txt" the details of all the flights running between Source1 and desitnation1 and display the same. Develop a program to achieve the above task.

9	Create a reservation class that facilitates booking and cancellation of domestic and international flights using the following methods and parameters. Develop a program to store the details of 10 bookings in "**Reservations.txt**" and display the same.
	    a. Book_Ticket(Flight_Number, Flight_Name, Ticket_Number,Source, Destination, Adhar_number, Passport_number,Date, Departure_time, Class, Type_of_Travel(Domestic , International), Fare, Status)
	    b. Cancel_Ticket(Ticket_Number)

10	A passenger would like to cancel the ticket due to a genuine reason. Read the ticket_no and search for the record in "Reservation.txt". Cancel the Ticket based on the request from passenger and update the status.

Course Title	Data Structures Lab				Course Type		Theory	
Course Code	**B20CI0307**	Credits		1	Class		III semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	2	2	0	26	50%	50%

COURSE OVERVIEW

The course focuses on basic and essential topics in data structures, including array-based lists, linked lists, recursion, stack, queues, and binary trees, heaps, sorting and searching algorithms. It also covers analysis and design of fundamental data structures and engages learners to use data structures as tools to algorithmically design efficient computer programs that will cope with the complexity of actual applications.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Discuss the concept of Abstract Data Types (ADT)

2. Provide the knowledge of stacks and queues.

3. Understand the importance of Linked lists

4. Illustrate the operations of trees

5. Demonstrate the use of appropriate of data structures for a given problem.

6. Design a data structure application for real time problems.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Explain the Abstract Data Types, Structures	1 to 5	1
CO2	Formulate the solution for any computational problem using stacks and queues.	1 to 5	1,2
CO3	Analyze the importance of linked lists.	1 to 5	1,2
CO4	Solve real time problems using trees data structure.	1 to 5	1,2
CO5	Apply appropriate data structures to solve a given problem.	1 to 5	1
CO6	Compare the performance of various data structures.	1 to 5	1,2

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√			
CO4			√			
CO5		√				
CO6			√			√

COURSE ARTICULATION MATRIX

CO#/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1		2					1	2		3		
CO2			1					1					3	3	
CO3					2		2		2				3	3	
CO4	3	3					2	1	2	1			3	3	
CO5	1				1		2	2	2			2	3		
CO6		1					2	2	2			2	3	3	

Note: 1-Low, 2-Medium, 3-High

PRACTICE:

1	Design, Develop and Implement a menu driven Program in C for the following Array operations a. Creating an Array of N Integer Elements b. Display of Array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position (POS) d. Deleting an Element at a given valid Position(POS) e. Exit. Support the program with functions for each of the above operations.
2	Design, Develop and Implement a Program in C for the following operations on Strings a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b. Perform Pattern Matching Operation: c. Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. d. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Note: Don't use Built-in functions
3	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome

	d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations
4	Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^ (Power) and alphanumeric operands.
5	Design, Develop and Implement a Program in C for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b. Solving Tower of Hanoi problem with n disks 21 6 Design, Develop and Imp
6	Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations
7	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Sem, PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion and Deletion at End of SLL d. Perform Insertion and Deletion at Front of SLL e. Demonstrate how this SLL can be used as STACK and QUEUE f. Exit
8	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue f. Exit
9	Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes a. Represent and Evaluate a Polynomial P(x,y,z) = 6x2y2z-4yz5+3x3yz+2xy5z-2xyz3 b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations
10	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Delete an element(ELEM) from BST e. Exit

Course Title	Management Science				Course Type		Theory	
Course Code	B20MGM301	Credits	2		Class		III Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	2	2	2				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	-	-	-	-				
	Total	2	2	2	26	-	50	50

COURSE OVERVIEW

The course intends to familiarise students to understand the management principles and applications, which lays a strong foundation for managers and leaders in critical thinking and decisions making process. The course emphasises on giving an overview of the functional area of management

COURSE OBJECTIVE (S):

 The objectives of this course are to:

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	To Plan organizational structure for a given context in the organisation carries out production operations through Work-study.	1-5	2
CO2	To carry out production operations through Work-study.	1-5	3
CO3	To Understand the markets, customers and competition better and price the given products Appropriately.	1-5	2
CO4	To Plan and control the HR function better.	1-5	2,3
CO5	To create foundation of decision making process and critical thinking	1-6	3
CO6	To emphasises on giving an overview of the functional area of management	2,4	2

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√	√	√	√	
CO2	√	√	√	√	√	
CO3	√	√	√	√	√	
CO4	√	√	√	√	√	
CO5	√	√	√	√	√	√
CO6		√		√		

COURSE ARTICULATION MATRIX

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3									3	
CO2	1	1	3	3	3										3
CO3	1	3	2	3	1									3	
CO4	1	1	3	2	5									3	3
CO5	1	1	2	3	2	2									3
CO6		1		2										3	

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY:

UNIT – 1

Introduction to Management and Organisation: Concepts of Management and organization- nature, importance and Functions of Management. Systems Approach to Management – Taylor's Scientific Management Theory- Taylor's Principles of Management, Maslow's theory of Hierarchy of Human Needs- Douglas McGregor's Theory X and Theory– Hertzberg Two Factor Theory of Motivation – Leadership Styles, Social responsibilities of Management. Designing Organisational Structures: Basic concepts related to Organisation Departmentation and Decentralisation.

UNIT – 2
. **Operations and Marketing Management**: Principles and Types of Plant Layout-Methods of Production(Job, batch and Mass Production), Work Study –Basic procedure involved in Method Study and Work Measurement – Business Process Reengineering(BPR) Statistical Quality Control: control charts for Variables and Attributes (simple Problems) and Acceptance Sampling, TQM, Six Sigma, Deming's contribution to quality. Objectives of Inventory control, EOQ, ABC Analysis. Purchase Procedure, Stores Management and Store Records – JIT System, Supply Chain Management, Functions of Marketing, Marketing Mix. And Marketing Strategies based on Product Life Cycle. Channels of distribution.

UNIT – 3
Human Resources Management (HRM): Concepts of HRM. HRD and Personnel Management and Industrial Relations (PMIR), HRM vs PMIR.. Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development. Placement, Wage and Salary Administration, Promotion. Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating -Capability Maturity Model (CMM) Levels – Performance Management System.

UNIT – 4
Strategic Management and Contemporary strategic Issues: Mission, Goals, Objectives, Policy, Strategy. Programes, Elements of Corporate Planning Process, Environmental Scanning. Value Chain Analysis, SWOT Analysis. Steps in Strategy Formulation and implementation, Generic. Strategy alternatives. Bench Marking and Balanced Score and as Contemporary Business Strategies.

TEXTBOOKS:

1. Kotler Philip and Keller Kevin Lane, Marketing Management, Pearson, New York, 15th Edition, 2012.
2. Koontz and Weihrich: Essentials of management, McGraw Hill, New Delhi, 11th Edition, 2012.

REFERENCEBOOKS:

1. Thomas N. Duening and John M. Ivancevich, Management – Principles and Guidelines, Dreamtech Press; 1st Edition, 2012.
2. Samuel C. Certo, Modern Management, Prentice Hall, New York, 9th Edition, 2012.
3. Schermerhorn, Capling, Poole and Wiesner, Management, Wiley, New York, 6th Edition, 2012.
4. John A. Parnell, Strategic Management – Theory and Practice, Cengage Publications, 2018.
5. Lawrence R Jauch, R. Gupta and William F. Glucek: Business Policy and Strategic Management Science, McGraw Hill, New York, 5th Edition, 2012.

Course Title	Environmental Science				Course Type		Theory	
Course Code	B20AS0301	Credits		2	Class		III Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	2	2	2				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	-	-	-	-				
	Total	2	2	2	26	-	50	50

COURSE OVERVIEW

This course intends to understand, analyze and execute the environmental conditions and the control measures on various types of pollutions can be recognized. This course also talks about the environmental degradation on global warming, acid rain formation, and waste management and how the energy and natural resources can be used effectively in ecosystem.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Graduates will be familiar with current and emerging environmental engineering and global issues, and have an understanding of ethical and societal responsibilities.
2. Graduates will have the ability to obtain the knowledge, and will recognize the need for engaging in life-long learning.
3. Will find the need of various types of energy (conventional & non-conventional) resources and natural resources.
4. Acquire knowledge with respect to biodiversity, threats, conservation and appreciate the concept of ecosystem.
5. Acquire knowledge about sources, effects and control measures of environmental pollution, degradation and waste management.
6. Explore the ways for protecting the environment

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	Pos	PSOs
CO1	Understand, analyse and execute favourable environmental conditions and the role of individual, government and NGO in environmental protection.	1-5	2
CO2	List the causes, effects & remedial measures and find ways to overcome them by suggesting the pollution-controlled products.	1-5	3
CO3	Classify different wastes, sources of waste and their effect on population	1-5	2,3
CO4	Get motivation to find new renewable energy resources with high efficiency through active research and innovation and critically analyse the ecological imbalances and provide recommendations to protect the environment.	1-5	2,3
CO5	To learn about increase in population growth and its impact on environment	2,3,4	3
CO6	To Gain knowledge about environment and ecosystem	1-5	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3				√		
CO4			√			
CO5		√	√	√		
CO6	√	√	√	√	√	

COURSE ARTICULATION MATRIX

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3									3	
CO2	1	1	3	3	3										3
CO3	1	3	2	3	1									3	3
CO4	1	1	3	2	5									3	3
CO5		2	2	2											3
CO6	1	2	2	2	2										3

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY:

UNIT – 1

ENVIRONMENT & ENVIRONMENTAL PROTECTION:
Basics of environment: Introduction & definition 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 protection: Role of Government - Assignments of MOEF, Functions of central and state boards, Institutions in Environment and People in Environment, 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. **Waste management:** Municipal solid waste, Bio medical 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 - Importance, Deforestation-Causes, effects and controlling measures

UNIT – 4
Ecology, ecosystem & field work: **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-a biotic 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.

TEXTBOOKS:
1. R .J. Ranjit Daniels and Jagadish Krishnaswamy, "Environmental Studies", Wiley India Private Ltd., New Delhi, Co-authored &Customised by Dr.MS Reddy & Chandrashekar, REVA University, 1st Edition, 2017. . R.J.
2. Ranjit Daniels and Jagadish Krishnaswamy, "Environmental Studies", Wiley India Private Ltd., New Delhi, 2nd Edition, 2014
3. Benny Joseph, "Environmental Studies", Tata McGraw – Hill Publishing Company Limited, New Delhi, 2nd Edition, 2008
4. Dr.S.M.Prakash, "Environmental Studies", Elite Publishers, Mangalore, 2nd Edition, 2009

REFERENCEBOOKS:
1. Rajagopalan R, "Environmental Studies – from Crisis to cure", Oxford University Press, New Delhi, 3rd Edition, 2016
2. Anil Kumar Dey and Arnab Kumar Dey, "Environmental Studies", New age international private limited publishers, New Delhi, 2nd Edition, 2007
3. Michael Allaby, "Basics of environmental Science", Routledge-Tayler & Francis e-library, New York, 2nd Edition, 2002
4. Dr.Y.K Singh, "Environmental Science", New age international private limited publishers, New Delhi, 1st Edition, 2006.

Self-Learning Exercises: Need for public awareness on the environment, Gaia Hypothesis

Course Title	ADVANCED KANNADA (or) Basics of Kannada				Course Type		Theory	
Course Code	B20AHM301 & B20AHM302	Credits	0		Class		III Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	-	-	-	-				
	Total	-	-	-	-	-	-	-

REVA UNIVERSITY
Bengaluru, India

ರುಕ್ಮಿಣಿ ಜ್ಞಾನವನ, ಕಟ್ಟಿಗೇನಹಳ್ಳಿ, ಯಲಹಂಕ, ಬೆಂಗಳೂರು – 560064

ಕನ್ನಡಿಗರಿಗೆ ಇಂಜಿನಿಯರಿಂಗ್ ಪ್ರಥಮ ಪದವಿ ಪಠ್ಯ

ಪರಿವಿಡಿ

ಘಟಕ – 1 : ಕವಿತೆಗಳು

1. ಬೆಳಗು – ದ ರಾ ಬೇಂದ್ರೆ
2. ಕಲ್ಕಿ – ಕುವೆಂಪು

ಘಟಕ – 2 : ಕಥೆಗಳು

3. ಗಾಂಧಿ – ಬೆಸಗರಹಳ್ಳಿ ರಾಮಣ್ಣ
4. ಸೆರೆ – ಯಶವಂತ ಚಿತ್ತಾಲ

ಘಟಕ – 3 : ವಿಜ್ಞಾನ ಲೇಖನಗಳು

5. ಆನೆಹಳ್ಳದಲ್ಲಿ ಹುಡುಗಿಯರು – ಬಿ ಜಿ ಎಲ್ ಸ್ವಾಮಿ
6. ವೃತ್ತಿಶಿಕ್ಷಣದಲ್ಲಿ ಕನ್ನಡ ಮಾಧ್ಯಮ – ಎಸ್ ಸುಂದರ್

ಘಟಕ – 4 : ಪರಿಸರ ಲೇಖನಗಳು

7. ಚೇಂಕ್ರ ಮೇಸ್ತ್ರಿ ಮತ್ತು ಅರಿಸ್ಟಾಟಲ್ – ಕೆ ಪಿ ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ
8. ಗುಬ್ಬಚ್ಚಿಯ ಗೂಡು – ಪಿ ಲಂಕೇಶ್

❖ ಬಿ ಎಂ ಎಸ್ ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ, ಬೆಂಗಳೂರು ಕನ್ನಡಿಗರಿಗೆ **'ಕನ್ನಡ ಕಲಿ'** ಪಠ್ಯ ಪುಸ್ತಕ

❖ ಕರ್ನಾಟಕ ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ವಿಭಾಗ ಕನ್ನಡಿಗರಿಗೆ **'ಸಾಹಿತ್ಯ ಸಿಂಚನ'** ಪಠ್ಯ ಪುಸ್ತಕ

❖ ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ ಕನ್ನಡಿಗರಿಗೆ **'ಬಳಕೆ ಕನ್ನಡ'** ಪಠ್ಯ ಪುಸ್ತಕ

ಹಲವಾರು ಪಠ್ಯಪುಸ್ತಕಗಳು ಇಂಜಿನಿಯರಿಂಗ್ ವಿಭಾಗದಲ್ಲಿ ಕನ್ನಡ ಬೋಧನೆಗೆ ಬಳಕೆಯಲ್ಲಿದ್ದು ಜೊತೆಗೆ ಬಿಡ್ ಕನ್ನಡ ಕಲಿಕೆಯ ಪಠ್ಯಪುಸ್ತಕಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ರೇವಾ ವಿಶ್ವವಿದ್ಯಾಲಯದ ತಾಂತ್ರಿಕ ವಿಭಾಗದ ಕನ್ನಡಿಗರು ಮತ್ತು ಕನ್ನಡೇತರ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಇಷ್ಟವಾಗುವ ಮತ್ತು ಪ್ರಯೋಜನಕಾರಿಯಾಗುವ ಪಠ್ಯ ಪುಸ್ತಕವನ್ನು ತರಗತಿಗಳು ಪ್ರಾರಂಭವಾಗುವುದರ ಒಳಗೆ ಸಿದ್ಧಪಡಿಸಲಾಗುವುದು.

ರುಕ್ಮಿಣಿ ಜ್ಞಾನವನ, ಕಟ್ಟಿಗೇನಹಳ್ಳಿ, ಯಲಹಂಕ, ಬೆಂಗಳೂರು – 560064

ಕನ್ನಡೇತರರಿಗೆ ಇಂಜಿನಿಯರಿಂಗ್ ಪ್ರಥಮ ಪದವಿ ಪಠ್ಯ
ಭಾಷಾ ಕೌಶಲ್ಯಗಳು

ಘಟಕ – 1
1. ಆಲಿಸುವುದು
   - ಆಲಿಸುವ ಕೌಶಲ್ಯ
   - ಆಲಿಸುವಿಕೆಯಲ್ಲಿನ ದೋಷಗಳು
   - ಉತ್ತಮ ಆಲಿಸುವಿಕೆ

ಘಟಕ – 2
2. ಮಾತನಾಡುವುದು
   - ಸಂಭಾಷಣೆ
   - ವ್ಯವಹಾರಿಕ ಸಂಭಾಷಣೆ
   - ದೋಷಗಳು ಮತ್ತು ಪರಿಹಾರಗಳು

ಘಟಕ – 3
3. ಓದುವುದು
   - ಓದು ಕಲಿಸುವಾಗ ಗಮನಿಸಬೇಕಾದ ಅಂಶಗಳು
   - ಧ್ವನ್ಯಾಂಗಗಳ ಪರಿಚಯ
   - ಓದಿನ ವಿಧಗಳು

ಘಟಕ – 4
4. ಬರೆಯುವುದು
   - ವರ್ಣಮಾಲೆಯ ಸ್ವರೂಪ
   - ಕಾಗುಣಿತ ಸ್ವರೂಪ
   - ಕನ್ನಡ ಸಂಖ್ಯೆಗಳು

❖ ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ ಕನ್ನಡೇತರರಿಗೆ **'ಬಳಕೆ ಕನ್ನಡ'** ಪಠ್ಯ ಪುಸ್ತಕ

❖ ಬಿ ಎಂ ಎಸ್ ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ, ಬೆಂಗಳೂರು ಕನ್ನಡೇತರರಿಗೆ **'ಕನ್ನಡ ಮನಸ್ಸು'** ಪಠ್ಯ ಪುಸ್ತಕ

❖ ಕರ್ನಾಟಕ ತಾಂತ್ರಿಕ ಶಿಕ್ಷಣ ವಿಭಾಗ ಇವರು **'ಬಳಕೆ ಕನ್ನಡ'** ಪಠ್ಯ ಪುಸ್ತಕ ತಂದಿದ್ದಾರೆ.

ಹಲವಾರು ಪಠ್ಯಪುಸ್ತಕಗಳು ಇಂಜಿನಿಯರಿಂಗ್ ವಿಭಾಗದಲ್ಲಿ ಕನ್ನಡ ಬೋಧನೆಗೆ ಬಳಕೆಯಲ್ಲಿದ್ದು ಜೊತೆಗೆ ಬಿಎಡ್ ಕನ್ನಡ ಕಲಿಕೆಯ ಪಠ್ಯಪುಸ್ತಕಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ರೇವಾ ವಿಶ್ವವಿದ್ಯಾಲಯದ ತಾಂತ್ರಿಕ ವಿಭಾಗದ ಕನ್ನಡಿಗರು ಮತ್ತು ಕನ್ನಡೇತರ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಗಮನದಲ್ಲಿಟ್ಟುಕೊಂಡು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಇಷ್ಟವಾಗುವ ಮತ್ತು ಪ್ರಯೋಜನಕಾರಿಯಾಗುವ ಪಠ್ಯ ಪುಸ್ತಕವನ್ನು ತರಗತಿಗಳು ಪ್ರಾರಂಭವಾಗುವುದರ ಒಳಗೆ ಸಿದ್ಧಪಡಿಸಲಾಗುವುದು.

Detailed Syllabus

Semester-4

Course Title	Design and Analysis of Algorithm				Course Type		Theory	
Course Code	B20CI0401	Credits		3	Class		IV Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	-	-	-	-				
	Total	3	3	3	39	-	50	50

COURSE OVERVIEW

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 is done.

COURSE OBJECTIVE (S):

The objectives of this course are to:

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

2. Illustrate the algorithms using brute force and divide and conquer design technique.

3 .Make use of greedy and dynamic algorithmic design techniques for a given problem.

4. Discuss the problems based on backtracking and branch and bound techniques.

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply the knowledge of mathematical foundation for the analysis of algorithms.	1 to 5, 12	1,2
CO2	Develop a program to solve the given real world problems using brute force and divide and conquer design paradigm.	1 to 5,12	1,2
CO3	Make use of greedy and dynamic programming techniques for solving the given real world problem.	1 to 5,12	1,2,3
CO4	Utilize backtracking and branch and bound techniques to solve real world problems.	1,to 5,12	1,2,3
CO5	Learn new tools and technologies in the Desiging of algorithms and apply for suitable application development.	12	1
CO6	Develop solution to the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	5,6,12	1,2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√			
CO4			√			
CO5			√			
CO6			√	√		

COURSE ARTICULATION MATRIX

CO#/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	3	1							1	3	3	
CO2	2	2	1	2	2							2	3	3	
CO3	2	2	1	3	2							2	3	3	3
CO4	2	1	1	3	2							1	3	3	3
CO5												3	3		
CO6					3				3	2			3	3	

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT

THEORY:

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

TEXTBOOKS:

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

REFERENCEBOOKS:

1.Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, "Introduction to Algorithms", PHI, 3rd Edition,

2. ACM Transactions on Algorithms.

3.ACM Journal of Algorithms and Computational Technology.

JOURNALS/MAGAZINES

1. https://www.mdpi.com/journal/algorithms
2. https://ieeexplore.ieee.org
3. https://www.springer.com/journal/453
4. https://ieeexplore.ieee.org/document/7990553

SWAYAM/NPTEL/MOOCs:

1. https://onlinecourses.swayam2.ac.in/cec20_cs03/preview
2. https://iiiier.org/NPTEL-Local-Chapter
3. https://www.edx.org/course/algorithm-design-and-analysis

Self-Learning Exercises:

1. More exploration on GIThub

Course Title	Operating System				Course Type		Integrated	
Course Code	B20CI0412	Credits	3		Class		IV Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice				Theory	Practical	IA	SEE
	-	-	-	-				
	Total	3	3	3	39	-	**50%**	**50%**

COURSE OVERVIEW:

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.

COURSE OBJECTIVE(S):

1: Explain the major components and different services of Operating system

2: Implement process management and scheduling schemes.

3: Discuss synchronization and deadlock techniques in real time applications.

4: Demonstrate memory management techniques for a given machine architecture

COURSEOUTCOMES(COs)

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

CO#	CourseOutcomes	POs	PSOs
CO1	Identify the major components and different services of Operating system	1-3	1
CO2	Evaluate the Performance of different CPU Scheduling algorithm for the given real world applications	1-5	1
CO3	Build applications to overcome synchronization problems and to avoid deadlocks	1-3,5	2,3
CO4	Compare the physical and virtual memory management techniques and interpret the file systems concepts	1-5	2,3
CO5	Understand fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,	1-5	2,3
CO6	Explain the performance trade-offs inherent in OS implementation	1-5,9	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom'sLevel					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		✔				
CO2					✔	
CO3			✔			
CO4				✔		
CO5		✔	✔			
CO6			✔			

COURSE ARTICULATIONMATRIX

CO#/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2		1							1	3		
CO2	3	2	3	1	1								3		
CO3	3	2	3	1	1				1			1	3		
CO4	2	2	2	2	2				2			2	3		
CO5	3	3	3	2	2	1									
CO6	3	3	3	2	2	2			3				3	3	2

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Operating System Principles: what Operating Systems do, Computer System organization, computer system architecture, Operating System structure, 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. Threads: Overview, Multicore programming, Multithreading models, Thread Libraries, threading issues.   **Process Synchronization**: Background, 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.

UNIT-3
CPU Scheduling: Basic concepts, scheduling criteria, Scheduling algorithms, Multiple Processor scheduling, thread scheduling.   **Deadlock**: Definition, Deadlock characteristics, methods of handling deadlocks, Deadlock Prevention, Deadlock Avoidance: banker's algorithm, Deadlock detection and Recovery.

UNIT-4
Memory Management: Background, Swapping, contiguous memory allocation, Paging, structure of page table, Segmentation. Virtual Memory Management: Background, Demand paging, copy-on-write, Page replacement, Allocation of frames, Thrashing.   **File System Interface**: File concept; Access methods; Directory and disk structure; File system mounting; File sharing; Protection.

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 9th edition, Wiley-India, 2012.

REFERENCE BOOKS:

1. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw- Hill, 2013.
2. Andrew Tanenbaum & Albert Woodhull, Operating Systems: Design and Implementation. Prentice-Hall, Third edition, 2014.
3. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.
4. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE),2014.

JOURNALS/MAGAZINES:

1. S. Pamplona, N. Medinilla and P. Flores, "A Systematic Map for Improving Teaching and Learning in Undergraduate Operating Systems Courses," in *IEEE Access*, vol. 6, pp. 60974-60992, 2018, doi: 10.1109/ACCESS.2018.2871768.
2. Y. Liu, Z. Yu, B. Guo, Q. Han, J. Su and J. Liao, "CrowdOS: A Ubiquitous Operating System for Crowdsourcing and Mobile Crowd Sensing," in *IEEE Transactions on Mobile Computing*, vol. 21, no. 3, pp. 878-894, 1 March 2022, doi: 10.1109/TMC.2020.3015750.
3. P. Li, Binoy Ravindran, S. Suhaib and S. Feizabadi, "A formally verified application-level framework for real-time scheduling on POSIX real-time operating systems," in *IEEE Transactions on Software Engineering*, vol. 30, no. 9, pp. 613-629, Sept. 2004, doi: 10.1109/TSE.2004.45.
4. F. Ugalde Pereira, P. Medeiros de Assis Brasil, M. A. de Souza Leite Cuadros, A. R. Cukla, P. Drews Junior and D. F. Tello Gamarra, "Analysis of Local Trajectory Planners for Mobile Robot with Robot Operating System," in *IEEE Latin America Transactions*, vol. 20, no. 1, pp. 92-99, Jan. 2022, doi: 10.1109/TLA.2022.9662177.

SWAYAM/NPTEL/MOOCs:

1. https://archive.nptel.ac.in/courses/106/105/106105214/ (Operating System fundamentals)
2. https://www.coursera.org/courses?query=operating%20system (Introduction to operating system)
3. https://www.udacity.com/course/introduction-to-operating-systems--ud923 (Introduction to Operating System)

SELF-LEARNING EXERCISES

Virtual machines and Introduction to Linux Operating System, Introduction to Distributed computing, Parallel computing, grid computing, cloud computing.

Course Title	Database Management System				Course Type		Integrated	
Course Code	B20CI0403	Credits	3		Class		IV Semester	
Course Structure		TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage
		Theory	3	3	3			
		Practice	-	-	-	Theory	Practical	CIE	SEE
		-	-	-	-			
		Total	3	3	3	39	-	50	50

COURSE OVERVIEW:

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 OBJECTIVE(S):

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):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Design conceptual entity relationship diagrams for the real world applications.	1 to 5, 10,12	1,2
CO2	Make use of the concepts of relational algebra to solve queries over database.	1 to 5,12	1,2
CO3	Construct the database for given real world application and solve queries over it using SQL commands.	1 to 5,12	1,2,3
CO4	Develop an optimized database using design guidelines and normalization technique.	1,to 5,12	1,2
CO5	Learn new tools and technologies in DBMS and apply for suitable application development.	12	1
CO6	Develop solutions and create better database, either individually or as a part of the team and report the results with proper analysis and interpretation.	5,6,10	1,2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√			
CO4			√			
CO5			√			
CO6			√	√		

COURSE ARTICULATION MATRIX:

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2					1		1	3	3	
CO2	3	3	2	3	1							1	3	3	
CO3	3	3	2	3	3							1	3	3	3
CO4	3	3	2	3	1							1	3	3	
CO5												3	2		
CO6					2				3	2			3	3	

Note: 1-Low,2-Medium,3-High

COURSE CONTENT
THEORY:

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.

TEXTBOOKS:
1. Elmasri and Navathe, "Fundamentals of Database Systems", Pearson Education, 5th Edition, 2007.
2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", McGraw-Hill, 3rd Edition, 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

JOURNALS/MAGAZINES

1. http://www.ijstr.org/final-print/june2019/Database-Management-System.pdf
2. https://www.dbjournal.ro/

SWAYAM/NPTEL/MOOCs:

1. https://www.coursera.org/courses?query=database%20management
2. https://onlinecourses.swayam2.ac.in/cec19_cs05/preview
3. https://www.edx.org/learn/databases
4. https://www.classcentral.com/course/swayam-data-base-management-system-9914

Self-Learning Exercises:

1. MONGODB
2. Transaction and concurrency control
3. UML

Course Title	Computer Organization and Architecture				Course Type		Integrated	
Course Code	B20EJ0401	Credits	3		Class		IV Semester	
Course Structure		TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
		Theory	3	3	3				
		Practice	0	0	0	Theory	Practical	CIE	SEE
		-	-	-	-				
		Total	3	0	0	39	0	50	50

COURSE OVERVIEW

Computer organization and architecture is the science and art of selecting and interconnecting hardware components to create a computer that meets functional, performance, and cost goals. Computer organization defines the constituent parts of the system, how they are interconnected, and how they interoperate in order to implement the architectural specification. In this course, student will learn the basics of hardware components from basic arithmetic units to memory and I/O devices, instruction set architectures and assembly language, and designs to improve performance.

COURSE OBJECTIVE(S):

The objectives of this course are to:

1. Explain architecture of ARM processor and write simple assembly programs.
2. Demonstrate the translation of assembly instructions into their binary representation.
3. Describe and understand the processor memory hierarchy.
4. Discuss basic understanding of interrupts, I/O devices, and I/O protocols

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of ARM processor instruction set for developing simple assembly programs.	1,2,7,12	1
CO2	Interpret the functional architecture of computing systems.	1,2,4,10	1
CO3	Identify the issue related to instruction set architecture, memory unit and control unit and I/O functions.	1,11	1
CO4	Develop a real world application using parallel processing concepts.	1,2,4,10,11	1,2
CO5	Learn new tools and technologies and apply for suitable application development.	12	1
CO6	Develop solutions in the Computer Architecture and Organization to the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	5, 6, 10	1, 2

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2		√				
CO3			√			
CO4			√			
CO5			√			
CO6			√			

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3					3					1	3		
CO2	3	3		2						2			3		
CO3	3										2		3		
CO4	3	3		2						2	2		3	3	
CO5												1			
CO6					1				1	1			1	1	

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY:

UNIT – 1

Introduction to ARM processor: Introduction to the architecture of Microprocessor, Microcontroller, Microcomputer and Internet of Things (IoT). ARM characteristics, Register structure, Addressing modes, Instructions, Assembly language, Operating Modes and Exceptions, Conditional execution of Instructions.

UNIT – 2

Arithmetic unit: Addition and Subtraction of Signed Numbers, Multiplication of unsigned numbers, Multiplication of signed numbers, Fast multiplication, Integer division, Floating point numbers and operations, Arithmetic operations on floating point numbers.

UNIT – 3

Memory System: Basic concepts, Synchronous RAM memories, Read-only memories, Direct Memory Access, Memory Hierarchy, Cache memories, Virtual memory.

TEXTBOOKS:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, McgraHIll.

REFERENCEBOOKS:

1. Linda Null, Julia Labor, "The Essentials of Computer Organization and Architecture", Viva Publishers, 4th Edition, 2015.

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", April 2016.

JOURNALS/MAGAZINES

1. https://engineering.lehigh.edu/cse/academics/course-index/cse-202-computer-organization-and-architecture-3

2. https://www.computer.org/csdl/magazine/co/1977/12/01646340/13rRUwInvnA

3. https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=10208

SWAYAM/NPTEL/MOOCs:

1. https://www.classcentral.com/course/swayam-computer-organization-and-architecture-a-pedagogical-aspect-9824

2. https://onlinecourses.nptel.ac.in/noc20_cs25/preview

3. https://www.edx.org/course/computation-structures-2-computer-architecture-2

Self-Learning Exercises:

1. Intel IA-32 architecture, Instruction Set Architecture of IA-32, Basic Input/Output, Basic processing unit and Pipelining.

Course Title	Theory of Computation				Course Type		Theory	
Course Code	B20EJ0402	Credits	3		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	-	50%	50%

COURSE OVERVIEW:

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 OBJECTIVE (S):

The objectives of this course are to:

1. Explain the concepts of Deterministic and Non-Deterministic Finite Automata.

2. Demonstrate the use of regular expressions for constructing DFA and NFA.

3. Illustrate the construction of context free grammar for a given language.

4. Describe computing Machine including PDA and Turing Machine

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Construct the Finite State Machine by applying the concepts of DFA and NFA.	1 to5,11,12	1
CO2	Make use of regular expressions for constructing DFA and NFA.	1to5,11,12	2
CO3	Identify ambiguity in grammar and Construct CFG for the given language in Normal Forms.	1 to5,11,12	3
CO4	Apply the concepts of Push down Automata and Turing machine for a given Language.	1to5,11,12	2
CO5	Understand the complexity or difficulty level of problems when solved using these machines.	1to5,11,12	2
CO6	Explore the formal languages and grammars: regular grammar and regular languages, context-free languages and context-free grammar; and introduction to context-sensitive language and context-free grammar, and unrestricted grammar and languages.	1 to5,11,12	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√	√			
CO2		√	√			
CO3			√			
CO4			√			
CO5		√				
CO6					√	

COURSE ARTICULATION MATRIX:

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1						1	1	3		
CO2	2	2	1	1	1						1	1		3	
CO3	2	2	1	1	1						1	1			3
CO4	2	2	1	1	1						1	1		3	
CO5	2	2	1	1	1						1	1		3	
CO6	2	2	1	1	1						1	1			3

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
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 Automata and Turing Machine: Push down automata (PDA); Languages of a PDA; Deterministic PDA; Turing Machine.

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.

JOURNALS/MAGAZINES

1. https://theoryofcomputing.org/
2. https://www.journals.elsevier.com/theoretical-computer-science
3. https://www.springer.com/journal/224

SWAYAM/NPTEL/MOOCs:

1. https://www.edx.org/course/automata-theory
2. https://nptel.ac.in/courses/106/104/106104028/
3. https://ocw.mit.edu/courses/mathematics/18-404j-theory-of-computation-fall-2006/syllabus/

Self-Learning Exercises:

1. Applications of Finite Automata and Applications of Regular Expressions.

Course Title	Numerical Methods and Optimization Techniques			Course Type		Theory	
Course Code	B20AS0401	Credits	3	Class		IV Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	-	-	-	-				
	Total	3	3	3	39	-	50%	50%

COURSE OVERVIEW:

Numerical Methods and Optimization Techniques emphasizes on the development of numerical algorithms to provide solutions to common problems formulated in science and engineering. The primary objective of the course is to develop the basic understanding of the construction of numerical algorithms, and perhaps more importantly, the applicability and limits of their appropriate use. The emphasis of the course will be the thorough study of numerical algorithms to understand the guaranteed accuracy that various methods provide, the efficiency and scalability for large scale systems. and issues of stability. Optimization Techniques provide ability to solve real-world problems by finding the optimal solutions to the models subject to constraints.

COURSE OBJECTIVE (S):

The objectives of this course are to:
1. Explain numerical methods to obtain approximate solutions to mathematical problems.
2. Examine numerical methods for various mathematical operations and tasks, such as interpolation and integration.
3. Illustrate the notation of vector spaces, sub spaces, linear independence, coordinate and change of coordinate.
4. Solve linear programming problems considering Transportation and Assignment Problems.

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply numerical methods to obtain approximate solutions for mathematical problems.	1 to 3, 12	1
CO2	Determine suitable interpolation formula and quadrature formulae to find the solution for the given data.	1 to 4 ,12	2
CO3	Solve the matrix associated with liner transformation with respect to the given base and understand the relationship between the operation and linear transformations and their corresponding matrices.	1 to 5,	3
CO4	Develop mathematical equations with simplex method and Transportation-Assignment problem for linear programming	1 to 5,12	1,2,3
CO5	Learn new tools and technologies in the Numerical Methods and apply for suitable application development.	12	2,3
CO6	Develop solutions in the Numerical Methods to the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	5,6,10	2,3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2					√	
CO3			√			
CO4			√			
CO5			√			
CO6			√		√	

COURSE ARTICULATION MATRIX

CO#/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3									1	3		
CO2	3	3	3	3								1		3	
CO3	3	3	3	3	3							1			3
CO4	3	3	3	3	3							1	3	3	3
CO5												2			
CO6					2	3				3					

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT
THEORY:

UNIT – 1
Numerical Methods: Errors in Numerical Calculations Types of Errors-Significant Digits-Programming Errors-Numerical Solution of Non-Linear Equations-Bisection Method-Regula Falsi Method-Newton Raphson Method –Fixed Point Method of Iteration – Rates of Convergence of These Methods. Solutions of Algebraic Equations, Relaxation Method and Gauss Seidel Iteration Method.

UNIT – 2
Numerical Analysis: Finite Differences-Operators (Δ, ∇ and E), Interpolation, Newton-Gregory Forward Interpolation Formula, Central Difference, Stirling And Bessel's Interpolation Formulae, Lagrange's Interpolation Formula, Inverse Interpolation Formula, Divided Difference Formula, and Newton's Divided Differences Formula. Numerical integration: Newton-Cotes quadrature formulae: Trapezoidal, Simpson's rules and Weddle's rule.

UNIT – 3
Vector Spaces and Linear transformations: Bases, Echelon forms, Rank, and determinants. Gauss elimination

and its complexity, Inner products, Gram-Schmidt orthogonalization. Linear transformations.

UNIT – 4

Linear Programming: Introduction, Canonical and Standard Form of LPP-Simplex Method-Big M Method- Two Phase Method-Principle of duality-Dual Simplex Method. Transportation Problem and Assignment problem.

TEXTBOOKS:
1. Sastry S.S., "Numerical Analysis", Prentice-Hall India (module I), 4th edition
2. K. Hoffman and R. Kunze," Linear Algebra", Prentice-Hall India, 1971.
3. R Panneerselvam," Operations research", 2nd edition, PHI

REFERENCES
1. KanthiSwarup, P.K. Gupta, Man Mohan, "Operations research", Sultan Chand & Sons. (module II), 5th edition.
2. Froberg, "Introduction to Numerical Analysis", Second Edition, Addition Wesley
3. Gerald and Wheatley, "Applied Numerical Analysis", Pearson Education Asia, Sixth Edition
4. S.S Rao, "Optimization Theory and Applications", Wiley Eastern
5. Grawin W. W, "Introduction of Linear Programming", McGraw Hill.

JOURNALS/MAGAZINES
1. https://onlinelibrary.wiley.com/journal/10970207
2. https://www.springer.com/journal/245
3. https://ijnao.um.ac.ir/
4. https://www.scimagojr.com/journalrank.php?category=2612

SWAYAM/NPTEL/MOOCs:
1. https://nptel.ac.in/courses/106/108/106108056/
2. https://www.coursera.org/learn/intro-to-numerical-analysis
3. https://nptel.ac.in/courses/122/102/122102009/
4. https://nptel.ac.in/courses/122/106/122106033/
5. https://www.edx.org/course/convex-optimization

Self-Learning Exercises:
1. Optimization Methods for Business Analytics
2. Numerical Methods and Optimization in Finance

Course Title	Design and Analysis of Algorithms Lab				Course Type		Theory	
Course Code	**B20EJ0402**	Credits	1		Class		IV semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	2	2	0	26	50%	50%

COURSE OVERVIEW

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 is done.

COURSE OBJECTIVE (S):

The objectives of this course are to:

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

2. Illustrate the algorithms using brute force and divide and conquer design technique.

3. Make use of greedy and dynamic algorithmic design techniques for a given problem.

4. Discuss the problems based on backtracking and branch and bound techniques.

COURSE OUTCOMES (COs):

After the completion o fthe course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply the knowledge of mathematical foundation for the analysis of algorithms.	1 to 5, 12	1,2
CO2	Develop a program to solve the given real world problems using brute force and divide and conquer design paradigm.	1 to 5,12	1,2
CO3	Make use of greedy and dynamic programming techniques for solving the given real world problem.	1 to 5,12	1,2,3
CO4	Utilize backtracking and branch and bound techniques to solve real world problems.	1,to 5,12	1,2,3
CO5	Learn new tools and technologies in the Desiging of algorithms and apply for suitable application development.	12	1
CO6	Develop solution to the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	5,6,12	1,2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√			
CO4			√			
CO5			√			
CO6			√	√		

COURSE ARTICULATION MATRIX

CO#/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	3	1							1	3	3	
CO2	2	2	1	2	2							2	3	3	
CO3	2	2	1	3	2							2	3	3	3
CO4	2	1	1	3	2							1	3	3	3
CO5												3	3		
CO6					3				3	2			3	3	

Note:1-Low,2-Medium,3-High

Exp. No	PROBLEM STATEMENT
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
4	Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithms. Differentiate the methods.
5	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra's algorithm
6	Design and Implement 0/1 Knapsack problem using Dynamic Programming.
7	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm
8	Obtain the DFS ordering of vertices in a given digraph.
9	Implement Horspool's algorithm for String Matching and find the number of key comparisons in successful search and unsuccessful search
10	Sort a given set of elements in ascending order which has duplicate entries. Use the sorting by counting algorithm
11	Implement N Queen's problem using Back Tracking.
12	Write a program to sort all transactions of Big Mall by quantity of sales.
13	Write a program to find network of people of same location in Linkedin social network

Course Title	Operating System Lab				Course Type		HC	
Course Code	B20CI0405	Credits		1	Class		IV Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory							
	Practice	1	2	2	Theory	Practical	IA	SEE
	-	-	-	-				
	Total	1	2	2	-	26	**50%**	**50%**

COURSE OVERVIEW:

Operating system provides a practical case of operating systems for the user to understand and master deeply and tangibly the theory and algorithms in operating systems. It gives deeper insights into the hierarchical structure, principles, applications, shells, development, and management of the operation system multi-dimensionally, systematically and from the elementary to the profound. It makes the user to understand about how operating system functions.

COURSE OBJECTIVE (S):

The objective of this lab is to:

1. Provide the knowledge and skills required to understand Basics of UNIX Operating Environment
2. Describe process concepts and scheduling techniques.
3. Illustrate the use of different memory management techniques of operating system.
4. Describe the data structures and internal representation of files in operating system.

COURSEOUTCOMES(COs)

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

CO#	Course Outcomes	POs	PSOs
CO1	Understand the scope of UNIX operating environment	1,3	1
CO2	Implementation of scheduling algorithm using C	1,4,5	1,3
CO3	Compare and analyze the performance of different memory management techniques	1,4,5	2,3
CO4	Make use of file types, file structure and file system implementation. .	1,2,4, 5	1,3
CO5	Learn new tools and technologies in the Designing of algorithms and apply for suitable application development.	1,2,4, 5	1,3
CO6	Develop solution to the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	5,6,10	1,2

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom'sLevel					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		✔				
CO2			✔			
CO3				✔		
CO4				✔		
CO5		✔				✔
CO6				✔		

COURSE ARTICULATIONMATRIX

CO#/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		3										3		
CO2	1			2	2								3		1
CO3	2			2	1									3	3
CO4	3	3		1	1								1		3
CO5	3	3		2	2								1		3
CO6				2	2					3			3	3	

Note:1-Low,2-Medium,3-High

PRACTICE:

	PART A:		
No	**Title of the Experiment**	**Tools and Techniques**	**Expected Skill /Ability**
1	When the parent process creates a child process, child process can perform any task assigned to it. During the execution of child process, the parent process waits and vice versa. Develop a program in C to create a child process to read commands from the standard input and execute them.	Process creation using fork()	Programming with C
2	Multithreading is a technique, where each thread is assigned with a task and they get executed	Parallel Programming	Programming with C

	simultaneously. For instance, if there are two tasks, two threads are created, one for each task. When one thread is being executed, the other thread waits and vice versa. So, if there are N tasks, N threads can be created one for each task. It works on shared memory technique, where all the threads share the common memory for storing or retrieving the data. Build a program in C to carry out the following tasks i)create two functions, Generate() and Print() to generate the Fibonacci series and print them respectively. ii) Create a separate thread to execute each function. ii) Ensure the synchronization while executing above functions		
3	A policy is applied by a Scheduler to select a process for execution when there is more than one process ready for execution. The policy may be the process which arrives first is executed first **(First Come First Served-FCFS)** or the process which has shortest execution time **(Shortest Job First-SJF)** amongst the set of processes is executed first. Develop a program in C to carry out the following tasks: i) Read a set of processes along with the CPU burst time, arrival time (may be assumed as 0) for each process ii) Allocate the processor to the process which has arrived first (**apply FCFS)** and compute the average waiting time and average turnaround time. iii) Allocate the processor to the process which has shortest CPU burst time (**apply SJF**) and compute the average waiting time and average turnaround time. Compare the performance of both.	Scheduling concept	Programming with C
4	The scheduler may apply different policies to select a process for execution when there is more than one process ready for execution. The policy may be the process which has highest priority (**Priority based scheduling)** amongst all the processes arrived for execution. Develop a program for carrying out the following tasks i) read a set of processes along with the CPU burst time, arrival time (may be assumed as 0) and the priority for each process ii) allocate the processor to the process which has the highest priority and compute the average waiting time and average turnaround time	Scheduling concept	Programming with C

5	Given the list of processes and their CPU burst time, arrival time, the Scheduler may apply a different policy that "each process is given certain amount of execution time called time slice or quantum time" and after completion of time slice, another process in queue is taken for execution. This procedure repeats until all the processes in the list get executed for fixed amount of time. Later, the first process in the queue is selected for the execution once again. This process repeats until the completion of execution of all the processes. **This technique is called Round Robin Technique.** Develop a program for carrying out the following tasks i) read a set of processes along with the CPU burst time, arrival time (may be assumed as 0) and the time slice or time quantum ii) allocate the processor to the processes in the order of their arrival based on arrival time and execute each of them for fixed amount of time (Time quantum). iii) After completion of first round, if execution of processes is not completed, repeat the step ii) iv) compute the average waiting time and average turnaround time	Scheduling concept	Programming with C
6	Consider an example of multi-process synchronization problem, where producer produces the data and stores at some location which will be accessed by another process called Consumer. Since, the producer and consumer share a common, fixed size buffer, there will be a synchronization problem. The solution can be obtained by using semaphores to establish inter process communication with synchronization. Develop a program in C to implement Producer-Consumer Problem by using semaphores to establish inter process communication with synchronization. Create two separate threads, one for producer and another one for consumer. When producer is getting executed, consumer must be in waiting state and vice-versa.	Process synchronization	Programming with C
7	Consider a set of processes, where each process holds some resources with it and requests for some more resources to complete its execution. But, when process P1 is requesting for resource R1 which is being used by P2 and if P2 is requesting for R2 which is held by P1, dead lock occurs and execution does not continue. Banker's Algorithm is used to avoid such deadlocks. Develop a program in C to implement Banker's Algorithm which finds whether the state is safe or not after allocating the resources requested by the processes.	Process synchronization	Programming with C
8	The operating system replaces the old page of a process	Page replacement Algorithm	Programming with C

	whenever a new page of the same process is to be loaded into memory. To select the page for replacement, OS may choose a policy that "the page which has not been used for the longest period of time is to be replaced first". It is termed as Least recently used technique. Develop a C program to implement LRU page replacement algorithm.		
9	When a process with different size arrives to main memory for loading, Find the frame which is larger than the page arrived and store the page in that frame. This strategy is termed as First fit memory allocation technique. Develop a program in C to implement the First fit memory allocation technique.	Memory management	Programming with C
10	The operating system manages storage of information by creating and storing information in the file. The memory required for a new file may be allocated using one of the methods such as Linked list, Indexed or Contiguous method. Develop a C program to implement any one of the file allocation techniques (Linked, Indexed or Contiguous).	File Management	Programming with C

Course Title	Database Management System Lab				Course Type		Theory	
Course Code	**B20CI0406**	Credits		1	Class		IV semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	2	2	0	26	50%	50%

COURSE OVERVIEW:

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 OBJECTIVE(S):

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):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Design conceptual entity relationship diagrams for the real world applications.	1 to 5, 10,12	1,2
CO2	Make use of the concepts of relational algebra to solve queries over database.	1 to 5,12	1,2
CO3	Construct the database for given real world application and solve queries over it using SQL commands.	1 to 5,12	1,2,3
CO4	Develop an optimized database using design guidelines and normalization technique.	1,to 5,12	1,2
CO5	Learn new tools and technologies in DBMS and apply for suitable application development.	12	1
CO6	Develop solutions and create better database, either individually or as a part of the team and report the results with proper analysis and interpretation.	5,6,10	1,2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)

CO#						
CO1			√			
CO2			√			
CO3			√			
CO4			√			
CO5			√			
CO6			√	√		

COURSE ARTICULATION MATRIX:

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2					1		1	3	3	
CO2	3	3	2	3	1							1	3	3	
CO3	3	3	2	3	3							1	3	3	3
CO4	3	3	2	3	1							1	3	3	
CO5												3	2		
CO6					2				3	2			3	3	

Note: 1-Low,2-Medium,3-High

PRACTICE:

S.No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability
	Part-A		
1	Consider the following schema for Order Database: SALESMAN (Salesman_id, Name, City, Commission) CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id) Write SQL queries to 1. Count the customers with grades above Bangalore's average. 2. Find the name and numbers of all salesmen who had more than one customer. 3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.) 4. Create a view that finds the salesman who has the customer with the highest order of a day. 5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted	SQL PLUS	Solving queries using SQL

2	Specify the following queries on the Flight relational database schema using SQL Flights(*flno: integer, from: string, to: string,* *distance: integer, departs: time, arrives: time*) Aircraft(*aid: integer, aname: string, cruisingrange: integer*) Certified(*eid: integer, aid: integer*) Employees(*eid: integer, ename: string, salary: integer*) 1.Find the eids of pilots certified for some Boeing aircraft. 2. Find the names of pilots certified for some Boeing aircraft. 3. Find the aids of all aircraft that can be used on non-stop flights from Bonn to Madras. 4. Identify the flights that can be piloted by every pilot whose salary is more than \$100,000. 5. Find the names of pilots who can operate planes with a range greater than 3,000 miles but are not certified on any Boeing aircraft. 6. Find the eids of employees who make the highest salary. 7. Find the eids of employees who make the second highest salary.	SQL PLUS	Solving queries using SQL

	Solve the below queries by using SQL		
	Student(snum, sname, major, level, age)		
	Class(cname, meets at, room, fid)		
	Enrolled(snum, cname)		
	Faculty(fid, fname, deptid)		
	The meaning of these relations is straightforward; for example, Enrolled has one record per student-class pair such that the student is enrolled in the class.		
	Queries		
	1. Find the names of all juniors (Level = JR) who are enrolled in a class taught by I. Teacher.		
	2. Find the age of the oldest student who is either a History major or is enrolled in a course taught by I. Teacher.		
	3. Find the names of all classes that either meet in room R128 or have five or more students enrolled.		
3	4. Find the names of all students who are enrolled in two classes that meet at the same time.	SQL PLUS	Solving queries using SQL
	5. Find the names of faculty members who teach in every room in which some class is taught.		
	6. Find the names of faculty members for whom the combined enrollment of the courses that they teach is less than five.		
	7. Print the Level and the average age of students for that Level, for each Level.		
	8. Print the Level and the average age of students for that Level, for all Levels except JR.		
	9. Find the names of students who are enrolled in the maximum number of classes.		
	10. Find the names of students who are not enrolled in any class.		

4	Solve the below queries by using SQL
	
	     branch (<u>branch-name</u>, branch-city, assets)
	     customer (<u>customer-name</u>, customer-street, customer-city)
	     account (<u>account-number</u>, branch-name, balance)
	     loan (<u>loan-number</u>, branch-name, amount)
	     depositor (<u>customer-name, account-number</u>)
	     borrower (<u>customer-name, loan-number</u>)
	     employee (<u>employee-name, branch-name</u>, salary)
	
	1. Find the names of all customers.
	2. Find the names of all branches in the loan relation, don't display duplicates.
	3. Display the entire Branch table.
	4. Find the account number for all accounts where the balance is greater than $700.
	5. Find the account number and balance for all accounts from Brighton where the balance is greater than $800.
	6. Display the branch name and assets from all branches in thousands of dollars and rename the assets column to 'assets in thousands'.
	7. Find the name of all branches with assets between one and four million dollars.
	8. Find the name, account number, and balance of all customers who have an account.
	9. Find the name, account number, and balance of all customers who have an account with a balance of $400 or less.
		SQL PLUS	Solving queries using SQL

5	Consider the following schema for a Library Database: BOOK (Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS (Book_id, Author_Name) PUBLISHER (Name, Address, Phone) BOOK_COPIES (Book_id, Branch_id, No-of_Copies) BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out, Due_Date) LIBRARY_BRANCH (Branch_id, Branch_Name, Address) Write SQL queries to 1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch, etc. 2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017 3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation. 4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query. 5. Create a view of all books and its number of copies that are currently available in the Library.	SQL PLUS	Solving queries using SQL

Course Title	Communication Skills				Course Type		Theory	
Course Code	B20AH0301	Credits	2		Class		IV Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	2	2	2				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	-	-	-	-				
	Total	2	2	2	26	-	50%	50%

COURSE OVERVIEW:

This course is 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 work place context, to examine that the learners use the electronic media such as internet and supplement the learning materials used in the classroom.

COURSE OBJECTIVE(S):

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 (Cos):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Demonstrate speaking ability with clarity, confidence and comprehension and communicate with one or many listeners using	1 to 3, 12	1,3
CO2	Build inferences from the text.	1 to 4 ,12	2
CO3	Make use of accurate writing skills using different components of academic writing.	1 to 5,12	2
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	1 to 5,12	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2					√	
CO3			√			
CO4			√			

COURSE ARTICULATION MATRIX:

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3									1	3		1
CO2	3	3	3	3								1		3	
CO3	3	3	3	3	3							1		2	
CO4	3	3	3	3	3							1		3	3

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT

THEORY:

UNIT – 1
Functional English: Grammar: Prepositions; Modal Auxiliaries, Reading Comprehension, Active and passive voice, Giving Instructions.
UNIT – 2
Interpersonal Skills: Grammar: Tenses; Wh-questions, Compound words; Phrasal verbs, Recommendations
UNIT – 3
Multitasking Skills Grammar: Conditional Sentences, Homonyms; homophones, Subject- verb agreement.
UNIT – 4
Communication Skills Grammar: Direct and indirect speech, Interpreting visual materials(line graphs, pie charts etc.), Single word substitutes.

TEXT BOOKS:
1. Green, David. Contemporary English Grammar Structures and Composition, NewDelhi: MacMillan Publishers,20l0,
2. Thorpe, Edgar and Showick, Basic Vocabulary. Pearson Education India, 20l2.
3. Leech, Geoffrey and Jan Svartvik, A Communicative Grammar of English, Longman,2003.

REFERENCES:
1. Murphy, Raymond " Murphy's English Grammar with CD",CambridgeUniversityPress,2004.
2. Rizvi,M .Ashraf, "Effective Technical Communication", New Delhi, TataMcGraw-Hill,2005.
3. Riordan, Daniel, "Technical Communication", New Delhi: Cengage Publications,20ll.
4. Senetal, "Communication and Language Skills" CambridgeUniversityPress,2015.

Course Title	Indian Constitution and Professional Ethics				Course Type		Theory	
Course Code	B20LS0301	Credits	2		Class		IV Semester	
Course Structure			Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	TLP	Credits						
	Theory	2	2	2				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	-	-	-	-				
	Total	2	2	2	26	-	50	50

COURSE OVERVIEW

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 OBJECTIVE (S):

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 (COs)

After thecompletion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Analyze the Fundamental Rights, Duties and other Rights protected under Indian Constitution.	1 ,6,7,8,9, 12	1,3
CO2	Demonstrate the practicality of Constitution perspective and make them face the world as a bonafide citizen.	1 to 4,7,8 ,12	2
CO3	Illustrate the professional ethics and human values.	1 to 5, 7,8 ,12	2
CO4	Summarize ethical standards followed by different companies.	1 to 5,7,8,12	2,3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2					√	
CO3			√			
CO4			√			

COURSE ARTICULATION MATRIX

CO#/	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3					2	2	2	2			1	3		1
CO2	3	3	3	3			3	3				1		3	
CO3	3	3	3	3	3		3	3				1		2	3
CO4	3	3	3	3	3		3	3				1		3	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY:

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 & old-age).   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.

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

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.

REFERENCES 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", S Chand & Company, 5th Edition

3. Durga Das Basu, "Introduction to constitution of India", LexisNexis, 23rd Edition.

SELF-LEARNINGEXERCISES:

Abuse of Technologies: Hacking and other crimes, addiction to mobile phone usage, video games and social networking websites.

Course Title	Universal human values				Course Type		Theory	
Course Code	B20AHM401	Credits		0	Class		IV Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	Total Number of Classes Per Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	0	0	0	0	0	50%	50%

COURSE OVERVIEW

Universal human values help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.

2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence

3. Strengthening of self-reflection.

4. Development of commitment and courage to act

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession	1 to 3, 12	1,3
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	1 to 4 ,12	2
CO3	Understand the role of a human being in ensuring harmony in society and nature.	1 to 5,12	2
CO4	Demonstrate the role of human being in the abetment of pollution	1 to 5,12	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2					√	
CO3			√			
CO4			√			

COURSE ARTICULATION MATRIX

CO#/	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3									1	3		1
CO2	3	3	3	3								1		3	
CO3	3	3	3	3	3							1		2	3
CO4	3	3	3	3	3							1		3	3

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT
THEORY:

UNIT – 1

Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship, basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly, Method to fulfil human aspirations: understanding and living in harmony at various levels, Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I being the doer, seeker and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.

UNIT – 2

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

UNIT – 3
Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT – 4
Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers b) At the level of society: as mutually enriching institutions and organizations

TEXT BOOKS:

1. R R Gaur, R Sangal, G P Bagaria, Human Values and Professional Ethics, Excel Books, New Delhi, 2010

2. A.N Tripathy, Human Values, New Age Intl. Publishers, New Delhi, 2004.

3. R.R. Gaur, R. Sangal and G.P. Bagaria, A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi, 2010

4.Bertrand Russell, Human Society in Ethics & Politics, Routledge Publishers, London, 1992

REFERENCE BOOKS:

1.Corliss Lamont, Philosophy of Humanism, Humanist Press, London, 1997

2. I.C. Sharma, Ethical Philosophy of India Nagin & co Julundhar, 1970

3. Mohandas Karamchand Gandhi, The Story of My Experiments with Truth, Navajivan Mudranalaya, Ahmadabad, 1993

4. William Lilly, Introduction to Ethics, Allied Publisher, London, 1955.

Detailed Syllabus

Semester 5

Course Name	Web Technologies & Applications				Course Type		Theory	
Course Code	B20EJ0501	Credits		3	Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-				
	Tutorial	-	-	-	Theory	Practical	CIE	SEE
	Total	3	3	3	39	-	50%	50%

COURSE OVERVIEW:

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, Perland PHP.

COURSE OBJECTIVE(S):

The objectives of this course are to:

1. Understand the various steps in designing a creative and dynamic website.
2. Describe the hierarchy of objects in HTML and XML.
3. Design dynamic and interactive web pages by embedding Java Script code in HTML.
4. Illustrate the advantages and use of different types of CSS.
5. Examine the HTML. Know how to use Dynamic HTML.
6. Familiarize server side scripting language like Perl &PHP.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Describe the concepts of WWW including browser and HTTP protocol and summarize the various HTML tags and use them to develop the user- friendly web pages.	2,3,7,11	1,2
CO2	Define the CSS with its types and use them to provide the styles to the web pags at various levels.	2-5	2,3
CO3	Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.	1,4,8,9,11	2,3
CO4	Apply Java Script to develop the dynamic web pages and use server side Scripting with PHP to generate the web pages dynamically using the database connectivity.	1-4,11,12	2,3
CO5	Examine the HTML .Know how to use Dynamic HTML.	2,3,4,5	2,3
CO6	Familiarize server side scripting language like Perl & PHP.	2-5	1,2

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√				
CO2		√	√	√		
CO3			√			
CO4		√	√	√		
CO5		√	√	√	√	
CO6		√	√	√	√	

COURSE ARTICULATION MATRIX

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	1				1				1		2	2	
CO2		2	3	1	1									3	1
CO3	1	2	1	2				3	1		1			2	1
CO4	1	2	3	1							1	1		2	1
CO5		2	2	3	1									2	2
CO6		1	2	3	1								1	2	

Note:1-Low,2-Medium,3-High

Course Contents

Theory

Contents
UNIT-1
Web Essentials: Clients, Servers, and Communication. The Internet- Basic Internet Protocols -The World Wide Web- HTTP request message- response message-Web Clients Web Servers-Case Study. Mark up Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics- Some Fundamental HTML Elements-Relative URLs- Lists- tables- Frames- Forms XML Creating HTML Documents. Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Name spaces Java Script and XML

UNIT-2
Style Sheets: Lists, Tables, Forms, Frames CSS: Introduction, Levels of style sheets, Style specification formats ,Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The <span>and<div>tags, Conflict resolution. Java script: Over view of Java script, Object orientation and Java script, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors.
UNIT-3
Perl, CGI Programming: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples. The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; Cookies. Data base access with Perl and MySQL
UNIT-4
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.

TEXT BOOKS:

1. Robert.W.Sebesta,"Programming the World Wide Web",Fourth Edition,Pearson.
2. Education,2007 Jeffrey C .Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2006. 2007.

REFERENCE BOOKS:

1. Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, PearsonEducation,2006.
2. Marty Hall and Larry Brown, "Core Web Programming" Second Edition, Volume I and II, PearsonEducation,2001.
3. Bates,"DevelopingWebApplications",Wiley,2006.

JOURNALS/MAGAZINES:

1. International Journal of WebTechnology-ISSN:2278-2389
2. International Journal of Web & Semantic Technology (IJWesT)
3. ELSEVIER Journals with in "Internet And Web Technology"

SWAYAM/NPTEL/MOOCS:

1. Coursera-Web Design: Wire frames to Prototypes
2. Coursera–Web Application Technologies and Django
3. https://nptel.ac.in/courses/106/105/106105084/
4. https://www.edx.org/learn/web-development

SELF LEARNING EXERCISES:

HTML5, JQuery, XML, Ruby, Introduction to REST and REST ful API

Course Title	Computer Networks				Course Type		Theory	
Course Code	B20CI0501	Credits	3		Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	-	50%	50%

COURSE OVERVIEW:

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 the or etical 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 OBJECTIVE(S):

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.
5. Emphasis the management of local area networks
6. Learning about computer network organization and implementation

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of the architectural principles of computer networking and compare different approaches to organizing networks.	1to6,12	1
CO2	Identify the good network design with simplicity, scalability, performance and the end-to-end principle.	1to6,12	1
CO3	Appraise the working principles of Internet.	1to6,12	1
CO4	Develop applications using network protocols.	1to6,12	1,2,3
CO5	Emphasis the management of local area networks	1to6,12	2,3
CO6	Learning about computer network organization and implementation	1to6,12	1,2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√		√		√
CO2					√	√
CO3	√				√	√
CO4						√
CO5	√	√	√	√		
CO6	√	√	√	√	√	

COURSE ARTICULATION MATRIX

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1						1	3		
CO2	3	3	3	3	2	2						1	3		
CO3	3	3	3	3	2	1						2	3		
CO4	3	3	3	2	2	1						1	3	3	3
CO5	3	3	3	2	2	1						2		3	3
CO6	3	3	3	2	2	1						2	2	3	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Introduction to Data Communication and Networking: Internet history and Internet today, Data Communications, 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, Shannon 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. Transmission Media.
Error Detection and Correction: Introduction, cyclic Codes: Cyclic redundancy code generation. 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 Wi-Fi, 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 Go Back-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, DNS Message Format.

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.

JOURNALS/MAGAZINES:

1. IEEE Transactions on Networking.
2. Elsevier Journal of Computer Networks
3. Springer Journal of communications and Information networks.

SWAYAM/NPTEL/MOOCS:

1. https://www.udemy.com/topic/computer-network/

2. https://www.coursera.org/courses?query=computer%20network

3. https://nptel.ac.in/courses/106/105/106105183/

4. https://www.edx.org/learn/computer-networking

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

Course Title	Big Data Analytics				Course Type		Theory	
Course Code	B20EJ0502	Credits	3		Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

This course is for those new to data science and interested in understanding why the Big Data Era has come to be. It is for   those who want to become conversant with the terminology and the core concepts behind big data problems, applications, and systems. It is for those who want to start thinking about how Big Data might be useful in their business or career. It provides an introduction to one of the most common frameworks, Hadoop, that has made big data analysis easier and more accessible -- increasing the potential for data to transform our world.

COURSE OBJECTIVE (S):

1.Introduce Big Data concepts and managing big data.
2.Describe Hadoop and processing data using Hadoop.
3.Illustrate the use of map-reduce analytics using Hadoop and related tools.
4.Describe Hadoop tools, PIG and Hive architecture

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of the concepts of Big Data in real world applications.	1 to5,9,12	2
CO2	Apply the theories of Hadoop.	1 to5,9,12	2
CO3	Illustrate the fundamental techniques and scalable algorithms like Hadoop, Map Reduce.	1 to5,9,12	1
CO4	Develop a real world application using Hadoop tools	1 to5,9,12	1
CO5	Learn new tools and technologies in the bigdata and apply for suitable application development.	1 to5,9,12	1
CO6	Develop solutions in the bigdata platform to the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	1 to 5,9,12	2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√			√	√
CO2			√			
CO3				√		√
CO4						√
CO5						√
CO6				√		

COURSE ARTICULATION MATRIX:

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	2				1			3		3	
CO2	3	3	3	3	3				1			3		3	
CO3	3	3	3	3	3				1			3	3		
CO4	3	3	3	3	3				2			3	3		
CO5	3	3	3	3	3				2			3	3		
CO6	3	3	3	3	3				1			3		3	

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

UNIT	Syllabus
1	**Unit – 1** **Introduction to Big Data:** Classification of digital data, characteristics of data, evolution of big data, definition of big data, challenges with big data, what is big data, why big data, traditional business intelligence (BI) versus big data, A typical data warehouse environment, A typical Hadoop environment, top challenges facing big data, why is big data analytics, what kind of technologies are we looking toward to help meet the challenges posed by big data?
2	**Unit – 2** **Introduction to Hadoop:** Introducing Hadoop, why Hadoop, why not RDBMS, RDBMS versus Hadoop, History of Hadoop, Hadoop overview, use case of Hadoop, Hadoop distributors, HDFS, Processing data with Hadoop, NoSQL, Hadoop-Features of Hadoop.
3	**Unit – 3** **MapReduce:** A weather dataset, Analyzing data with UNIX tools, Analyzing data with Hadoop, scaling out, How MapReduce Works, Anatomy of a MapReduce job run, shuffle and sort, job scheduling.
4	**Unit – 4** **Hadoop Related Tools:** Introduction to PIG, What is PIG, The anatomy of PIG,PIG on Hadoop, PIG Latin, Data types in PIG, running PIG,Execution modes,HDFS Commands,Relational operators,PIG versus Hive, Introduction to HIVE, What is hive ,hive architecture, hive data types,hive file formats,HQL,UDF.

TEXT BOOKS:

1. Sridhar Alla, "Big Data Analytics with Hadoop 3", published by Packt Publishing Ltd, May 2018.

2. Subhashini Chellappan, Dharanitharan Ganesan," Practical Apache Spark Using the Scala API", A Press, 2018.

REFERENCE BOOKS:

1. Michael Minelli, Michele chambers, Ambiga Dhiraj," Big data, big analytics", Wiley,2013

2. P. Tan, M. Steinbach, V. Kumar, "Introduction to Data Mining", Addison-Wesley, 2005.

3. J. Han, M. Kamber, "Data Mining: Concepts and Techniques", 2nd ed. Morgan Kaufmann, 2005.

JOURNALS/MAGAZINES:

1. IEEE,Introduction to the IEEE Transactions on Big Data

2. Elsevier, Big data research journal Elsevier

3. Springer, Journal on Big Data Springer.

4. ACM DL,The Journal of Machine Learning Research-ACM

SWAYAM/NPTEL/MOOCS:

1. Coursera – Big Data

2. Coursera – Introduction to Big Data

3. https://nptel.ac.in/courses/106/104/106104189/

4. https://www.edx.org/learn/big-data

SELF-LEARNING EXERCISES:

Spark Real-Time Use Case: Data Analytics Project Architecture, Data Ingestion, Data Storage, Data Processing, Data Visualization

Course Title	Machine Learning				Course Type		Theory	
Course Code	B20CI0502	Credits	3		Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	-	50%	50%

COURSE OVERVIEW:

Course Description: Machine learning uses interdisciplinary techniques such as statistics, linear algebra, optimization, and computer science to create automated systems that can process through large volumes of data at high speed to make predictions or decisions without human intervention.

COURSE OBJECTIVES:

The objectives of this course are to:

1.Explain machine learning and problems relevant to machine learning.

2.Discuss the fundamentals of Decision trees learning and its issues

3.Illustrate neural networks, Bayes classifier and k nearest neighbour for problems appearing in machine learning.

4.Describe statistical analysis of machine learning techniques.

COURSE OUTCOMES (COs)

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

CO#	Course Outcomes	POs	PSOs
CO1	Explain the basics of machine learning concepts.	1 to 5	1,2,3
CO2	Implement suitable classification technique for intelligent applications	1 to 5	1,2,3
CO3	Implement clustering algorithms for intelligent applications	1 to 5	1,2,3
CO4	Implement machine learning algorithms for intelligent applications	1 to 5	1,2,3
CO5	Learn new tools and technologies related to machine learning and apply for suitable application development.	10,12	2,3
CO6	Develop solutions using machine learning based algorithms for the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	11,12	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1						√
CO2			√			√
CO3				√		√
CO4				√	√	√
CO5		√		√		
CO6				√	√	

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2	1								3	3	3
CO2	3	2	3	1	2								3	3	3
CO3	3	1	2	1	2								3	3	3
CO4	3	2	2	2	2								3	3	3
CO5										2		3		2	2
CO6											3	3		3	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY:

Contents
Unit-1:
Introduction to Machine Learning: What is Machine Learning, challenges, Applications, methods of Machine Learning, performance metrics, Data preprocessing, Data Loading, Understanding data, Pre-Processing unit
Unit-2:
Classification – Decision Tree, K-nearest neighbor, logistic regression, support vector machine algorithm, naive Bayes algorithm, random forest algorithm
Unit -3:
Regression - linear regression, Random Forest Regression Clustering: overview, k – means clustering, mean shift clustering, hierarchical clustering, DBSCAN clustering algorithm.
Unit – 4
Introduction to neural networks: Biological Neuron, ANN Perception, Network Topology (Feed forward network, Feedback Networks), Adjustments of Weights or Learning, Activation Functions, Training Algorithm, Gradient descent algorithms - Batch Gradient Descent, Stochastic Gradient

TEXT BOOKS:

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

Websites:

1. https://www.tutorialspoint.com/machine_learning_with_python/index.htm

2. https://www.tutorialspoint.com/artificial_neural_network/index.htm

RECOMMENDED LEARNING RESOURCES (REFERENCE BOOKS):

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", 2nd edition, springer series in statistics.

2. Ethem Alpaydın, "Introduction to machine learning", second edition, MIT press.

JOURNALS/MAGAZINES:

1. Springer Journal of Machine Learning.

2. International Journal of Machine Learning and Computing.

SWAYAM/NPTEL/MOOCs:

1. Coursera – Machine Learning

2. Coursera – Deep Learning

3. https://onlinecourses.nptel.ac.in/noc19_cs53/preview

SELF-LEARNING EXERCISES:

Reinforcement Learning: Introduction, Learning Task, Q Learning

Course Title	Advanced Database Systems(PE-1)				Course Type		Theory	
Course Code	B20EJS501	Credits		3	Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

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 OBJECTIVE (S):

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)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the features of Object Definition Language and Object Query Language for given real world applications	1 to6	1
CO2	Develop Complex queries in SQL and ODMG for parallel and distributed databases.	1 to6	1
CO3	Make use of different types of databases and other technologies to mine the data.	1 to6	1
CO4	Design multi dimension model for a given application in Data mining.	1 to6	1,2,3
CO5	Understand of data modelling techniques, OLAP,OLTP	1-6	1,2
CO6	Practical implementation of advanced data base system	1-6	1,2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1			√			
CO2			√			
CO3			√	√		
CO4			√	√	√	√
CO5		√				√
CO6	√	√	√	√	√	√

COURSE ARTICULATION MATRIX

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1	2	-	-	-	-	-	-	3	-	-
CO2	3	3	2	3	2	2	-	-	-	-	-	-	3	-	-
CO3	1	2	3	1	2	1	-	-	-	-	-	-	3	-	-
CO4	3	3	3	2	2	3	-	-	-	-	-	-	3	3	3
CO5	1	2	3	1	2	1							1	2	
CO6	3	3	3	2	2	3							2	3	

Note:1-Low,2-Medium,3-High

COURSE CONTENT

Contents
UNIT-1
Introduction to various tools and frameworks: Introduction to OLAP, OLTP and Data warehouse system, data modelling, star schema, snowflake schema. Build Data warehouse/data mart using opensource tools like pentaho data integration tool, pentaho business analytics. OLAP versus OLTP, Introduction tovarious tools Overview 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, multidimensional model, 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;

TEXTBOOKS:

1. 1.Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3rd Edition, McGraw- Hill, 2003.
2. 2.Elmasri and Navathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2007.
3. 3.Jiawei Han, MichelineKamber, Jian Pei, "Data Mining: Concepts and Techniques", Elsevier, 2011.

REFERENCEBOOKS:

1. 1.Connolly and Begg, "Database Systems", 4th Edition, Pearson Education, 2002.

JOURNALS/MAGAZINES:

1. https://dl.acm.org/journal/jdiq

2. https://dl.acm.org/journal/tkdd

3. https://dl.acm.org/journal/tods

4. https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=69

5. https://www.springer.com/journal/10618

SWAYAM/NPTEL/MOOCs:

1. Coursera – Database Management Essentials, University of Colorado System
2. Coursera – Databases and SQL for Data Science, IBM
3. https://www.edx.org/course/advanced-database-administration
1. https://www.edx.org/course/olap-and-recursion
2. https://www.edx.org/course/advanced-database-queries

Self-Learning Exercises:

1. More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management, P-P database.

2. Transaction management.

Course Title	System Software (PE-1)					Course Type		Theory	
Course Code	B20EJS502	Credits		3		Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester			Assessment in Weightage	
	Theory	3	3	3					
	Practice	-	-	-	Theory	Practical		CIE	SEE
	Tutorial	-	-	-					
	Total	3	3	3	39	0		50%	50%

COURSE OVERVIEW:

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 OBJECTIVE (S):

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):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of different instruction formats and addressing modes of SIC and SIC/XE architectures for implementing arithmetic operations.	1 to6,12	1
CO2	Identify the suitable data structures required to develop various system softwares.	1 to5,12	1
CO3	Develop the programs for the pass1 and pass2 algorithms of linkers and loaders.	1 to5	1,2
CO4	Apply functions and algorithms of macro-processor to process a given macro definition.	1 to5	1,2
CO5	Explain basics of system software and differentiate between system software and application software	1 to5,12	1
CO6	Describe assemblers design (pass1andpass2) for the SIC and SIC/XE machine architecture.	1 to5	1,2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√	√			
CO2				√	√	
CO3						√
CO4			√			
CO5				√	√	
CO6						√

COURSE ARTICULATION MATRIX:

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2	2	1						1	3		
CO2	2	2	2	2	1							1	3		
CO3	2	2	1	1	1								3	3	
CO4	2	1	1	1	1								3	3	
CO5	2	2	2	2	1							1	3		
CO6	2	2	1	1	1								3	3	

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
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

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.

REFERENCES 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

JOURNALS/MAGAZINES;

1. https://www.researchgate.net/publication/328956597_THE_IMPACT_OF_ACCOUNTING_SOFTWARE_ON_BUSINESS_PERFORMANCE
2. https://www.bioss.ac.uk/people/chris/app.pdf

3. 3 Elsevier Journal of Systems and Software.
4. IEEE Transactions on Software Engineering

SWAYAM/NPTEL/MOOCS:

1. https://www.coursera.org/learn/cloud-sys-software
2. https://www.ucdenver.edu/offices/office-of-information-technology/software/how-do-i-use/coursera

SELF LEARNING EXERCISES:

Design of a micro preprocessor, Peep whole optimizer and Compile and GO loader.

Course Title	Mobile Application Development (PE-1)				Course Type		Theory	
Course Code	B20EJS503	Credits	3		Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

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 OBJECTIVE (S):

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 OUT COMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of Android features to develop real world application.	1 to6,9,10	1
CO2	Design a suitable user interface and database for the given real world application.	1 to6,9,10,12	3
CO3	Choose the intrinsic controls required for the development of real world applications.	2 to5,9,10,11	1,2
CO4	Develop Android Services for multimedia, camera and location based activities.	1 to6,9,10,11	2,3
CO5	Discuss mobile application models/ architectures and patterns for development of a mobile software application	1 to6,9,10,12	3
CO6	Demonstrate the installation of software and tools required for development of android applications	1 to6,9,10,11	2,3

BLOOM'SLEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√				
CO2					√	√
CO3				√		
CO4			√			√
CO5			√			
CO6		√	√			

COURSE ARTICULATION MATRIX:

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	1				2	2			3		
CO2	2	3	2	3	2				3	2		2			3
CO3		2	3	1					3	1			3	3	
CO4	3	3	2	2	1				2	2				3	3
CO5	2	3	2	3	2				3	2		2			3
CO6	3	3	2	2	1				2	2				3	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Introduction to mobile communication and computing: Introduction to mobile computing, Novel applications, 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

Jellybean 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 and contextual 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, Broadcast Receiver 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, creating custom 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.

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
4. 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. 4.Maurice Sharp Erica Sadun Rod Strougo, "Learning iOS Development-A Hands-on Guide to the Fundamentals of iOS
5. Programming", Addison Wesley by Pearson Education, Inc.2014.   .Wei-Meng Lee, "Beginning Swift Programming", Wiley India Pvt. Ltd.,2018.

JOURNALS/MAGAZINES:

1. https://www.researchgate.net/publication/303370028_A_Review_Paper_on_Cross_Platform_Mobile_Application_Dev   elopment_IDE
2. igi-global.com/journal/international-journal-mobile-computing-multimedia/1102
3. https://www.researchgate.net/publication/339602524_Framework_for_Developing_Secure_Converged_Web_and_Mobile_Applications

SELF LEARNING EXERCISES:

More Recent Applications: Multimedia;2D graphics ; networking support in Android, Introduction to IoS, App. Development

Course Title	Human Computer Interaction (PE-1)			Course Type		Theory	
Course Code	B20EJS504	Credits	3	Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

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 OBJECTIVE (S):
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)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the suitable positioning and pointing device to be used to work with the given application.	1 to5	1
CO2	Develop the user interface by Selecting an effective style for the given real world applications.	1 to5	2
CO3	Make use of different UI design rules to develop a user interface for a real-world application.	1 to5	3
CO4	Compare the different evaluation techniques used to measure the quality of User Interface.	1 to5	1
CO5	Demonstrate the use of an interactive design process and universal design principles in designing HCI systems.	1 to5	2
CO6	Illustrate the use of different evaluation methods	1 to5	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√				
CO2			√	√		√
CO3			√			
CO4				√	√	
CO5			√	√		√
CO6			√			

COURSE ARTICULATION MATRIX:

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	2								3		
CO2	3	2	1	1	2									3	
CO3	3	2	2	3	1								3		3
CO4	2	3	3	2	2								3		
CO5	3	2	1	1	2									3	
CO6	3	2	2	3	1								3		3

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
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 through user participation, choosing an evaluation method.

TEXT BOOKS:
1. 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. 1.Jonathan Lazar, Jinjuan Heidi Feng, & Harry Hochheiser," Research Methods in Human- Computer Interaction", Wiley, Second edition, 2010

JOURNALS/MAGAZINES:

1. ACM, International Journal of Human-Computer Studies, 2003.
2. IEEE, Transactions on Human-Machine Systems, 2014
3. Elsevier, International Journal of Human-Computer Studies. 2005.

SELF LEARNING EXERCISES:

Designing user support systems, Ubiquitous computing applications research, Hypertext, multimedia and the World Wide Web.

Course Title	Digital Communication (PE-1)				Course Type		Theory	
Course Code	B20EJS505	Credits		3	Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-				
	Tutorial	-	-	-	Theory	Practical	CIE	SEE
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

The course focuses on 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 introduction to digital communications, the pre-requisites/co-requisites listed are absolutely necessary.

COURSE OBJECTIVE (S):

The objective of this course is to:

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

    2: Discuss the flow and processing of information from the source to various units at the transmitter side.

    3: Illustrate the inverse operations at the receiver to facilitate the retrieval of transmitted information.

    4: Describe various processing units of a digital communication system.

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the limitations of analog communications resources bandwidth and power to appreciate the effective use of such Resources	1 to4	1
CO2	Analyze the flow and processing of information from the source to various units at the transmitter side.	1 to4	1
CO3	Make use of the inverse operations at the receiver to facilitate the retrieval of transmitted information.	1 to4,6	1
CO4	Apply the different Channel coding methods for the given real world data.	1 to4	1,2
CO5	Illustrate the inverse operations at the receiver facilitate the retrieval of transmitted information.	1 to4	1
CO6	Describe various processing units of a digital communication system.	1 to4,6	1

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√	√			
CO2				√	√	
CO3			√	√		√
CO4			√		√	
CO5				√	√	
CO6			√	√		√

COURSE ARTICULATION MATRIX:

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1									3		
CO2	3	2	2	2									3		
CO3	3	3	3	2		3							3		
CO4	3	3	1	2									3	3	
CO5	3	2	2	2									3		
CO6	3	3	3	2		3							3		

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
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.

TEXTBOOKS:

1. Digital Communications – Fundamentals and Applications, Bernard Sklar, Second Edition, Pearson

Education, 2016.

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. SimonHaykin, "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.
JOURNALS/MAGAZINES:

1. Elsevier Journal Digital Communications and Networks.
2. IEEE Transactions on Communications.
3. Journal of Analog and Digital Communications.
4. https://nptel.ac.in/courses/108/102/108102117/
SWAYAM/NPTEL/MOOCS:

1. https://nptel.ac.in/courses/108/102/108102117/
2. https://www.coursera.org/learn/information-theory#syllabus

Course Title	Software Testing (PE-1)				Course Type		Theory	
Course Code	B20EJS506	Credits		3	Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

This course examines fundamental software testing and related program analysis techniques. In particular, the important phases of testing will be reviewed, emphasizing the significance of each phase when testing different types of software. The course will also include concepts such as test case generation, test coverage, regression testing, program analysis (e.g., program-flow and data-flow analysis), and test prioritization

COURSE OBJECTIVE (S):

1. Discuss fundamental concepts in software testing.

2. Illustrate the use of different software testing methods.

3. Demonstrate the use of Selenium IDE to develop applications.

4. Discuss the use of locators in developing real world applications.

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the fundamental concepts in software testing.	1 to5,9,10	1
CO2	Analyze the performance of testing methods on the given real world applications.	1 to5	1
CO3	Develop an application using Software Testing IDE.	1to5,10,12	2,3
CO4	Make use of locators in developing real world applications.	1 to5	1
CO5	Develop Big Data Solutions using Hadoop Eco System	1 to5,9,12	1
CO6	Analyze Info sphere Big Insights Big Data Recommendations	1 to5,9,12	2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√				
CO2				√		√
CO3			√			√
CO4			√			
CO5						√
CO6				√		

COURSE ARTICULATION MATRIX:

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1				1	1			3		
CO2	3	3	2	2	1								3		
CO3	3	2	2	1	1					1		1	3	3	
CO4	3	3	3	3	3	1							3		
CO5	3	3	3	3	3				2			3	3		
CO6	3	3	3	3	3				1			3		3	

-

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1   **Introduction:** Software Testing Principles Need for testing, Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing, **Examples:** Generalized pseudocode, The triangle problem, The NextDate function, The commission problem. Introduction to Automated testing tools (open source and commercial)
UNIT-2   **FunctionalTesting:** Boundary value analysis, Robustness testing, Equivalence Class Testing, Decision table method, **Examples:** The triangleproblem,   **Structural Testing:** Path Testing: DD-Paths, Test Coverage Metrics, Basis path Testing; Dataflow Testing: define/Use Testing, Slice Based Testing
UNIT-3   **Getting Started with Selenium IDE:** Important preliminary points, What is Selenium IDE, installing Selenium IDE, Selenium IDE, Rules for automation, Recording your first test with Selenium IDE Updating a test to assert items are on the page, updating a test to verify items on the page adding Selenium IDE comments, Multiplying windows, Working with multiple windows.
UNIT-4   **Locators:** Locating elements by ID, Finding IDs of elements on the page with Fire bug, finding elements by ID, moving elements on the page, finding elements by name, Adding filters to the name, finding elements by link text. Overview of Selenium Web Driver, History of Selenium Architecture, Web Driver API, Web DriverSPI.

TEXT BOOKS:
1. P.C. Jorgensen, "Software Testing aCraftman's Approach", CRC Press, Auerbach Publications2013.
2. David Burns, Selenium 2 Testing Tools Beginner's Guide.

REFERENCE BOOKS:
1. Glenford J. Myers, "The Art of Software Testing", John Wiley & Sons 1979
2. Boris Beizer, "Black-Box Testing: Techniques for Functional Testing of Software and Systems", John Wiley & Sons 1995.
3. William E. Perry," Effective Methods for Software Testing (2nd Edition)", JohnWiley& Sons 2000

JOURNALS/MAGAZINES:

1   Journal of Software Engineering and Research Engineering, 2013.
2   International Journal of Software Engineering, Technology and Applications, 2013.

SWAYAM/NPTEL/MOOCS:

1. https://www.nptel.ac.in/courses/106/101/106101163

2. https://www.coursera.org/courses?query=software testing

SELF-LEARNING EXERCISES:

Automated Testing tools: QTP tools, Lab View etc, ATLM.

Course Title	Introduction to AI (OE-1)				Course Type		Theory	
Course Code	B20CIO501	Credits		3	Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50	50

COURSE OVERVIEW

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 OBJECTIVE (S):

The objectives of this course are to:

1. Describe the basics of Artificial Intelligence (AI).
2. Illustrate knowledge representation issues and methods
3. Explain planning methods/algorithms in problem solving
4. Discuss the application of AI in Robot.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Solve AI problems using AI search strategies and production system	1,2,3,4,5	1,2
CO2	Develop knowledge base for representing the given real world data using logic and reasoning methods	1,2,3,4,5	1,2
CO3	Make use of planning and probability to solve uncertainty problems.	1,2,3,4,5	1,2
CO4	Design and develop an intelligent agent for robotics in a specific environment to solve real world problems.	1,2,3,4,5	1,2,3

| CO5 | Explain planning methods/algorithms in problem solving | 1,2,3,4,5 | 1,2 |
| CO6 | Discuss the application of AI in Robot . | 1,2,3,4,5 | 1,2 |

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

| CO# | Bloom's Level | | | | | |
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		√	√			
CO2						√
CO3			√			
CO4			√			√
CO5						√
CO6				√		√

COURSE ARTICULATION MATRIX:

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	3								3	3	
CO2	3	3	3	2	3								3	3	
CO3	3	2	3	3	3								3	3	1
CO4	3	2	2	2	2								3	3	3
CO5	3	3	3	2	3								3	3	
CO6	3	2	3	3	3								3	3	1

Note:1-Low,2-Medium,3-High

COURSE CONTENT

THEORY

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
Robotic Sensing and Manipulation: Introduction to robotics, Sensing, Manipulation, Human-robot interaction **Mobile Robots:** Navigation and path planning, Learning and robotics: Reinforcement learning, Case study: Autonomous vehicles technologies and impacts

TEXTBOOKS:

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

REFERENCE BOOKS:

1. Nils J.Nilsson, Elsevier, "Principles of Artificial Intelligence", 1980. "Artificial Neural Networks",
2. Krishan Mehrotra, Chilkuri K. Mohan, Sanjay Ranka, "Artificial Neural Networks", Penram International Publishing, 1997.
3. B.Yegananarayana, "Artificial Neural Networks", PHI, 2001.

JOURNALS/MAGAZINES:

1. Springer- Springer transaction for security based intelligent systems

2. IEEE transaction for computational Intelligence

3. ACM, ACM transaction on Multi-Agent System.
4. Boston Dynamics videos, 2018 ,https://www.youtube.com/user/BostonDynamics
5. Priday, R. "What's Really Going on in those Boston Dynamics Videos," Wired, February 18,
6. 2018https://www.wired.co.uk/article/bostondynamics-robotics-roboticist-how-to-watch o RAND Institute, "Autonomous
7. RAND Institute, "Autonomous Vehicle Technology: A Guide for Policymakers", 2016
8. https://www.rand.org/content/dam/rand/pubs/research_reports/RR400/RR443- 2/RAND_RR443-2.pdf

SWAYAM/NPTEL/MOOCS:

1 https://onlinecourses.nptel.ac.in/noc21_cs42/preview

2 Introduction to Artificial Intelligence -Coursera

SELF-LEARNING EXERCISES:

Natural Language Processing, Deep Learning

Course Title	OOPS USING C++(OE-1)				Course Type		Theory	
Course Code	B20CIO502	Credits	3		Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

This course introduces the basic concepts of object-oriented programming. Familiarizes with object creation and accessing members of object. OOPs concepts such as data abstraction, information hiding Encapsulation), overloading operations, inheritance mechanisms, virtual functions, friend functions and are discussed. FileI/O operations, Templates and exception handling mechanisms are also introduced.

COURSE OBJECTIVE (S):

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 (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply the basic concepts of objects and classes for a real world application	2,3,7,11	1,2
CO2	Develop applications by implementing operator overloading and function overloading.	2,3,4,5	2,3
CO3	Make use Inheritance feature of OOPs to develop a real world application	1-4,8,9,11	2,3
CO4	Build the real-world application using exception handling and templates	1-4,11,12	2,3

| CO5 | Understand the difference between the top-down and bottom-up approach | 2,3,4,12 | 1,2 |
| CO6 | Illustrate the process of data file manipulations using C++ | 2,3,6,11 | 1,2 |

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√				
CO2	√	√				
CO3		√	√			
CO4		√	√	√		√
CO5		√				
CO6		√		√		

COURSE ARTICULATION MATRIX:

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	1				1				1		2	2	
CO2		2	3	1	1									3	1
CO3	1	2	1	2				3	1		1			2	1
CO4	1	2	3	1							1	1		2	1
CO5		2	2	2								2	2	2	
CO6		2	1		2						2		1	2	

 Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
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 to objects, 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 of Exception handling, handling derived class exceptions.

TEXT BOOKS:

1. Herbert Schildt," The Complete Reference C++", 4th Edition, Tata McGraw Hill, 2003.
2. SanleyB.Lippmann, JoseeLajore, "C++ Primer", 4th Edition, Pearson Education, 2005.

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,l999.

JOURNALS/MAGAZINES:

1. International Journal of Web Technology-ISSN:2278-2389
2. International Journal of Web & Semantic Technology (IJWesT)
3. ELSEVIER Journals with in" Internet And Web Technology"

SWAYAM/NPTEL/MOOCS:

1. https://onlinecourses.swayam2.ac.in/nou20_cs05/preview

2. https://nptel.ac.in/courses/106/105/106105084/

SELF LEARNING EXERCISES:

The student is expected to study more about the following topics: Rails and Angular JS.

Course Title	Web Technology (OE-1)				Course Type		Theory	
Course Code	B20CIO503	Credits	3		Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

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 OBJECTIVE (S):

The objectives of this course are to:

1. Understand the various steps in designing a creative and dynamic website.
2. Describe the hierarchy of objects in HTML and XML
3. Design dynamic and interactive web pages by embedding Java Script code in HTML.
4. Illustrate the advantages and use of different types of CSS.
5. Examine the HTML. Know how to use Dynamic HTML.
6. Familiarize server-side scripting language like Perl & PHP.

COURSE OUTCOMES (COs):

CO#	Course Outcomes	POs	PSOs
CO1	Describe the concepts of WWW including browser and HTTP protocol and summarize the various HTML tags and use them to develop the user-friendly web pages.	2,3,7,11	1,2
CO2	Define the CSS with its types and use them to provide the styles to the web pages at various levels.	2-5	2,3
CO3	Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.	1,4,8,9,11	2,3
CO4	Apply JavaScript to develop the dynamic web pages and use server-side scripting with PHP to generate the web pages dynamically using the database connectivity.	1-4,11,12	2,3

CO5	Create a server side java application called JSP to catch form data sent from client and store it on database.	1,4,5,11,12	2,3
CO6	Develop a dynamic web page by the use of java script and DHTML.	1,4,8,9,11	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1	√	√				
CO2		√	√	√		
CO3			√			
CO4			√	√	√	
CO5		√				√
CO6		√		√		√

COURSE ARTICULATION MATRIX:

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	1				1				1		2	2	
CO2		2	3	1	1									3	1
CO3	1	2	1	2				3	1		1			2	1
CO4	1	2	3	1							1	1		2	1
CO5	1	2	3	1	2						1	1		2	1
CO6	1	2	1	2				3	1		1			2	1

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide W-eb-HTTP request message-response message-Web Clients Web Servers-Case Study. Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics- Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-XML Creating HTML Documents. Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration - Namespaces JavaScript andXML
UNIT-2
Style Sheets: Lists, Tables, Forms, Frames CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The <span>and <div>tags, Conflict resolution.
JavaScript: Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors.
UNIT-3
Perl, CGI Programming: Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples. The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module.
Cookies. Database access with Perl and MySQL
UNIT-4
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.

TEXTBOOKS:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, PearsonEducation, 2008.
2. JeffreyC. Jackson,"WebTechnologies--AComputerSciencePerspective",PearsonEducation,2006.

REFERENCE BOOKS:

1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education,2006.
2. Marty Hall and Larry Brown, "Core Web Programming" Second Edition, Volume I and I, Pearson Education,2001.

JOURNALS/MAGAZINES:

1. International Journal of Web Technology-ISSN:2278-2389
2. International Journal of Web & Semantic Technology(IJWesT)

SWAYAM/NPTEL/MOOCS:

1 https://onlinecourses.swayam2.ac.in/nou20_cs05/preview
2 https://nptel.ac.in/courses/106/105/106105084/

SELF LEARNING EXERCISES:

The student is expected to study more about the following topics: Rails and Angular JS.

Course Title	Web Technologies and Applications Lab				Course Type		Theory	
Course Code	**B20EJ0504**	Credits		1	Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	2	2	0	26	50%	50%

COURSE OVERVIEW:

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, Perland PHP.

COURSE OBJECTIVE(S):

The objectives of this course are to:

1. Understand the various steps in designing a creative and dynamic website.
2. Describe the hierarchy of objects in HTML and XML.
3. Design dynamic and interactive web pages by embedding Java Script code in HTML.
4. Illustrate the advantages and use of different types of CSS.
5. Examine the HTML. Know how to use Dynamic HTML.
6. Familiarize server side scripting language like Perl &PHP.

COURSE OUTCOMES (COs)
After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Describe the concepts of WWW including browser and HTTP protocol and summarize the various HTML tags and use them to develop the user- friendly web pages.	2,3,7,11	1,2
CO2	Define the CSS with its types and use them to provide the styles to the web pages at various levels.	2-5	2,3
CO3	Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.	1,4,8,9,11	2,3
CO4	Apply Java Script to develop the dynamic web pages and use server side Scripting with PHP to generate the web pages dynamically using the database connectivity.	1-4,11,12	2,3
CO5	Examine the HTML .Know how to use Dynamic HTML.	2,3,4,5	2,3

CO6	Familiarize server side scripting language like Perl & PHP.	2-5	1,2

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√	√				
CO2		√	√	√		
CO3			√			
CO4			√	√	√	
CO5		√	√	√	√	
CO6		√	√	√	√	

COURSE ARTICULATION MATRIX

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	1				1				1		2	2	
CO2		2	3	1	1									3	1
CO3	1	2	1	2				3	1		1			2	1
CO4	1	2	3	1							1	1		2	1
CO5		2	2	3	1									2	2
CO6		1	2	3	1								1	2	

Note:1-Low,2-Medium,3-High

Practice:

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability
1.	In today's digital world, information dissemination through printed documents consumes 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 static web pages for an online Book store. The pages should resemble like www.amazon.com The website should consist of. Home page, Registration & Login, User profile page, Books catalogue, Shopping cart, Payment by credit card, and order confirmation.		
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 for validity or correctness of the input data by writing a JavaScript to validate these fields.		
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 page by 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.		

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 composed in response to users' requests. Advanced web technologies play a vital role in storage, processing and retrieval of dynamic web content from web servers. Hence it is 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.		
5.	. Information technology has become part and parcel of humanity to such an extent that people can shop anything online, from anywhere, at any time 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 & XSLT. Design a document using CSS and XSLT to create a catalog of items for an online electronic shopping.		
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.		
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 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		

| 8. | Databases are the storage systems used by most of the business and 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. | | |
| 9. | 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. | | |

Course Title	COMPUTER NETWORKS Lab				Course Type		Theory	
Course Code	B20CI0506	Credits		1	Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	2	2	0	26	50%	50%

COURSE OVERVIEW

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 OBJECTIVE (S):

The objectives of this course are to:

1. Explain the protocol stacks (OSI and TCP/IP) for data communication.

2. Discuss the MAC protocols, error detection & correction strategies for data transmission over the networking devices.

3. Describe the standards for data communication with routing protocols.

4. Illustrate the client server communication using TCP or UDP protocols and other application level protocols

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of the architectural principles of computer networking and compare different approaches to organizing networks.	1 to 6, 12	2
CO2	Discover the good network design with simplicity, scalability, performance and the end-to-end principle	1 to 6, 12	2
CO3	Appraise the working principles of Internet.	1 to 6, 12	3
CO4	Compile the effectiveness of existing or similar network protocols.	1 to 6, 12	3
CO5	Design a component or a product applying all the relevant standards and with realistic constraints	5,6,9,10	2
CO6	Compare various congestion control mechanisms and identify appropriate Transport layer protocol for real time applications	5,6,9,10	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√	√		
CO3			√	√	√	
CO4			√	√	√	√
CO5			√			
CO6						√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	1						1		3	
CO2	3	3	3	3	2	2						1		3	
CO3	3	3	3	3	2	1						2			3
CO4	3	3	3	2	2	1						1			3

CO5					2	3			2	3					3	
CO6					2	3										3

Note: 1-Low, 2-Medium, 3-High

PRACTICE:

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability
Part - A			
1	a) Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.	RJ-45 connector, IO Connector, Crimping Tool, Twisted pair Cable, Cable Tester.	Cable Crimping, Standard Cabling and Cross Cabling, IO connector crimping and testing the crimped cable using a cable tester can be done successfully
	b) Install and Configure Wired and Wireless NIC and transfer files between systems in LAN and Wireless LAN.	NIC, Adapter	Installation and configuration of Wired and Wireless (remotely) NIC and transfer files between systems in LAN and Wireless LAN between two systems in a LAN can be done successfully.
	c) Install and configure Network Devices: HUB, Switch and Routers.	HUB, Switch, Router and configuration software.	Gain the knowledge on configuring the different connecting devices
	d) Connect the computers in Local Area Network.	Computer Systems with connecting media.	Interconnection and building a simple LAN
2	a) Establish Peer to Peer network connection using two systems using Switch and Router in a LAN.	Computer Systems with connecting media.	Configuration of peer to peer network communication
	b) Configure Internet connection and use IPCONFIG, PING / Tracer and Net stat utilities to debug the network issues.	Connected Computer Systems.	Configure Internet connection
	c) Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network	Connected Computer Systems with printer.	File *t*ransfer between systems in LAN using FTP Configuration.
	d) Study of basic network command and	Command Prompt	Network configuration

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	Network configuration commands		
3	In information theory and coding theory with applications in computer science and telecommunication, error detection and correction or error control are techniques that enable reliable delivery of digital data over unreliable communication channels. Many communication channels are subject to channel noise, and thus errors may be introduced during transmission from the source to a receiver. Error detection techniques allow detecting such errors, while error correction enables reconstruction of the original data in many cases. Write a Program for Implementation of any one mechanism for Error Detection / Error Correction Techniques.	CRC Hamming Code	Error detection and control in data transmission.
4	A routing algorithm is a procedure that lays down the route or path to transfer data packets from source to the destination. They help in directing Internet traffic efficiently. ... Routing algorithm mathematically computes the best path, i.e. "least – cost path" that the packet can be routed through Write a Program for Implementation of any routing algorithms.	Distance vector & Link state routing	Routing in networks before the communication begins.
Part B: Mini Project 1: Design of Corporate Network			
1	Configuring a Switched network and Study of VLAN's and assigning a PC based on the VLAN.	Windows/Linux OS, Packet Tracer	Switch and VLAN Configuration.
2	Implementing an IP Addressing Scheme Configuring WEP on a Wireless Router. Interpreting Ping and Traceroute Output	Windows/Linux OS, Packet Tracer	Router configuration and connectivity checking.
3	Configuring Static Routing. Configuring Dynamic Routing protocols RIP, OSPF.	Windows/Linux OS, Packet Tracer	Static and Dynamic Routing over a network
4	Examining Network Address Translation (NAT). Configuring a Cisco Router as a DHCP Server	Windows/Linux OS, Packet Tracer	Configuration and working of NAT with setup of DHCP server.
Part C: Mini Project 2: Performance Analysis of TCP and UDP applications over the different Topologies of network			
1	Consider Six nodes and demonstrate the different ways of connecting them in topology methods. Also specify the different transmission media with specific channel specifications.	Python, NS3, Ubuntu.	Create an interface between the devices using different topologies.
2	Configure the IP address of the nodes in the specified network. Achieve the port specifications for different applications. Apply and Demonstrate the TFTP on the specified network using UDP. Observe the trace results.	Python, NS3, Ubuntu.	Analyze the performance using UDP based applications
3	Apply and Demonstrate the FTP and TELNET on the specified network using TCP. Observe the trace results.	Python, NS3, Ubuntu.	Analyze the performance using TCP based applications
4	Apply and Demonstrate the Congestion and Error Controlling mechanism in the specified networks. Observe the trace results.	Python, NS3, Ubuntu.	Analyze the congestion and error controlling in TCP based applications

Course Title	MACHINE LEARNING Lab				Course Type		Theory	
Course Code	B20CI0505	Credits	1		Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	2	2	0	26	50%	50%

COURSE OVERVIEW:

Course Description: Machine learning uses interdisciplinary techniques such as statistics, linear algebra, optimization, and computer science to create automated systems that can process through large volumes of data at high speed to make predictions or decisions without human intervention.

COURSE OBJECTIVES:

The objectives of this course are to:

1.Explain machine learning and problems relevant to machine learning.

2.Discuss the fundamentals of Decision trees learning and its issues

3.Illustrate neural networks, Bayes classifier and k nearest neighbour for problems appearing in machine learning.

4.Describe statistical analysis of machine learning techniques.

COURSE OUTCOMES (COs)

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

CO#	Course Outcomes	POs	PSOs
CO1	Explain the basics of machine learning concepts.	1 to 5	1,2,3
CO2	Implement suitable classification technique for intelligent applications	1 to 5	1,2,3
CO3	Implement clustering algorithms for intelligent applications	1 to 5	1,2,3
CO4	Implement machine learning algorithms for intelligent applications	1 to 5	1,2,3
CO5	Learn new tools and technologies related to machine learning and apply for suitable application development.	10,12	2,3
CO6	Develop solutions using machine learning based algorithms for the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	11,12	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1						√
CO2			√			√
CO3				√		√
CO4				√	√	√
CO5		√		√		
CO6				√	√	

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2	1								3	3	3
CO2	3	2	3	1	2								3	3	3
CO3	3	1	2	1	2								3	3	3
CO4	3	2	2	2	2								3	3	3
CO5										2		3		2	2
CO6											3	3		3	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT

LAB:

1	**Decision Tree Classifier** Implement and demonstrate a Decision Tree Classifier to classify the instances of dataset. Display the classification results. Also, try the same algorithm to classify the instances for any given medical diagnosis dataset.
2	**Feature extraction using Principal Component Analysis (PCA)** Implement and demonstrate the Principal Component Analysis algorithm for dimensionality reduction for any dataset.
3	**K nearest neighbour (KNN)** Implement and demonstrate the k-Nearest Neighbour algorithm (k-NN) to classify the iris data set. Display the Confusion matrix and classification report. Also, try the same algorithm of the social networks dataset to predict a customer can purchase an item or not.
4	**Support Vector Machine (SVM)** Implement and demonstrate a Support vector machine classifier to classify the instances of any dataset. Display the classification results. Also, try the same algorithm to classify the instances for any given dataset
5	Short Title: **Regression** Implement and demonstrate linear regression and logistic regression algorithms for any given dataset(s). Visualize the results using graphs. (Salary prediction, Price Prediction)
6	**Random Forest (RF)** Implement and demonstrate a Random Forest classifier to classify the instances of dataset. Display the classification results. Also, try the same algorithm to classify the instances for any given dataset
7	**K-Means Clustering** Implement and demonstrate the k-means clustering algorithms. Visualize the results using graphs.
8	**Hierarchical clustering** Implement and demonstrate the hierarchical clustering algorithms. Visualize the results using graphs.
9	**DBSCAN clustering** Implement and demonstrate the hierarchical clustering algorithms. Visualize the results using graphs.
10	Short Title: **Artificial Neural Networks (ANN)** Implement and demonstrate the two hidden layer multilayer perceptron neural network to any given dataset for classification. Apply two different optimizers or activation functions and compare the results.

TEXT BOOKS:

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

Websites:

   1. https://www.tutorialspoint.com/machine_learning_with_python/index.htm

   2. https://www.tutorialspoint.com/artificial_neural_network/index.htm

RECOMMENDED LEARNING RESOURCES (REFERENCE BOOKS):

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", 2nd edition, springer series in statistics.

2. Ethem Alpaydın, "Introduction to machine learning", second edition, MIT press.

JOURNALS/MAGAZINES:

1. Springer Journal of Machine Learning.

2. International Journal of Machine Learning and Computing.

SWAYAM/NPTEL/MOOCs:

1. Coursera – Machine Learning

2. Coursera – Deep Learning

3. https://onlinecourses.nptel.ac.in/noc19_cs53/preview

SELF-LEARNING EXERCISES:

Reinforcement Learning: Introduction, Learning Task, Q Learning

Course Title	Technical Documentation				Course Type		Theory	
Course Code	B20CI0503	Credits	1		Class		V semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/Semester		Assessment in Weightage	
	Theory	1	1	1				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	1	1	13	0	50%	50%

COURSE OVERVIEW:
The goal of this course is to prepare engineering students with the individual and collaborative technical writing, presentation, and research skills necessary to be effective technical communicators in academic and professional environments

COURSE OBJECTIVE (S):
The objectives of this course are:

1. Understanding the characteristics of technical writing and the importance of purpose, audience, and genre for written communication in technical fields.
2. Planning, drafting, revising, editing, and critiquing technical and professional documents through individual and collaborative writing.
3. Writing effective technical documents that are grammatically and stylistically correct.

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 (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Describe the characteristics of technical writing and	1 to4,8,9,12	1
CO2	Develop professional documents through individual	1to3,5,9,12	1
CO3	Write effective technical documents that are grammatically and Stylistically correct	1 to5,9,12	2
CO4	Writing effective paper for conference or journal publication	1,4,5,9,12	1
CO5	Understand the current resources for locating secondary information, and also understand the strategies of effective primary data gathering.	1to3,5,9,12	2
CO6	Explore different format features in both print, multimedia and html documents, and develop document design skills	1 to5,9,12	2

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1			√			
CO2			√			
CO3			√	√		
CO4						√
CO5		√				
CO6					√	

COURSE ARTICULATION MATRIX

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	2				1	1			1

CO											
CO2	3	2	3		2				1		1
CO3	3	1	2	1	2				1		1
CO4	3			2	2				1		1
CO-5	3	2	3		2				1		1
CO6	3	1	2	1	2				1		1

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
-UNIT-1
Introduction Technical Reports: Importance of Reports, Objectives of Reports , characteristics of a Report , Categories of Reports, Informative Reports , Analytical Reports , Periodic and Special Reports , Oral and Written Reports , Long and Short Reports , Formal and Informal Reports , Individual and Group Reports , Formats , Prewriting , Purpose and Scope , Audience, Sources of Information , Organizing the Material , Interpreting Information , Making an Outline , Structure of Reports (Manuscript Format), Prefatory Parts , Main Text , Supplementary Parts , Types of Reports , Writing the Report , First Draft , Revising, Editing, and Proofreading.   **Technical Proposals:** Introduction, Definition and Purpose, Types, Characteristics, Structure of Proposals, Prefatory Parts, Body of the Proposal, Supplementary Parts, Style and Appearance, Evaluation of Proposals.   **Research Papers and Technical Descriptions**: Introduction, Research Paper, Characteristics, Components, Technical Description, Guidelines for Writing Good Descriptions, Checklist.

TEXTBOOKS:

1. Meenaxi Raman and Sangeetha Sharma, "TechnicialCommunication", Oxford University press, 2015.
2. C. R. Kothari, Research Methodology Methods and Techniques, 2nd. ed. New Delhi: New Age International Publishers, 2009.
3. R. Panneerselvam, Research Methodology, New Delhi: PHI, 2005.

4. P. Oliver, Writing Your Thesis,New Delhi:Vistaar Publications, 2004.
5. F. Mittelbach and M. Goossens,The LATEX Companion, 2nd. ed. Addison Wesley, 2004.

Course Title	Software Testing			Course Type		Theory	
Course Code	B20EJ0503	Credits	2	Class		V semester	
-	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
Course Structure	Theory	1	1	1				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	2	3	3	13	26	50%	50%

COURSE OVERVIEW:

This course examines fundamental software testing and related program analysis techniques. In particular, the important phases of testing will be reviewed, emphasizing the significance of each phase when testing different types of software. The course will also include concepts such as test case generation, test coverage, regression testing, program analysis (e.g., program-flow and data-flow analysis), and test prioritization

COURSE OBJECTIVE (S):

1. Discuss fundamental concepts in software testing.

2. Illustrate the use of different software testing methods.

3. Demonstrate the use of Selenium IDE to develop applications.

4. Discuss the use of locators in developing real world applications.

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the fundamental concepts in software testing.	1 to5,9,10	1
CO2	Analyze the performance of testing methods on the given real world applications.	1 to5	1
CO3-	Develop an application using Software Testing IDE.	1to5,10,12	2,3
CO4	Make use of locators in developing real world applications.	1 to5	1
CO5	Develop Big Data Solutions using Hadoop Eco System	1 to5,9,12	1
CO6	Analyze Info sphere Big Insights Big Data Recommendations	1 to5,9,12	2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1-		√				
CO2				√		√
CO3			√			√
CO4			√			
CO5						√
CO6				√		

COURSE ARTICULATION MATRIX:

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1				1	1			3		
CO2	3	3	2	2	1								3		
CO3	3	2	2	1	1					1		1	3	3	
CO4	3	3	3	3	3	1							3		
CO5	3	3	3	3	3				2			3	3		
CO6	3	3	3	3	3				1			3		3	

-

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
-Introduction: Software Testing Principles Need for testing, Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing, **Examples:** Generalized pseudocode, The triangle problem, The NextDate function, The commission problem. Introduction to Automated testing tools (open source and commercial)
UNIT-2
FunctionalTesting: Boundary value analysis, Robustness testing, Equivalence Class Testing, Decision table method, **Examples:** The triangleproblem,   **Structural Testing:** Path Testing: DD-Paths, Test Coverage Metrics, Basis path Testing; Dataflow Testing: define/Use Testing, Slice Based Testing
UNIT-3
Getting Started with Selenium IDE: Important preliminary points, What is Selenium IDE, installing Selenium IDE, Selenium IDE, Rules for automation, Recording your first test with Selenium IDE Updating a test to assert items are on the page, updating a test to verify items on the page adding Selenium IDE comments, Multiplying windows, Working with multiple windows.
UNIT-4
Locators: Locating elements by ID, Finding IDs of elements on the page with Fire bug, finding elements by ID, moving elements on the page, finding elements by name, Adding filters to the name, finding elements by link text. Overview of Selenium Web Driver, History of Selenium Architecture, Web Driver API, Web DriverSPI.

PRACTICE:

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability
1.	Write programs in "C" language to demonstrate the working of the following: a.Constructs: i) do…while ii) while….do iii) if…else iv) switch v) for	C	Generate Test case with input, Expected output, Actual Output and remarks.
2.	A program written in "C" language for Matrix Multiplication fails or Introspect the causes for its failure and write down the possible reasons for its failure.	C	Generate Test case with input, Expected output, Actual Output and remarks.
3.	Take any system (e.g. ATM System) and study its system specifications and report the various bugs	C	Generate Test case with input, Expected output, Actual Output and remarks.
-4.	Take any system (e.g. ATM System) and study its system specifications and report the various bugs.	Word	Generate Test case with input, Expected output, Actual Output and remarks.
5.	Create a test plan document for any application (eg. Library Management System)	Word	Generate Test case with input, Expected output, Actual Output and remarks.
6.	Study of any testing tool (eg., Win runner)	Win runner	Generate Test case with input, Expected output, Actual Output and remarks.
7.	Study of any web testing tool(eg., Selenium)	Selenium	Generate Test case with input, Expected output, Actual Output and remarks.
-8.	Study of any bug tracking tool (eg., Bugzilla, bugbit)	Bugzilla, bugbit	Generate Test case with input, Expected output, Actual Output and remarks.
9.	Study of any test management tool (eg., Test Director)	Test Director	Generate Test case with input, Expected output, Actual Output and remarks.
10.	Study of any open source-testing tool(eg., Test Link)	Test Link	Generate Test case with input, Expected output, Actual Output and remarks.

TEXT BOOKS:
1. P.C. Jorgensen, "Software Testing aCraftman's Approach", CRC Press, Auerbach Publications2013.
2. David Burns, Selenium 2 Testing Tools Beginner's Guide.

REFERENCE BOOKS:
1. Glenford J. Myers, "The Art of Software Testing", John Wiley & Sons 1979
2. Boris Beizer, "Black-Box Testing: Techniques for Functional Testing of Software and Systems", John Wiley & Sons 1995.
3. William E. Perry," Effective Methods for Software Testing (2nd Edition)", JohnWiley& Sons 2000

JOURNALS/MAGAZINES:

1   Journal of Software Engineering and Research Engineering, 2013.
2   International Journal of Software Engineering, Technology and Applications, 2013.

SWAYAM/NPTEL/MOOCS:

1.   https://www.nptel.ac.in/courses/106/101/106101163

2.   https://www.coursera.org/courses?query=software testing

SELF-LEARNING EXERCISES:

Automated   Testing   tools: QTP   tools,   Lab   View   etc,   ATLM.
-

Detailed Syllabus

Semester 6

Course Title	Information and Network Security			Course Type		Theory	
Course Code	B20EJ0601	Credits	3	Class		VI semester	
Course Structure	TLP	Credits	-Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

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 (S):

 The 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)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Summarize the security planning, standards and practices in Intrusion Detection Systems	1 -5,7-12	1
CO2	Make use of the different cryptographic algorithms for encryption and description of given data.	1 -12	2
CO3	Compare the various performance of protocols used for authentication.	1 -12	2,3
CO4	Identify the suitable firewalls and- IDPS for solving real world network problems	1 -12	1,2,3
CO5	Relate different firewalls available for more security	1 – 12	2,3
CO6	Identify different auditing tools for intrusion management system.	1 -10,12	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO #	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			-√			
CO2			√			
CO3			√			
CO4			√			
CO5			√	√		
CO5			√	√		
CO6		√				

COURSE ARTICULATION MATRIX:

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1	0	2	3	2	1	2	1	3	0	0
CO2	3	2	3	1	2	1	3	2	1	3	2	0	0	3	0
CO3	3	1	2	2	3	2	3	2	2	3	3	1	0	3	3
CO4	2	2	2	1	1	2	3	2	3	2	3	2	3	3	3
CO5	2	2	3	3	2	3	3	3	2	3	2	3	2	3	3
CO6	2	2	1	3	3	3	3	3	3	2	0	2	0	3	3

Note:1-Low,2-Medium,3-High-

COURSE CONTENT
Theory:

Contents
UNIT-1
Planning for Security: Introduction; Information Security Policy, Standards, and Practices; The Information Security Blueprint; 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, ADES Example, Block Cipher Design Principles, Advanced Encryption Standard. Public-Key Crypto systems, 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, Handshake Protocol, Cryptographic Computations.
UNIT-4
Firewalls: Introduction, Identification, Authentication, Authorization, Accountability, Firewall processing modes, Firewalls categorized by generation, Firewalls categorized by structure, Firewall 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 PChacking, wireless hack walk through

TEXT BOOKS:
1. William Stallings, Cryptography and Network Security, Pearson Publications, 6th edition,20l4.
2. M. E. Whitman and Herbert J. Mattered, Principles of Information Security, Information Security Professional, 4th edition, 20l4.

REFERENCE BOOKS:
1. Behrouz A. Forouzan, Cryptography and Network Security, Tata McGraw-Hill, 2007.
2. Joseph Migga Kizza, Guide to Computer Security, Springer Science & Media Inc., 3rd edition,20l5

JOURNALS/MAGAZINES:
1. Springer Journal of Cryptographic Engineering, ISSN2l90-8508 https://www.springer.com/journal/13389
2. ACM- International Journal of Applied Cryptography, ISSN:753-0563 https://dl.acm.org/citation.cfm?id=J1105
3. IEEE Transactions on Information Forensics and Security, https://ieeexplore.iee-e.org/xpl/aboutJournal.jsp?punumber=10206
4. Elsevier, Journal of Information Security and Applications, https://www.journals.elsevier.com/journal-of-information-security-and-applications

SWAYAM/NPTEL/MOOCs:
2. https://www.coursera.org/learn/crypto
3. https://nptel.ac.in/courses/106/105/106105031/

Course Title	CLOUD COMPUTING			Course Type		Theory	
Course Code	B20EJ0602	Credits	3	Class		VI semester	
Course Struct-ure	TLP	Credits	Contact Hours	Work Load	13 weeks / Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-				
	Tutorial	-	-	-	Theory	Practical	CIE	SEE
	Total	3	3	3	39	-	50%	50%

COURSE OVERVIEW:
The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large scale distributed systems which form the cloud infrastructure.

COURSE OBJECTIVE
1. Introduce cloud computing and provide knowledge in different layers of cloud computing such as: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS)
2. Describe various cloud computing technologies like data center technology, virtualization technology, web technology, multitenant technology; service technology

3. Explain Virtualization technologies: Hypervisor, emulation, and application VM, Platform virtualization, storage virtualization, and network virtualization.
4. Provide knowledge about cloud security and threats

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Explain the cloud computing concepts such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS)	1-5	2
CO2	Use various cloud computing technologies like data center technology, virtualization technology, web technology, multitenant technology; service technology	1-5	3
CO3	Apply Virtualization technologies: Hypervisor, emulation, and application VM, Platform virtualization, storage virtualization, and network virtualization in developing cloud applications.	1-5,10	1,3
CO4	Analyze cloud security and threats for new problems in hand and develop and provide security services for cloud based applications	1-5, 10,11	2,3
CO5	Learn new tools and technologies in Virtualization and cloud computing concepts and apply for suitable solutions for application development.	12	2,3
CO6	Develop solutions in Virtualization and cloud computing concepts to solve the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	5,9,10	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1-	√	√				
CO2			√	√		
CO3			√	√		
CO4				√	√	√
CO5		√		√		
CO6			√	√		√

COURSE ARTICULATION MATRIX

CO#/	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

	1	2	3	4	5	6	7	8	9	10	11	12	13
CO1	1	2	3	2	1				2			3	
CO2	2	2	2	3	2				3				3
CO3	2	3	3	3	3				2		3		3
CO4	2	2	3	3	2				2	1		3	3
CO5											2	3	
CO6	2					2		2	2			3	

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT
THEORY

-Contents
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, Cloud Deployment Models.
UNIT-2
Cloud Computing 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 Environment: Automated Scaling Listener, Load Balancer, SLA Monitor, Pay-per-use monitor, Audit Monitor, Failover System, Hypervisor, Resource cluster, Multi-device Broker, State Management **Cloud Management Mechanisms:** Remote Adm-inistration System, Resource Management System, SLA Management System, Billing Management System.
UNIT-4
Virtualization: Implementation levels of virtualization, virtualization structures/tools and mechanisms, virtualization of CPU, memory and I/O devices.

TEXT BOOKS:

1. Thomas Erl , Ricardo Puttini , Zaigham Mahmood Cloud Computing: Concepts, Technology & Architecture PHI, 2013.
2. Kai Hwang, Geoffrey C. Fox, Jack J Dongarra, Distributed and Cloud Computing, MK, 2012.

REFERENCE BOOKS:

1. Dan C. Marinescu, Cloud Computing: Theory and Practice, MK
2. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.

3. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing- Principles and Pradigms,Wiley.
4. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Cloud Computing, A practical approach, TATA - McGRAW HILL.
5. Gautam Shroff, Enterprise Cloud Computing- Technology, Architecture, Applications, CAMBRIDGE.
6. David Marshall, Wade A. Reynolds and Dave McCrory, Advanced Server Virtualization-VMware and Microsoft Platforms in the Virtual Data Center, AUERBACH Publications.

JOURNALS/MAGAZINES:

1. International Journal of Cloud Computing, INDERSCIENCE Publishers.
2. IEEE Cloud Computing
3. International Journal of Cloud Applications and Computing (IJCAC), IGI Global.

SWAYAM/NPTEL/MOOCS:

1. https://onlinecourses.nptel.ac.in/noc21_cs15/preview

2. https://onlinecourses.nptel.ac.in/noc21_cs14/preview

3. https://www.classcentral.com/course/swayam-cloud-computing-and-distributed-systems-17544

SELF LEARNING EXERCISES:

1. https://www.cybrary.it/course/virtualization-management/

2. http://cds.iisc.ac.in/faculty/simmhan/SE252/

3. https://data-flair.training/blogs/hardware-virtualization-in-cloud-computing/

Course Title	Information Retrieval Systems(PE-II)				Course Type		Theory	
Course Code	B20EJS601	Credits	3		Class		VI semester	
-	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
Course Structure	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

Information retrieval is the process through which a computer system can respond to a user's query for text-based information on a specific topic. IR was one of the first and remains one of the most important problems in the domain of natural language processing (NLP). Web search is the application of information retrieval techniques to the largest corpus of text anywhere -- the web -- and it is the area in which most people interact with IR systems most frequently.

COURSE OBJECTIVE (S):
The objectives of this course are to:

1. Describe the basic concepts of the information retrieval and its models.
2. Illustrate the use of query languages and its operations in real world applications
3. Demonstrate the use of user interfaces and visualization for search process
4. Explain the multimedia IR models, Indexing and searching the web concepts.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Outline basic concepts of the information retrieval.	1 to5	2
CO2-	Apply appropriate Query technique on given real world applications	1 to5	2
CO3	Develop user interfaces and visualization for search process to address research issues.	1 to5	2
CO4	Identify appropriate indexing and searching method for Feature Extraction.	1 to5	2
CO5	Demonstratetheuseofuserinterfacesandvisualizationforsearchprcess	1 to5	2
CO6	Explain the multimedia IR models, Indexing and searching the web concepts	1 to5	2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

- CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√				
CO2			√			
CO3						√
CO4				√	√	
CO5		√		√		
CO6		√				

COURSE ARTICULATION MATRIX:

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1	3	2	2	1	1										3
CO2	2	3	2	1	2										3
CO3	2	2	2	2	1										3
CO4	2	2	3	1	2										3
CO5	2	3	2	1	2										3
CO6	2	2	2	2	1										3

-Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1   **INTRODUCTION TO INFORMATION RETRIEVAL AND MODELING**   **Introduction:** Basic Concepts, The Retrieval Process. Modelling: Introduction, classic Information Retrieval, Alternative set Theoretic Models, Alternative Algebraic Models, Alternative Probabilistic Models, Structured Text Retrieval Models, Models for browsing, Trends and research Issues.
UNIT-2   **QUERY LANGUAGES AND QUERY OPERATIONS**   **Query languages:** Introduction, keyword querying, Pattern Matching, Structural Queries, Query Protocols, Trends, and research issues. Query Operations: Introduction, User Relevance Feedback, Automatic Local Analysis, Automatic Global Analysis, Trend and Research Issue.   **Text Operations:** Document Preprocessing, Document Clustering, Text Compression, Comparing Text - compression Techniques. Indexing and Searching: Inverted files, Boolean Queries, Sequential Searching, Pattern Matching, Structural Queries, Compression.
UNIT-3   **USER INTERFACES AND VISUALIZATION**   Human-computer Interaction, The information Access Process, Starting points, Query specification, context, using Relevance judgments, interface support for the search process, trends and research issues
UNIT-4   **MULTIMEDIA IR**   Data Modelling, Query languages, Trends and research issues. Indexing and searching: A generic Multimedia indexing Approach, One-dimensional Time series, Two-dimensional color images, Automatic Feature Extraction.   **Searching the web:** Challenges, Characterizing the web, Search engines, Browsing, Meta searchers, Finding the needle in the Haystack, Searching using Hyperlinks.

TEXT BOOKS:

1. Ricardo Baeza -Yates and Berthier Ribeiro - Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011.

2. William B.Frakes,Ricardo Baeza-Yates "Information Retrieval: Data Structures and Algorithms" Fifth edition, Pearson,2012.

REFERENCE BOOKS:

1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval, Cambridge University Press, 2008.

2. Ophir Frieder "Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series ", 2nd Edition, Springer, 2004.

JOURNALS/MAGAZINES

1. Springer Journal on Information Retrieval (https://link.springer.com/journal/10791)

SWAYAM/NPTEL/MOOCs:

https://www.nptel.ac.in/courses/106/101/106101007

SELF LEARNING EXERCISES:

Introduction about Text and Multimedia languages and properties, Meta data, text, Markup Languages, Multimedia

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Course Title	Management Information Systems(PE-II)				Course Type		Theory	
Course Code	B20EJS602	Credits	3		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

This course contains the details of Information system; here we learn the history and the nature of the Information system, this course provides a basic treatment of all of the important aspects of Information system, we will be covering the questions Why Information system is important? What is Information system? The Advantages and Disadvantages of Information system, Business applications, Need of Electronic Business and commerce, System Security for Electronic commerce (e-banking, e-shopping, e-cards, e-business, etc). The major areas like DSS, CRM, OLAP, ERP,ECS MIS, HRM SCM Strategies and policies to stay in market, to develop the business, Purpose and need to study the subject is to know the real use of Information system in business challenges.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Explain the Role of information management systems in business.

2. Discuss the role of the major types of information systems in a business environment.

3. Demonstrate the use of ERP concepts in the real-world applications.

4. Illustrate the working of Supply chain management in real world applications.

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the role of information technology and information systems in business.	1to5,11,12	2
CO2	Choose the major types of information systems for a given business environment.	1to5,11,12	2
CO3	Make use of ERP concepts to simplify the information management system in the real-world applications.	1to5,11,12	2
CO4	Apply the Supply chain management and AI for the given real world applications.	1to5,11,12	2
CO5	provide the theoretical models used in database management systems to answer business questions	1to5,11,12	2
CO6	describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems	1to5,11,12	2

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√				
CO2				√	√	
CO3				√		√
CO4			√			
CO5			√			√
CO6		√				

COURSE ARTICULATION MATRIX:

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1	2	2	1	1	1					1	1	3	
CO2	2	2	1	1	1					1	1	3	
CO3	2	2	1	1	1					1	1	3	
CO4	2	2	1	1	1					1	1	3	
CO5	2	2	1	1	1					1	1	3	
CO6	2	2	1	1	1					1	1	3	

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Information Systems in Business: Introduction, The real world of Information Systems, The fundamental role of IS in business, Trends in IS, Managerial challenges of IT. System Concepts: A foundation, Components of an Information System, Information System Resources, Information System activities, Recognizing Information Systems. Fundamentals of strategic advantages: Strategic IT, Competitive strategy concepts, The competitive advantage of IT, Strategic uses of IT, Building a customer-focused business, The value chain and strategic IS, Reengineering business processes, Becoming an agile company Creating a virtual company, Building a knowledge creating company
UNIT-2
Enterprise Business Systems: Introduction, Cross-functional enterprise applications, Enterprise application integration, Transaction processing systems. Functional Business Systems: Introduction, Marketing systems, Human resource systems, financial management systems. Customer relationship management: Introduction, What is CRM? The three phases of CRM, Benefits and challenges of CRM, Trends in CRM
UNIT-3
Enterprise resource planning: Introduction, What is ERP? Benefits and challenges of ERP, Trends in ERP. Electronic commerce fundamentals: Introduction, The scope of ecommerce, Essential commerce, processes, Electronic payment processes. e-Commerce applications and issues: Ecommerce application trends, Business-to- Consumer e-commerce, Web store requirements, Business-to- Business e-commerce, e-commerce marketplaces, Clicks and bricks in ecommerce
UNIT-4
Supply chain Management: Introduction, What is SCM? The role of SCM, Benefits and challenges of SCM, Trends in SCM. Decision support in business: Introduction, Decision support trends, Decision Support Systems (DSS), Management Information Systems, Online analytical processing, Using DSS, Executive information systems, Enterprise portals and decision support, Knowledge management systems, Business and Artificial Intelligence (AI), An overview of AI, Expert systems.

TEXT BOOKS:
1. James A. O'Brien, George M Marakas, Management Information Systems, 7th Edition, TataMcGrawHill.2005. Chapter:
1, 2, 7, 8 ,9 ,13

REFERENCE BOOKS:

1. Kenneth C. Laudon and Jane P.Laudon, Management Information System, Managing the Digital Firm, 9th Edition,

2. Pearson Education,2006.
3. Steven Alter, Information Systems the Foundation of E-Business, 4th Edition, Pearson Education,2002.

J-OURNALS/MAGAZINES:

1 International Journal of Information Management: https://www.journals.elsevier.com/international-journal-of-information-management
2. International Journal of Information Systems and Management:

SWAYAM/NPTEL/MOOCS:

1. https://www.mooc-list.com/course/management-information-systems-saylororg
2. https://onlinecourses.nptel.ac.in/noc20_mg60/preview

Course Title	UI/UX Design(PE-II)				Course Type		Theory	
Course Code	B20EJS603	Credits	3		Class		VI semester	
-	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
Course Structure	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

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.

COURSE OBJECTIVE (S):

The objectives of this course are to:
1. Explain user interface design process for a given problem
2. Illustrate the selection of design; 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):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the new technologies to design user interfaces for the given real-world application.	1to5,6,7,12	2
CO2	Make use of the UI/UX design process to develop the given real-world application.	1to5,12	2
CO3	Develop applications using various Interaction styles including Direct Manipulation and Virtual Environment.	1to5,12	1
CO4-	Design web and mobile UI/UX based application using structure plane.	1to5,12	2
CO5	Describe the assumptions and prototype potential design solutions.	1to5,12	2
CO6	Discuss the issues and challenges to achieving a human-centered design process, especially with regard to user experience design	1to5,12	1

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

-	Bloom's Level					
CO#	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√				
CO2			√			
CO3						√
CO4				√		√
CO5		√				
CO6				√		

COURSE ARTICULATION MATRIX:

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	1	1					2		3	
CO2	3	2	2	2	1							1		3	
CO3	3	3	2	2	1							2	3		
CO4	3	3	2	2	1							2		3	
C-O5	3	3	2	2	1							2	3		
CO6	3	3	2	2	1							2		3	

Note:1-Low,2-Medium,3-High

COURSE CONTENT
TH-EORY

Contents
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 and Refinement; 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 Surface

Plane; UI/UXDesigningfortheDesktop,Mobileandotherdevices.UI/UXDesigningfortheweb.

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.

JOU-RNALS/MAGAZINES:

1. ACM, International Journal of Human-Computer Studies.
2. IEEE, Transactions on Human-Machine Systems.
3. Elsevier, International Journal of Human-Computer Studies.

SELF LEARNING EXERCISES:

Implementation of Common sight patterns in the Interaction design, Prediction of User expectations, Choosing and using the best UI patterns.

Course Title	Block Chain Technology (PE-II)				Course Type		Theory	
Course Code	B20EJS604	Credits	3		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

Block chain is the distributed and decentralized database technology behind this crypto currency. This course explores the fundamentals of the public, transparent, secure, immutable and distributed database called block chain. Block chains can be used to record and transfer any digital asset not just currency. This course will introduce students to the workings and applications of this potentially disruptive technology. Its potential impact on financial services, government, banking, contracting and identity management.

COURSE OBJECTIVE (S):

1. Describe the basic concepts of Cryptography and Block chain technology.
2. Explain the features of the block chain technology, decentralised applications and smart contract.
3. Demonstrate building of decentralised applications by deploying Smart Contracts
4. Analyse different Block chain Platforms that can be used in real world applications.

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the concepts of block chain technology suitable for given real world applications	1-9	1
C-O2	Compare the performance of POW and POS mining consensus algorithm with respect to given real world application.	1-11	2
CO3	Build a decentralised application by implementing smart contract using solidity programming language.	1-10	2
CO4	Apply various block chain platforms for solving real world problems.	1-12	2
CO5	Analysis new Block Chain technologies for real world problem	1-11	3
CO6	Prepare the security algorithm for securing block chains	1-12	3

BLOOM'S LEVELOF THECOURSE OUTCOMES:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√					
CO2		√		√		
CO3		√				
CO4			√			
CO5				√	√	
CO6			√	√		√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	3	2	3	2	0	0	0	3	0	0

CO2	3	3	2	3	2	3	2	3	2	3	3	0	0	3	0
CO3	2	3	3	2	2	3	3	3	3	2	0	0	0	3	0
CO4	2	3	3	2	2	2	2	3	2	3	3	2	0	0	3
-CO5	3	3	2	3	3	3	2	3	3	2	3	0	0	0	3
CO6	3	2	3	2	3	2	3	2	3	1	3	3	0	0	3

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT:
THEORY:

TEXT BOOKS:

Contents
UNIT-1
Introduction to Cryptography and Block chain: Introduction to cryptography-Symmetric- key cryptography, Public-key cryptography, Digital Signatures and Elliptic Curve Cryptography.   **Introduction to Block chain:** Types of Block chain, Structure of a Block, Block Header, Block Header Hash and Block Height, Genesis Block, Linking Blocks in the Block chain, Merkle Trees, Constructing the Block Header.   **Mining and Consensus:** The Byzantine general's Problem, Consensus mechanism-proof of work & proof of stake, Bit coin mining and Block chain Forks
UNIT-2
Overview of Ethereum: What Is Ethereum? Compared to Bitcoin, Ethereum: A General-Purpose Block chain, Ethereum Accounts (Externally Owned Accounts and Contracts), Ethereum and Turing Completeness, Decentralized Applications, Decentralized Autonomous Organizations, Smart Contract Introduction, Life Cycle of a Smart Contract.
UNIT-3
Dapp development on Ethereum: Programming Solidity: Structure, Basic Data Types & Statements, Specific Data Types, Data Structures, Memory vs Storage, Access Modifiers, Contract Definition, Functions, Contract Constructor, The Ethereum Contract ABI, Events, Run Ethereum Dapps, Develop a simple smart contract.
UNIT-4
Enterprise Block chains and Applications: Enterprise Block chains: Hyper ledger, R3 Corda, Quorum Block chain Applications: Identity management, Auction, Food industry supply chain and Block chain in Health care.

1. Joseph J. Bambara Paul R. Allen," Block chain, A Practical Guide to Developing Business, Law, and Technology Solutions", McGraw-Hill Education Professional, Second edition, 2018.
2. Melanie Swan "Block chain: Blueprint for a New Economy", O'Reilly Media, Third edition, Aug 2015.
3. Andreas M. Antonopoulos, Gavin Wood "Mastering Ethereum", O'Reilly Media, Inc.,November 2018.
4. Joseph Holbrook "Architecting Enterprise Block chain Solutions", Sybex, February 2020.

REFERENCE BOOKS:
1. Imran Bashir, "Mastering Block chain: Distributed ledger technology, decentralization, and smart contracts "Packt , 2nd edition 2018.

2. Jimmy Cooper, "Block chain Blueprint: Guide to Everything You Need to Know About Block chain Technology and How It Is Creating a Revolution ",Create Space Independent Publishing Platform, 2017.

JOURNALS/MAGAZINES:

1. Deepak Puthal, Nisha Malik, Saraju P Mohanty, Elias Kougianos, Chi Yang, "The Blockchain as a Decentralized Security Framework [Future Directions]" Volume 7, Issue 2, Pages 18 – 21, 2018.
2. Valentina Gatteschi, Fabrizio Lamberti, Claudio Demartini, Chiara Pranteda, Víctor Santamaría," To Blockchain or Not to Blockchain: That Is the Question ", Volume 20, Issue 2 Pages 62 - 74, 2018.
3. Tien Tuan Anh Dinh, Rui Liu, Meihui Zhang, Gang Chen, Beng Chin Ooi, Ji Wang "Untangling Blockchain: A Data Processing View of Blockchain Systems", Volume 30, Issue 7, Pages 1366 – 1385, 2018.
4. Mingjun Dai, Shengli Zhang, Hui Wang, Shi Jin, "A Low Storage Room Requirement Framework -for Distributed Ledger in Blockchain", Volume 6, Pages 22970 – 22975, 2018.

SWAYAM/NPTEL/MOOCs:

1. https://nptel.ac.in/courses/106/104/106104220/
2. https://www.coursera.org/specializations/blockchain

SELF-LEARNINGEXERCISES:

Distributed Ledger in Blockchain, Decentralized Applications.

Course Title	Modern Computing (PE-II)				Course Type		Theory	
Course Code	B20EJS605	Credits	3		Class		VI semester	
-	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
Course Structure	Practice	-	-	-				
	Tutorial	-	-	-	Theory	Practical	CIE	SEE
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW

Understanding of Nano computing and nano elctronics, learn the knowledge of Molecular computing and its advancements. Understanding of Quantum computing and its advancements, Understanding the concepts of soft computing.

COURSE OBJECTIVE (S):

1. Acquire knowledge on nano electronics and its importance.
2. Introduce the concept of molecular computing
3. Learn basics and advancements of quantum computing

4. Understand the architecture of processing in nano systems
5. Gain knowledge on soft computing and neural networks

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply the basic concepts in nano computing	1,3,4,5,8,9,10,12	1,2
CO2	Explain major advances in molecular computing	1,4,6,7,8,9,10,12	1
CO3	Recognize the evolution of molecular computing	1,3,4,5,6,7,9,10,11,12	2
CO4	Utilize the knowledge in quantum computing	2,3,6,7,8,9,10,11,12	1,3
CO5	Get familiarized with designing of parallel information processing machines	1,3,4,5,8,9,11,12	1,2
CO6-	Apprehend the importance of soft computing	1,4,5,5,8,9,10,12	1,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1-		√		√		
CO2	√		√	√		
CO3		√				
CO4		√	√	√	√	√
CO5				√		
CO6						√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	2	2	3	3	3	2	3	3	3	3
CO2	3	2	2	3	2	2	2	3	2	3	2	3	2	2	2
CO3	3	2	3	3	3	3	3	2	3	3	3	3	3	3	3

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CO4	2	3	3	2	3	3	3	3	3	3	2	3	3	3	3
CO5	3	2	3	3	3	2	2	3	2	3	2	3	3	3	3
CO6	3	2	2	3	3	2	2	3	3	3	2	3	3	2	3

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT

THEORY:

UNIT – 1
History of computing, Nano computing, Transistors inside the Machine, Quantum computers, Nano computing technologies, From Microelectronics to Nano electronics, rom Nano electronics to Nano electronics computers, Alter-native to Transistor technology – quantum computing,

UNIT – 2
Molecular computing, Brief background of molecular electronics, Origin of molecular computing, Molecular computing architecture, Some techniques of molecular computing Adleman"s landmark experiment, Challenges of molecular computing Reliability, Efficiency and Scalability.

UNIT – 3
Quantum computers-Bit and Qubit, Coherence and entanglement, Quantum parallelisms, Classical gates, Quantum algorithms-Necessity of quantum software in Conjunction with the hardware, Hardware challenges to large Quantum Computers, Computing with QCA, QCA clocking, QCA design rules.

UNIT – 4
Soft computing, Methods of soft computing -Fuzzy systems, Evolutionary algorithms, Connectionist systems, Computational Intelligence systems, Characteristics of neural networks, Local processing, Self organization.

TEXT BO-OKS:

1. Vishal Sahni and Debabrata Goswami, "Nano computing: The Future of Computing", Tata McGraw-Hill Education, 2008

2. Karl Goser, Peter Glösekötter and Jan Dienstuhl, "Nano electronics and Nanosystems: From Transistors to Molecular and Quantum devices", Springer, 2005

REFERENCE BOOKS:

1. Nano computing: Computational Physics for Nanoscience and Nanotechnology Hardcover – 31 March 2009.
2. Molecular Computing and Bioinformatics, 2019 by the authors; CC BY-NC-ND licence
3. QUANTUM COMPUTING A Gentle Introduction Eleanor Rieffel and Wolfgang Polak

JOURNALS/MAGAZINES

1. https://link.springer.com/book/10.1007/978-3-319-05122-2, Molecular Computing

2. International journal of advanced nano computing and analytics
3. Applied soft computing, Elsevier.
4. Journal of Quantum Computing

SWAYAM/NPTEL/MOOCs:

1. Coursera – Quantum computing

1. Quantum computing

2. Nano computing

3. Soft computing

Course Title	Neural Networks & Deep Learning (PE-II)			Course Type		Theory	
Course Code	B20EJS606	Credits	3	Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

machine learning models by stacking them as computational graphs. This is different from conventional programming where human programmers define the set of tasks to be carried out by a computer to solve a problem. Deep learning is a subset of machine learning that uses many layers of neural networks to accomplish tasks like image recognition, text procession, speech recognition,

natural language processing etc. This course aims at giving the students the knowledge and the skills required to model the solutions to real world problems using neural networks and deep learning.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Explain the fundamentals of neural network based paradigm to problem solving.

2. Inculcate knowledge of concepts involved in training of neural networks.

3. Discuss the concepts and issues in deep neural networks.

4. Explain generalizability of deep neural networks and introduce prominent deep neural architectures.

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Explain the fundamental architecture of neural network and the concepts involved.	1 to5	1,2
CO2	Apply the shallow neural network models - Perceptron, Least-Squares Regression, Logistic Regression, Support Vector machines to solve real world binary and multiclass classification problems.	1 to5	1,2
CO3	Develop simple deep neural networks to solve problems in unsupervised learning.	1 to5	1,3
CO4	Create deep neural models like CNN and RNN to solve problems.	1 to5	1,3
CO5	Create knowledge of concepts involved in training of neural networks.	1 to5	1,2
CO6	Explain generalizability of deep neural networks and introduce prominent deep neural architecture	1 to5	1,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

	Bloom's Level					
CO#	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		√	√			

CO2			√	√		√
CO3			√	√		√
CO4			√	√	√	√
CO5						√
CO6		√				

COURSE ARTICULATION MATRIX:

CO#/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	2	1							2	1	
CO2	3	2	3	1	2							1	3	
CO3	3	1	2	1	2							2		3
CO4	3	2	2	2	2							1		3
CO5	3	2	3	1	2							1	3	
CO6	3	1	2	1	2							2		3

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Introduction to Neural Networks: The basic architecture of Neural Networks – Single computational layer – The Perceptron, What Objective Function Is the Perceptron Optimizing? , Relationship with Support Vector

Machines Choice of Activation and Loss Functions, Some Useful Derivatives of Activation Functions Choice and Number of Output Nodes multilayer neural network, The Multilayer Network as a Computational Graph, Training a Neural Network with Back propagation, Practical Issues in Neural Network Training -The Problem of Over fitting, The Vanishing and Exploding Gradient Problems

Common Neural Architectures - Simulating Basic Machine Learning with Shallow Models, Radial Basis Function Networks, Restricted Boltzmann Machines, Recurrent Neural Networks, Convolutional Neural Networks, Two Notable Benchmarks - The MNIST Database of Handwritten Digits, The Image Net Database

UNIT-2
Machine Learning with Shallow Neural Networks - Neural Architectures for Binary Classification - Revisiting the Perceptron, Least-Squares Regression, Logistic Regression, Support Vector machines, Neural Architectures for Multiclass Models - Multiclass Perceptron, Weston-Watkins SVM, Multinomial Logistic Regression (Soft max Classifier), Hierarchical Soft max for Many Classes, Auto encoder: Basic Principles, Nonlinear Activations, Deep Auto encoders, Application to Outlier Detection, When the Hidden Layer Is Broader than the Input Layer, Word2vec: An Application of Simple Neural Architectures, Simple Neural Architectures for Graph Embeddings

UNIT-3
Deep Neural Networks – Introduction, Back propagation – Back propagation with the Computational Graph Abstraction, Back propagation with Post-Activation Variables, Back propagation with Pre-activation Variables, Examples of Updates for Various Activations, Loss Functions on Multiple Output Nodes and Hidden Nodes, Setup and Initialization Issues - Tuning Hyper-parameters, Gradient-Descent Strategies- Learning Rate Decay, Momentum-Based Learning -Nesterov Momentum, Parameter-Specific Learning Rates –AdaGrad, RMSProp, Adam, Gradient Clipping, Second-Order Derivatives, Batch Normalization.

UNIT-4
Teaching Deep Learners to Generalize- The Bias-Variance Trade-Off, Generalization Issues in Model Tuning and Evaluation, Issues with Training at Scale, Penalty-Based Regularization - L1-Regularization, L1- or L2-Regularization, Penalizing Hidden Units: Learning Sparse Representations, Ensemble Methods- Bagging and Subsampling, Parametric Model Selection and Averaging, Randomized Connection Dropping, Dropout, Data Perturbation Ensembles, Early Stopping.
Prominent Deep Learning Models - **Restricted Boltzmann Machines** – The Boltzmann Machine, How a Boltzmann Machine Generates Data, Training the RBM, Recurrent **Neural Networks** - The Architecture of Recurrent Neural Networks, Long Short-Term Memory (LSTM), **Convolutional Neural Networks** - The Basic Structure of a Convolutional Network Training a Convolutional Network, **Deep Reinforcement Learning** - The Basic Framework of Reinforcement Learning

TEXT BOOK TEXT BOOKS:

1. Charu Aggarwal, "Neural Networks and Deep Learning", Springer, 2018.

2. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press, 2016

REFERENCE BOOKS:

1. Francis Chollet, "Deep Learning with Python", Manning, 2018.
2. Jacek M. Zurada, Introduction to Artificial Neural Systems, PWS Publishing Company, 1995.
3. Simon Haykin, Neural Networks: A Comprehensive Foundation, Macmillan College Publishing Company, 1994.
4. Mohamad H. Hassoun, Fundamentals of Artificial Neural Networks, The MIT Press, 1995.
5. Laurene Fausett, Fundamentals of Neural Networks: Architectures, Algorithms, and Applications, Prentice Hall International, Inc., 1994.
6. B. D. Ripley, Pattern Recognition and Neural Networks, Cambridge University Press. 1996.

JOURNALS/MAGAZINES:

1. IEEE Transactions on Neural Networks and Learning Systems
   https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5962385
2. IEEE Transactions on Pattern Analysis and Machine Intelligence
   https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=34http://ijaerd.com/papers/special_papers/IT032.pdf
3. International Journal of Intelligent Systems https://onlinelibrary.wiley.com/journal/1098111x
4. http://www.charuaggarwal.net/neural.htm
5. http://neuralnetworksanddeeplearning.com/
6. https://github.com/mnielsen/neural-networks-and-deep-learning
7. deeplearning.stanford.edu
8. http://yann.lecun.com/exdb/mnist/

SWAYAM/NPTEL/MOOCs:

1. Swayam Nptel – Deep Learning – IIT Ropar https://onlinecourses.nptel.ac.in/noc21_cs35/preview
2. Coursera – Neural Networks and Deep Learning Andrew Ng
3. Coursera - Neural Networks for Machine Learning by Geoffrey Hinton in Coursera

SELF-LEARNING EXERCISES:

1. Experiment with problems on Kaggle.com
2. Tweak the given solutions with changes to hyper-parameters

Course Title	Computer Vision and Applications (PE-III)				Course Type		Theory	
Course Code	B20EJS607	Credits	3		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

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 OBJECTIVE(S):

The objectives of this course are to:

1.Explain the fundamentals of Computer vision.

2. Discuss various segmentation techniques and their applications.

3. Demonstrate the use of techniques for registration and classification of images.

4. Describe the object detection and recognition process in a given application

COURSEOUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Utilize linear filters to enhance the quality of images in given real world application.	1 to 5	1
CO2	Apply segmentation techniques to solve real world problems.	1 to 5	2
CO3	Develop image transformation techniques for solving real world problems.	1 to 5	3
CO4	Make use of object detection and recognition techniques to computer vision applications	1 to 5	3
CO5	Illustrate different filtering technique for Image Restoration and Reconstruction.	1 to 5	1
CO6	Apply watermarking and image compression techniques in computer vision applications.	1 to 5	3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√			
CO4			√			
CO5		√				
CO6		√				

COURSE ARTICULATIONMATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2								3		

CO2	3	3	2	1	3									3	
CO3	3	3	3	2	2										3
CO4	3	3	3	1	1										3
CO5	3	2	3	2	3								3		
CO6	3	2	2	3	3										3

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT

Contents
UNIT-1
Introduction: What is Digital Image Processing?, The Origins of Digital Image Processing, Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.   **Digital Image Fundamentals:** Image Sampling and Quantization, Representing Digital Images, Spatial and Gray-level Resolution, Zooming and Shrinking Digital Images, Some Basic Relationships between Pixels, Introduction to the Basic Mathematical Tools Used in Digital Image Processing
UNIT-2
Intensity Transformations and Spatial Filtering: Background, Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing (Lowpass) Spatial Filters, Sharpening (Highpass) Spatial Filters   **Filtering in the Frequency Domain:** Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Basics of Filtering in the Frequency Domain, Image Smoothing Using Lowpass Frequency Domain Filters, Image Sharpening Using Highpass Filters.
UNIT-3
Image Restoration and Reconstruction: Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only—Spatial Filtering, Periodic Noise Reduction Using Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering.
UNIT-4
Color Image Processing: Color Fundamentals, Color Models, Pseudocolor Image Processing, Wavelets and Multiresolution Processing: Wavelet and Other Image Transforms: Preliminaries, Haar Transform,

Multiresolution

Morphological Image Processing: Basic Concepts, Dilation and Erosion, Opening and Closing, Hit or miss transformation, sample applications

Theory

TEXT BOOKS:

1. Rafael C. Gonzalez, University of Tennessee, Richard E. Woods, Med Data Interactive, "Digital Image Processing", 4th Edition, Pearson, 2018.

REFERENCE BOOKS:

1. 1. David A. Forsyth, Jean Ponce, "Computer Vision: A Modern Approach" , 2nd Edition, University of Illinois at Urbana-Champaign Jean Ponce, EcoleNormaleSuperieure, 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.

JOURNALS/MAGAZINES:

1. International Journal of Computer Vision, Springer, https://www.springer.com/journal/11263
2. Image and Vision Computing, Elsevier, https://www.journals.elsevier.com/image-and-vision-computing
3. Computer Vision and Image Understanding, Elsevier, https://www.journals.elsevier.com/computer-vision-and-image-understanding
4. IEEE Transactions on Image Processing, https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=83
5. IEEE Transactions on Pattern recognition and machine intelligence, https://ieeexplore.ieee.org/xpl/aboutJournal.jsp?punumber=34

SWAYAM/NPTEL/MOOCs:

1. Computer Vision and Image Processing - Fundamentals and Applications: https://onlinecourses.nptel.ac.in/noc21_ee23/preview
2. Computer Vision: https://nptel.ac.in/courses/106/105/106105216/
3. Deep Learning for Computer Vision: https://nptel.ac.in/courses/106/106/106106224/

SELF-LEARNINGEXERCISES:

Artificial Neural Networks, Convolution Neural Network.
Implementation of applications using the above topics.

Course Title	C# and .NET(PE-III)				Course Type		Theory	
Course Code	B20EJS608	Credits	3		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	**3**	**3**	**3**	**39**	**0**	**50%**	**50%**

COURSE OVERVIEW:

      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 OBJECTIVE (S):

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 (COs):

      After the completion of the course the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the basic components of the .NET Framework.	1 to 5	1
CO2	Develop a program using C# data types for real world applications.	1 to 5	2, 3
CO3	Make use of various interface techniques to invoke interface Members at the object Level	1 to 5	3, 1
CO4	Apply exception handling mechanisms of C# for real world applications.	1 to 5	2, 3
CO5	Analysis the new concepts and applied for applications		
CO6	Create a new application		

BLOOM'S LEVELOF THECOURSE OUTCOMES:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		√				
CO2						√
CO3				√	√	
CO4			√			
CO5					√	
CO6						√

COURSE ARTICULATIONMATRIX:

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	3								3		

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CO2	3	3	3	2	2									3	3
CO3	3	3	3	1	2								3		3
CO4	2	2	2	2	1									3	3
CO5	3	3	3	3	3	3	3			3	3	3	2	3
CO6	2	3	3	3	3	3			3	3	3	3	2	3

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Introducing C# and .NET Platform: The Building Block of the .NET Platform (CLR, CTS, and CLS), 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: Constructor Basics, 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 Class Methods, 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#'s Encapsulation Services, **Pseudo-Encapsulation:** Creating Read-Only Fields. The Second Pillar: C#'s Inheritance 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 Exception Handing, 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.

TEXT BOOKS:
1. Andrew Trosele," Pro C# with .NET 3.0", Seventh Edition, 2007.
2. E Balaguruswamy," Programming in C#", 5th reprint, Tata McGraw Hill 2004.

REFERENCE BOOK

1. Vijay Nicoel, "Visual C#.NET", 5th reprint, Tata McGraw Hill 2004.
2. Janice Friedman, "Take Your Coding Skill Set to the Next Level, C Sharp Station", 2019

JOURNALS/MAGAZINE:

1. https://ieeexplore.ieee.org/document/1159034
2. https://dl.acm.org/doi/10.5555/948785.948822
3. https://www.sciencedirect.com/science/article/pii/S1875389212002908

SWAYAM/NPTEL/MOOCS:

1. https://www.coursera.org/lecture/develop-windows-apps-gcp/developing-asp-net-mvc-applications-T9XnS

2. https://dotnet.microsoft.com/learn/aspnet

3. https://www.edx.org/learn/c-sharp

SELF LEARNING EXERCISES:

Basics of Garbage Collection, Finalization a Type, the Finalization Process, Building an Ad Hoc Destruction Method, Garbage Collection Optimizations, the System. GC Type.

Course Title	Compiler Design(PE-III)				Course Type		Theory	
Course Code	B20EJS609	Credits	3		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

Course Description: The Course intends to make students learn the techniques needed for compiler construction and develops analytical skills. The course is conceptual.

COURSE OBJECTIVE (S):

1. Explain the concepts of Object-Oriented programming, Object-Relational Databases and Compilers.
2. Describe how syntax tree can be constructed to check the syntax of the given input.
3. Discuss different types of parsers and syntax directed definition and translation.
4. Demonstrate how code optimization and code generation is done for a given source code.

COURSEOUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	Pos	PSOs
CO1	Apply the concepts of lexical, syntactic and semantic analysis to parse the given statement.	1-5,8-10	1
CO2	Experiment with the knowledge of different parsers by constructing the top down and SLR parsers.	1-5,7,8,10-12	2
CO3	Make use of different types of parsers and syntax directed definition and translation to check the syntax of the given input.	1-5,8,9,11,12	1
CO4	Develop code optimization and code generation for a given source code.	1-5 ,11,12	2,3
CO5	Apply some algorithms for real time environment	1-12	3
CO6	Develop new algorithms for real world environment	1-12	3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√	√		
CO3			√			
CO4						√
CO5			√		√	
CO6				√		√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO1	2	2	2	1	1	0	0	3	2	3	2	2	3	0	0
CO2	2	2	2	1	1	0	2	3	0	3	2	2	0	3	0
CO3	2	2	2	1	1	0	0	3	2	0	1	2	3	0	0
CO4	2	2	2	1	1	0	0	0	0	0	2	2	0	3	3
CO5	3	2	3	2	3	3	2	3	2	3	2	3	0	0	3
CO6	2	3	2	1	2	3	2	3	2	3	2	3	0	0	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY:

Contents
UNIT-1
Overview of Object-Oriented Concepts, Object and Object-Relational Databases: Introduction to Compilers: Language processors; the structure of a Compiler.   **Lexical analysis:** Tokens, Regular expressions, Finite state automata, translating regular expressions into finite state automata;
UNIT-2
Syntax analysis 1: Context-free grammars, Derivations and syntax trees, Handling ambiguous grammars, Top-down parsing, Bottom-up parsing – SLR ();
UNIT-3
Syntax Analysis 2: More powerful LR Parsers.   **Syntax-directed translation:** Syntax-directed definitions; Evaluation orders for SDDs; Applications of syntax-directed translation; Parser stack implementation of Postfix SDT;
UNIT-4
Code optimization and generation: Basic blocks and Flow graphs; Optimization of basic blocks.   **Intermediate code generation:** Variants of syntax trees; Three-address code; Control flow; back patching;

TEXT BOOKS:

1. A. V. Aho, R. Sethi and J. D. Ullman, Compilers – Principles, Techniques, and Tools, Addison-Wesley, Pearson Education, 2001.
2. Charles N. Fischer, Richard J. LeBlanc, Jr., Crafting a Compiler with C, Pearson Education, 1991.
3. Kenneth C Louden, Compiler Construction Principles & Practice, Cengage Learning, 1997.

REFERENCE BOOKS:

1. A.W. Appel, Modern Compiler Implementation in Java, Cambridge University Press, 2002.

JOURNALS/MAGAZINES
1. https://www.springer.com/gp/book/9783319669656
2. https://ieeexplore.ieee.org/document/101813
3. IEEE, IEEE Transactions on Computers.

4. Elsevier, Computer Languages, Systems and Structures.

5. Springer, Journal of Logic, Language and Information.

6. ACM, ACM Transactions on Programming Languages and Systems (TOPLAS).

SWAYAM/NPTEL/MOOCs:
1. https://nptel.ac.in/courses/106/104/106104123/
2. https://www.mooc-list.com/tags/compilers

SELF-LEARNINGEXERCISES:

More Recent Applications: translating regular expressions into finite state automata; survey of latest compilers for dealing with parallel programming.

Course Title	Natural Language Processing in AI (PE-IV)				Course Type		Theory	
Course Code	B20EJS610	Credits	3		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

Course Description: The intent of the course is to give introduction to Natural Language Processing (NLP, a.k.a. computational linguistics), the study of computing systems that can process, understand, or communicate in human language. The primary focus of the course will be on understanding various NLP tasks as listed in the course syllabus, algorithms for effectively solving these problems, and methods for evaluating their performance. There will be a focus on statistical algorithms to acquire the knowledge needed to perform language processing.

COURSE OBJECTIVE (S):
The objectives of this course are to:
1. Explain the fundamentals of natural language processing and python

2. Discuss how to access the text corpora and Lexical Resources
3. Demonstrate the writing the structured programs to process the raw text
4. Describe role of Classifiers in Text processing

COURSEOUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply the concepts of python to implement NLTK Tools to solve the given real wold problems	1 to 5, 6-10	1,3
CO2	Develop an algorithm to access the text corpora and Lexical Resources to process the Raw Text	1 to 5,7-12	2
CO3	Make use of Categorizing and Tagging concepts to solve the given real world problem.	1 to 5,6-11	2,3
CO4	Analyze the performance of different classifiers in Text processing and Modelling Linguistic Patterns	1 to 5,7-10	1
CO5	Apply text processing and modelling Linguistic Patterns	1-12	3
CO6	Develop an algorithm for solving real world problems	1-12	3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√			
CO4				√		
CO5			√		√	
CO6				√		√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	3	2	3	2	3	0	0	3	0	3
CO2	2	3	2	3	3	0	3	2	2	3	2	3	0	3	0

CO3	2	3	2	3	2	3	2	3	2	3	2	0	0	3	2
CO4	3	3	1	3	2	0	3	2	3	2	0	0	3	0	0
CO5	3	2	3	2	3	2	3	2	3	2	3	2	0	0	3
CO6	2	3	2	3	3	3	2	3	2	3	2	3	0	0	3

Note: 1-Low, 2-Medium, 3-High

COURSE CONTENT
THEORY:

Contents
UNIT-1
Language Processing and python, Accessing Text corpora and Lexical Analysis: Computing with language: Texts and words, a closer look at python: texts as list of words.   **Computing with language**: simple statistics, Automatic natural language understanding; Accessing Text Corpora, Conditional Frequency Distributions, Lexical Resources, WordNet, Introduction to NLTK Tool.
UNIT-2
Processing Raw Text: Accessing Text from the Web and from Disk, Strings: Text Processing at the Lowest Level, Text Processing with Unicode,Regular Expressions for Detecting Word Patterns, Useful Applications of Regular Expressions, Normalizing Text, Regular Expressions for Tokenizing Text, Segmentation, Formatting: From Lists to Strings.
UNIT-3
Categorizing and Tagging Words: Using a Tagger, Using a Tagger, Mapping Words to Properties Using Python Dictionaries, Automatic Tagging, N-Gram Tagging, Transformation-Based Tagging, How to Determine the Category of a Word.
UNIT-4
Classifying Text: Supervised Classification: Examples, Evaluation; Decision Trees, Naive Bayes Classifiers, Maximum Entropy Classifiers, Modelling Linguistic Patterns.

Text books:

1. Steven Bird, Ewan Klein, and Edward Loper, "Natural Language Processing with Python", First Edition, OReilly Media, 2009.
2. Yuxi (Hayden) Liu, "Python Machine Learning by Example", First edition, Packt publisher, 2017.

Reference books:

1. James Allen," Natural Language Understanding", Benjamin-Cummings Publishing Co., Inc. Redwood City, CA, USA,1995.
2. Christopher D. Manning and Hinrich Schutze," Foundations of Statistical Natural Language Processing", The MIT Press, 1999.
3. Randolf Quirk, Sidney Greenbaum, Geoffrey Leech, Jan Svartvik, "A Comprehensive Grammar of English Language", Cambridge University Press,1987.

JOURNALS/MAGAZINES:

1. https://dl.acm.org/journal/tslp

2. https://www.journals.elsevier.com/cognitive-systems-research

SWAYAM/NPTEL/MOOCs:
1. https://nptel.ac.in/courses/106/105/106105158/
2. https://www.mooc-list.com/tags/nlp

SELF-LEARNINGEXERCISES:

Extracting information from Text, Exploring the 20 Newsgroups with Text Analysis Algorithms, Stock Price prediction with Regression Algorithms, Best Practices: i) Data preparation stage ii)Training sets generation stage iii) Model training, evaluation and selection stage.

Course Title	Advanced Internet Technology(PE-IV)				Course Type		Theory	
Course Code	B20EJS611	Credits	3		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-				
	Tutorial	-	-	-	Theory	Practical	CIE	SEE
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

This course covers features of HTML5 and CSS3, controls and web services of ASP. Net and database access with MYSQL, basics of AngularJS, basics of AJAX and J Query AJAX library, basics of Ruby, controls and RESTFul web services. These concepts are used in the development of Client-Server technology.

COURSE OBJECTIVE (S):

The objectives of this course are to:
1. Explain the features of HTML 5 andCSS-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.

COURSEOUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Utilize the tags of HTML5 and CSS3 to create web pages for a real world application.	1-5,8-11	1
CO2	Develop a website using ASP.Net and Angular JS for creating a front end and MYSQL as backend	1-6,8,9,10,12	2
CO3	Build a regular expression in ruby to Validate the given real world data.	1-9,12	3
CO4	Appraise the principles of object oriented development using ASP.Net.	1-10,12	3
CO5	Develop Client-Side Scripts using JavaScript and Server-Side Scripts using ASP.Net to generate and display the contents dynamically.	1-12	3
CO6	Design and develop an application using different available RESTFul Web Services	1-12	3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2				√		
CO3			√			
CO4				√		
C05						√
CO6				√		

COURSE ARTICULATIONMATRIX

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	0	0	3	2	2	2	0	3	0	0
CO2	2	1	3	2	3	3	0	3	2	3	0	3	0	2	0
CO3	2	2	1	3	2	2	3	2	3	0	0	2	0	0	3
CO4	2	2	3	3	2	3	3	2	3	2	0	3	0	0	3
CO5	2	2	3	2	3	2	3	2	3	2	2	2	0	0	3
CO6	3	3	2	2	2	3	3	2	1	3	2	3	0	0	3

Note: 1-Low, 2-Medium, 3-High

Contents
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 Angular JS: 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 Angular JS, Data binding 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 Active Resource, Parting

Words, The Resource-Oriented Architecture, REST and ROA Best Practices, Ajax Applications as REST Client.

COURSE CONTENT
THEORY

TEXT BOOKS:

1. Elizabeth Castro, Bruce Hyslop, HTML5 and CSS3, 7th Edition, Peachpit Press, 20l2

2. Robert W. Sebesta, Programming the World Wide Web, 4th Edition, Pearson Education,2008.

3. Nicholas C Zakas et al, Professional AJAX, 2nd Edition, Wroxpublications,2007.

REFERENCE BOOKS:

1. Deitel P, Deitel HM, Internet and World Wide Web How to Program, Pearson Education, 20l2

2. AchyutS. Godbole and AtulKahate, Web Technologies, Tata McGraw Hill,2003.

3. Jason Hunter, William Crawford, Java Servlet Programming, O'Reilly Publications,l998.

JOURNALS/MAGAZINES:

1. ACM Transactions on Internet Technology

2. IEEE International Conference on Enterprise Computing andE-Commerce.

3. ACM Transactions on Information Systems.

SWAYAM/NPTEL/MOOCs:

1. https://nptel.ac.in/courses/106/105/106105084/

2. https://www.mooc-list.com/tags/web-technologies

SELF-LEARNINGEXERCISES:

Rails, Angular JS complete study.

Course Title	Wireless and Sensor Networks (PE-IV)				Course Type		Theory	
Course Code	B20EJS612	Credits	3		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

The course covers concepts in sensor networks from introduction to wireless networks, architectures and technologies. This course also covers the concepts of wireless sensor network platforms, communication architecture and protocols for WSN (MAC, Link, and Routing). Mac standards with the defined protocols and different routing protocols for the deployment of wireless sensors for real time applications.

COURSE OBJECTIVE (S):
The objectives of this course are to:
1. Define the fundamentals of wireless sensor networks and its application
2. Explain the various protocols at various layers and the different techniques for modulation and access.

3. Discuss the issues pertaining to sensor networks and the challenges involved in managing a sensor network.
4. Describe different MAC control protocols with its standards and routing protocols for QoS management in sensor networks.

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify components of wireless Communication, Architecture, MAC, and Routing	1-5, 7,9,10,11	1
CO2	Choose the suitable architecture and strategy of sensors for solving a real-world problem.	1-5,8-11	2
CO3	Develop wireless sensor routing protocols for solving a real world problems.	1-5, 7-11	2
CO4	Build the applications using sensor devices to provide solutions for real world problems.	1-6, 10,11,12	3
CO5	Apply wireless sensor routing protocols to find destination	1-6, 8,9,10,11,12	2
CO6	Analyze the existing wireless applications for new real world problem identification	1-6, 8,9,10,11,12	3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1	√					
CO2		√				
CO3				√		√
CO4			√			√
CO5			√			
CO6				√		

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	3	0	3	0	3	2	3	0	3	0	0
CO2	3	2	3	2	3	0	0	3	2	3	2	0	0	3	0
CO3	3	2	3	2	3	0	3	2	3	3	2	0	0	3	0
CO4	2	3	2	3	2	3	0	0	0	3	2	3	0	0	3
CO5	3	2	3	2	3	2	0	3	2	3	2	3	0	3	0
CO6	3	3	2	2	3	3	0	3	2	3	3	2	0	0	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY:

Contents
UNIT-1
Introduction to Wireless Communication: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques. Wireless internet- What is wireless internet? Mobile IP. Challenges for WSNs, Enabling technologies for WSNs.
UNIT-2
Architecture: Single node architecture-Hardware components, energy consumption of sensor nodes, operating system, and execution environments. Network architecture- sensor network scenarios, optimization goals, design principles, service interfaces, and gateways.
UNIT-3

MAC Protocols: Fundamentals of MAC Protocols, Low duty cycle protocols and wakeup concepts, contention based and schedule-based protocols, IEEE 802.15.4 MAC protocols. Naming and addressing: Fundamentals, Address, and name management in WSN, Assignment of MAC address, Distributed assignment of locally unique address, Content based addressing.
UNIT-4
Routing Protocols: Gossiping and agent based unicast forwarding, energy efficient unicast, broadcast and multicast, mobile nodes. Transport layer and QoS: Transport layer and QoS in WSN, Coverage and deployment, Reliable data transport, single packet delivery, block delivery, Congestion control and rate control.

TEXTBOOKS:
1. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, 2005.
2. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education - 2008.

REFERENCE BOOKS:
1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, —Wireless Sensor Networks Technology, Protocols, And Applications, John Wiley, 2007.
2. Anna Hac, —Wireless Sensor Network Designs, John Wiley, 2003.
3. C. S. Raghavendra, K.M. Shivalingam and T. Znati, "Wireless Sensor Networks", Springer, New York, 2004
4. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, 2005.

JOURNALS/MAGAZINES:
1. Su, Weilian, and Mohamad Alzaghal. "Channel Propagation Characteristics of Wireless MICAz Sensor Nodes." Ad Hoc Networks 7.6 (2009): 1183-1193.
2. Ilyas, Mohammad, and Imad Mahgoub. "Sensor Network Architecture and Applications." Smart Dust. CRC Press, 2018. 113-126.

SELF-LEARNINGEXERCISES:

Hardware design of sensor Networks, Applications of WSN, Real life deployment of WSN, Development of sensor- based networking.

Course Title	Information and Network Security Lab				Course Type		Theory	
Course Code	**B20EJ0603**	Credits	1		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	2	2	0	26	50%	50%

COURSE OVERVIEW:

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 OBJECTIVE

The 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)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Summarize the security planning, standards and practices in Intrusion Detection Systems	1 to 5	1
CO2	Make use of the different cryptographic algorithms for encryption and decryption of given data.	1 to 5	2
CO3	Compare the various performance of protocols used for authentication.	1 to 5	2,3
CO4	Identify security in different layers of OSI for solving real world network problems	1 to 5	1
CO5	Relate different firewalls available for more security	1 to 5	2,3
CO6	Identify different auditing tools for intrusion management system.	1 to 5	1,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√			
CO4			√			
CO5			√	√		

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO6				√		√									

COURSE ARTICULATION MATRIX

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	1								3		
CO2	3	2	3	1	2									3	
CO3	3	1	2	2	3									3	3
CO4	2	2	2	1	1									3	3
CO5	2	2	3	3	1									2	3
CO6	2	2	3	3	2									2	3

Note: 1-Low, 2-Medium, 3-High

Practice:

Prerequisites: Computer Networks, C/C++/Java/python

List of Experiments

1. Study the tool used for Network scanning ie NMAP and conduct the network analysis.
2. Setup a honey pot and monitor the honeypot on network (KF Sensor).
3. Implement Caesar cipher using suitable programming and show the successful decryption of Ciphertext and verify the same with "Cryptool".
4. Implement DES algorithm to encrypt the data and verify the same with 'Cyptool'.
5. Implement a simple RSA algorithm and demonstrate how to recover the Plaintext.
6. Demonstrate how to perform key exchange securely using Diffie Helman Keyexchange mechanism.
7. Demonstrate the data hiding using any steganography tools.
8. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.

9. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool.

10. Install the Tinywall and configure it. Inspect the incoming and outgoing packets. Prepare the report of the Firewall traffic analysis.

Course Title	CLOUD COMPUTING				Course Type		Theory	
Course Code	B20EJ0604	Credits	4		Class		VI semester	
Course Struct-ure	TLP	Credits	Contact Hours	Work Load	13 weeks / Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	1	2	2				
	Tutorial	-	-	-	Theory	Practical	CIE	SEE
	Total	1	2	2	-	26	50%	50%

COURSE OVERVIEW:

The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large scale distributed systems which form the cloud infrastructure.

COURSE OBJECTIVE

1. Introduce cloud computing and provide knowledge in different layers of cloud computing such as: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS)
2. Describe various cloud computing technologies like data center technology, virtualization technology, web technology, multitenant technology; service technology
3. Explain Virtualization technologies: Hypervisor, emulation, and application VM, Platform virtualization, storage virtualization, and network virtualization.
4. Provide knowledge about cloud security and threats

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Explain the cloud computing concepts such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS)	1-5	2
CO2	Use various cloud computing technologies like data center technology, virtualization technology, web technology, multitenant technology; service technology	1-5	3
CO3	Apply Virtualization technologies: Hypervisor, emulation, and application VM, Platform virtualization, storage virtualization, and network virtualization in developing cloud applications.	1-5,10	1,3
CO4	Analyze cloud security and threats for new problems in hand and develop and provide security services for cloud based applications	1-5, 10,11	2,3
CO5	Learn new tools and technologies in Virtualization and cloud computing concepts and apply for suitable solutions for application development.	12	2,3
CO6	Develop solutions in Virtualization and cloud computing concepts to solve the complex problems, either individually or as a part of the team and report the results with proper analysis and interpretation.	5,9,10	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1-	√	√				
CO2			√	√		
CO3			√	√		

CO4				√	√	√	
CO5		√		√			
CO6			√	√		√	

COURSE ARTICULATION MATRIX

CO#/	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	1					2				3	
CO2	2	2	2	3	2					3					3
CO3	2	3	3	3	3					2			3		3
CO4	2	2	3	3	2					2	1			3	3
CO5												2	3		
CO6	2					2			2		2			3	

Note: 1-Low, 2-Medium, 3-High

PRACTICE

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability

#			
1.	Evaluate the performance of MapReduce program on word count for different file size.	Ubuntu Linux 10.04 LTS (deprecated: 8.10 LTS, 8.04, 7.10, 7.04) Hadoop 1.0.3 Hadoop requires a working Java 1.5+ (aka Java 5) installation. However, using Java 1.6 (aka Java 6) is recommended for running Hadoop	To perform the performance of MapReduce program
2.	Design a document, excel sheet, presentation and form using Google Docs, Google sheets, Google Slides and Google Forms. a) Create your resume using Google Docs and send it to your teacher and get it reviewed by your teacher. b) Create a spreadsheet containing cab requirements and collect the details from various guest teachers. c) Create a presentation containing phase1 details of your project in collaboration with your project team members.	Browser Google Account	To design a resume in different forms.
3.	Create multiple VM's on a single physical machine. Provide a communication between them using and without using Client.	To install and setup the Virtual Machine To check the connectivity between the Virtual Machines	To create multiple virtual machines
4.	Demonstrate the communication of VM's on different physical devices using ESXI.	To install and setup the Virtual Machine on same and different ESXi. To check the connectivity between the Virtual Machines	To communicate of VM's on different physical devices
5.	Illustrate the cloning of VM's.	To configure and maintain the VM's. To configure a multiple Virtual Machines on multiple ESXi's.	To create a duplicate of the virtual machine with the same configuration
6.	Illustrate the backup-restore scenario. -	To figure out the different ways of backup and restore the sessions of Virtual Machine.	The VM, to which the backup is required should be in ON
7.	Add iSCSI adapter and modify the relative parameters. Create a new VMkernel using iSCSI port binding.	To provide the adapter for the already created VM's	To create a new VM kernel
8.	Performance Analysis of Virtual Machine vs Physical Machine.	To find the performance of VM's in ESXi	To Perform analysis of Virtual Machine vs Physical Machine
9.	Design a module to control an LED from Webserver using NodeMcu or Esp8266 programming with Arduino IDE.	Create IOT application using Cloud.	To control an LED from Cloud Service.

		To install and configure the vCenter server Create a final data center for different VM's	To perform and create a data center.
10.	Create a data center using vCenter for multiple VM's.		
11.	Install and configure the vSphere Web client	To install and configure the vSphere web Client to access the vCenter server. Create a final data center for different VM's	To perform and install and configurations
12.	Illustration of vMotion to move the VM's from one ESXi to another ESXi -	To install and configure the vSphere web Client to access the vCenter server Create a final data center for different VM's. Identify the way of moving the VM's from one ESXi to another. Migrate the VM's from one to another ESXi.	To migrate running virtual machines from one physical server to another.

	Mini Project **Green Cloud Computing: Demand Allocation and Pricing Policies for Cloud Service Brokerage**		
1	Functioning as an intermediary between tenants and cloud providers, cloud service brokerages (CSBs) can bring about great benefits to the cloud market. As energy costs of cloud computing have been increasing r-apidly, there is a need for cloud providers to optimize energy efficiency while maintain high service level performance to tenants, not only for their own benefit but also for social welfares. Thus, for green cloud companies, two questions have arisen: 1) under what pricing policies from the cloud providers to the CSB, a profit-driven CSB is willing to minimize the total energy cost while satisfy tenant demands and 2) how should a CSB distribute tenants demands to achieve this objective? To address question 1), we find a pricing policy for cloud providers such that maximizing CSBs profit is equivalent to minimizing cloud providers energy cost. To address question 2), we first devise a greedy solution, and then propose an approximation algorithm and a decomposition-based solution with a constant approximation ratio. Both simulation and real-world Amazon EC2 experimental results demonstrate the effectiveness of our pricing policy to incentivize CSBs to save energy and the superior performance of our algorithms in energy efficiency and resource utilization over the previous algorithms.	Cloudsim Tools for Cloud, Edge and Fog Computing	To multiple cloud providers to minimize the energy cost of cloud provider
2.	**Enhancing Performance And Energy Efficiency For Hybrid Workloads In Virtualized Cloud Environment** Virtualization has accomplished standard status in big business IT industry. In spite of it's across the board appropriation, it is realized that virtualization likewise presents non-paltry overhead when executing undertakings on a virtual machine (VM). Specifically, a consolidated impact from gadget virtualization overhead and CPU booking dormancy can cause execution corruption when calculation concentrated undertakings and I/O serious errands are co-situated on a VM. Such an impedance causes additional vitality utilization, too. In this paper, we display Hylics, a novel arrangement that empowers proficient information cross ways for both I/O and calculation serious workloads. This is accomplished with the arrangement of in-memory record framework and system benefit at the hypervisor level. A few vital plan issues are pinpointed and tended to amid our model execution, including proficient moderate information sharing, organize benefit offloading, and QoS-mindful memory use administration. In view of our genuine -organization on KVM, Hylics can essentially enhance calculation and I/O execution for mixture workloads. In addition, this pl-an likewise mitigates the current virtualization overhead and normally improves the general vitality	Platform virtualization, Load management, Network interfaces, VM monitors	To enhance performance and energy efficiency

TEXT BOOKS:

3. Thomas Erl , Ricardo Puttini , Zaigham Mahmood Cloud Computing: Concepts, Technology & Architecture PHI, 2013.
4. Kai Hwang, Geoffrey C. Fox, Jack J Dongarra, Distributed and Cloud Computing, MK, 2012.

REFERENCE BOOKS:

1. Dan C. Marinescu, Cloud Computing: Theory and Practice, MK
2. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
3. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing- Principles and Pradigms,Wiley.
4. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Cloud Computing, A practical approach, TATA - McGRAW HILL.
5. Gautam Shroff, Enterprise Cloud Computing- Technology, Architecture, Applications, CAMBRIDGE.
6. David Marshall, Wade A. Reynolds and Dave McCrory, Advanced Server Virtualization-VMware and Microsoft Platforms in the Virtual Data Center, AUERBACH Publications.

JOURNALS/MAGAZINES:

4. International Journal of Cloud Computing, INDERSCIENCE Publishers.
5. IEEE Cloud Computing
6. International Journal of Cloud Applications and Computing (IJCAC), IGI Global.

SWAYAM/NPTEL/MOOCS:

4. https://onlinecourses.nptel.ac.in/noc21_cs15/preview

5. https://onlinecourses.nptel.ac.in/noc21_cs14/preview

6. https://www.classcentral.com/course/swayam-cloud-computing-and-distributed-systems-17544

SELF LEARNING EXERCISES:

4. https://www.cybrary.it/course/virtualization-management/

5. http://cds.iisc.ac.in/faculty/simmhan/SE252/

6. https://data-flair.training/blogs/hardware-virtualization-in-cloud-computing/

Course Title	Research Based Mini Project				Course Type		Theory	
Course Code	B20CI0601`	Credits	2		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	2	4	4	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	2	4	4	0	52	-	100%

COURSE OVERVIEW:

This course offers "An overview of research methodology including basic concepts employed in quantitative and qualitative research methods. This course introduces problem selection, synopsis writing, ethics, research design skills, research methods, how to carry out literature survey, reading and writing technical paper, thesis writing, introduction atex and beamer and how to design the quality research proposal.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Explain the dimensions and methods of research.

2. Illustrate the design of informed choice from the large number of alternative methods and experimental designs available.

3. Describe the features of a good research proposal.

4. Discuss the skills required for undertaking a research project and preparing a technical paper

COURSE OUTCOMES (COs)

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of the dimensions and methods of research for solving real world problems.	1,4,7,11,12	2,3
CO2	Identify the appropriate research problem and parameters to carry out the research work.	2,5,6,12	2,3
CO3	Apply different research skills in preparing proposal for research project and technical paper.	6,7,11	2,3
CO4	Create IPR documents using Latex Tool.	3,12	3
Co5	Describe the features of a good research proposal	2,5,6,12	2,3
Co6	Illustrate the design of informed choice from the large number of alternative methods and experimental designs available	6,7,11	2,3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		√				
CO2				√	√	
CO3			√			
CO4						√
Co5		√				
Co6			√			

COURSE ARTICULATION MATRIX

CO#/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2			2		1					1	1	1	2	
CO2		2			1	3						2	2	2	
CO3					2	1						2	2	1	
CO4			2									2			3
Co5		2			1	3						2	2	2	
Co6					2	1						2	2	1	

Note:1-Low,2-Medium,3-High

A Mini Project has to be carried out by the students and the same has to be completed by the end of semester. Students have to spend a minimum of 8 hours per week on the mini project. A Mini Project has to be developed and documented using Latex. The outcome of the mini project should be paper publication/ IPR.

Course Title	INDIAN TRADITION & CULTURE				Course Type		Theory	
Course Code	B20PA0501	Credits	1		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/Semester		Assessment in Weightage	
	Theory	1	1	1				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	1	1	1	13	0	50%	50%

COURSE OBJECTIVE (S):

To provide conceptual knowledge of Indian culture and traditions

1. To introduce students to the science and technological advancements related to Indian culture.
2. To help students understand the Indian spiritual aspects of Indian culture
3. To help learners understand the factors which unite the diverse cultures of India

COURSE OUTCOMES (COs):

1. Gain conceptual understanding of Indian culture and traditions.

2. Describe various ancient theories in treatment of any disease, Appreciate the science and technological advancements in ancient India.

3. Comprehend the Indian spiritual aspects of Indian culture like yoga, meditation and nirvana.

4. Demonstrate the theory behind celebrating Hindu festivals and concept of making varieties of food and Understand India as a land united by cultural diversity.

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Gain conceptual understanding of Indian culture and traditions.	2,3,4,6,8,12	3
CO2	Describe various ancient theories in treatment of any disease, Appreciate the science and technological advancements in ancient India.	10,11	3
CO3	Comprehend the Indian spiritual aspects of Indian culture like yoga, meditation and nirvana.	11	3
CO4	Demonstrate the theory behind celebrating Hindu festivals and concept of making varieties of food and Understand India as a land united by cultural diversity	11,12	3
CO5	familiarize learners with various aspects of the culture and heritage of India.	10,11	3
CO6	develop among learners a feeling of love and a sense of belonging towards the nation	11,12	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create(L6)
CO1		√				
CO2		√	√			
CO3		√				
CO4		√				
Co5		√				
Co6				√		

COURSE ARTICULATION MATRIX

CO#/Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2		2		3				3	
CO2									2	2		
CO3										2		
CO4										2	2	
Co5									2	2		
Co6										2	2	

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY

Contents
UNIT-1
Indian Tradition Culture – Indus Valley Civilization and early cultural practices, The Vedic culture, Influence of Buddhism and Jainism on Indian Culture, Influence of Islam and Christianity, Indian Cultural Renaissance of the 19th Century Religion – Pre-vedic and Vedic religion, Jainism, Buddhism, Hinduism, Religious Reform Movements, Advent of Christianity Art – Introduction to Natyashastra, classical and contemporary art forms (dance and music), regional art forms (dance and music), Folk art, puppetry Architecture – Engineering and Architecture in Ancient India;Evolution of Hindu Temple Structures, Sculptures, Coins and Pottery from Ancient India Literature- Vedas, Upanishads, Ramayana, Mahabharata & Bhagavat Gita.
UNIT-2
Contribution of ancient India to Science and Maths i. Development of Science in Ancient India- Astronomy, Mathematics, Medicine, Metallurgy. ii. Scientists of Ancient India: Mathematics and Astronomy- Baudhayan, Aryabhata, Brahmagupta, Bhaskaracharya, Mahaviracharya Science- Kanad, Varahamihira, Nagarjuna Medical Sciences (Ayurveda and Yoga)- Susruta, Charaka, Yoga and Patanjali iii. Science and Scientists in Medieval India- Mathematics, Biology, Chemistry, Astronomy, Medicine, Agriculture. iv. Scientists in Modern India- Srinivas Ramanujan, Chandrasekhara V Raman, Jagadish Chandra Bose, Homi Jehangir Bhabha, Dr, Vikram Ambalal Sarabhai, ,Dr. APJ Abdul Kalam
UNIT-3
Indian Spiritual Aspects I. Hindu Spirituality based on shruti and smriti- Hinduism in General, Basic notions of Vedas, Upanishads, Ramayana, Mahabharata & Bhagavat Gita. ii.Hata Yoga and Pranayama- Main Features, Basics of Yoga –Different kinds of Yoga; Raja Yoga (Ashtanga yoga); Karma yoga; Bhakti Yoga – yoga of Loving Devotion; Jnana yoga – Yoga of Knowledge; Hatha Yoga (Asana/ Pranayamas); Kundalini Yoga; Nada Yoga; Sannyasa Yoga iii. Buddhist, Jaina Spiritualities- Main Doctrines of Buddhism: Four Noble Truths (Arya Satya), Concept of Nirvana - Ashtanga Marga

UNIT-4
Unity in Diversity Commensality and the Significance of Food– Eating Together as Family and as a Society, Food at Rituals; annaprasan, marriage and funeral, Kitchen as Shared Space for Women, Food and Nationalist Response of Indian Community, Visibility of Indian Cuisine in the World Celebrating Diverse Festivals – Festival Types: Religious and Seasonal, Religious - Holi, Diwali, Ganesh Chaturthi, Janmashtami, Mahavir Jayanthi, Ramadan, Christmas, Buddha Purnima; Seasonal (harvest festivals) - Baisakhi, Pongal, Sankranti Attire - Indus Valley Civilization, Vedic period, Modern India

TEXT BOOKS:

1. Sundararajan K.R., Hindu Spirituality - Vedas through Vedanta, Cross Road Publications, New York, 1997.
2. Griffiths Bede, Yoga and the Jesus Prayer Tradition, Asian Trading Corporation, Bangalore, 1992

REFERENCE BOOKS:

1. Ansh Mishra, Science in Ancient India, Indian Corporation, New Delhi, 1998
3. Sen Taylor, Collen. Feasts and Fasts: A History of Food in India. Reaktion Books, New Delhi, 2014.
4. Thapar, Romila, Readings in Early Indian History. Oxford University Press. New Delhi, 2018

JOURNALS/MAGAZINES:

1. Arts and Humanities (miscellaneous)
2. History
3. Language and Linguistics
5. History and Philosophy of Science
6. Literature and Literary Theory

SWAYAM/NPTEL/MOOCs:

1. https://nptel.ac.in/courses/109/104/109104102/
2. https://nptel.ac.in/courses/109/103/109103018/

Course Title	Modern Databases	Course Type	Theory

Course Code	B20EQ0603	Credits	2		Class		VI semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13weeks/Semester		Assessment in Weightage	
	Theory	1	1	1				
	Practice	1	2	2	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	2	3	3	13	26	50	50

COURSE OVERVIEW:

This course will provide students with a general overview of databases, introducing you to database history, modern database systems, the different models used to design a database, and Structured Query Language (SQL), which is the standard language used to access and manipulate databases. Effective collection, analysis, and maintenance of data is key to achieve rapid progress in almost all disciplines of science and engineering.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1. Explain the concepts of DBMS and SQL.
2. Discuss the object oriented concepts and object relational Databases.
3. Demonstrate the use of parallel and distributed databases in real world applications.
4. Illustrate the development of Enhanced Data Model for given applications.

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Make use of the concepts of DBMS and SQL in real world applications	1 to4,8,9,12	1
CO2	Develop programs for Make use of the object-oriented concepts and object relational databases in real world applications.	1to3,5,9,12	1
CO3	Apply features of Experiment with parallel and distributed databases.	1 to5,9,12	2
CO4	Create enhanced Data Model for given applications	1,4,5,9,12	1
Co5	Develop the logical design of the database using data modeling concepts such as entity-relationship diagrams.	1to3,5,9,12	1
Co6	Create a relational database using a relational database package.	1 to5,9,12	2

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember(L1)	Understand(L2)	Apply(L3)	Analyze(L4)	Evaluate(L5)	Create (L6)
CO1			√			√
CO2			√			√
CO3			√	√		
CO4			√	√	√	
Co5		√				√
Co6		√				√

COURSE ARTICULATION MATRIX

CO#/ Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2									3		
CO2	2	2	3		2									3	
CO3	3	1	2	1	2										3
CO4	3			2	2								3	3	3
Co5	2	2	3		2									3	
Co6	3	1	2	1	2										3

Note:1-Low,2-Medium,3-HigH

COURSE CONTENT
THEORY

Contents
UNIT-1
Overview of DBMS and SQL: Introduction to DBMS and SQL, SQL Data Definition and Data Types, Schema change statements in SQL, Specifying basic constraints in SQL, Basic Queries in SQL, More Complex Queries in SQL.
UNIT-2

Modern database: General Constraints as Assertions, Views in SQL, Database Programming, Embedded SQL. Introduction to Hadoop, NoSQL, New SQL, MongoDB, Amazon RDS, Oracle & other latest technologies.
UNIT-3
Overview of Object-Oriented Concepts: Objects, Encapsulation, Polymorphism, Type and class hierarchies etc. Object model of ODMG, Object definition Language ODL; Object Query Language OQL
UNIT-4
Object and Object-Relational Databases: Overview of C++ language binding; Conceptual design of Object database; Overview of object relational features of SQL; Object-relational features of Oracle.

PRACTICE:

No	Title of the Experiment	Tools and Techniques	Expected Skill /Ability
	Part-A		
1.	a) **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. **To create DDL commands:** Customer (cid, cname, city, discount) Agent (aid, aname, city, commission) Product (pid, pname, city, quantity, price) Orders (ordno, month, cid, aid, pid, qty, amount)	SQL / Oracle	Create and perform operations.

		SQL / Oracle	Create and perform operations on Tuples.
	b) To practice with the following DML Commands: Insert Delete Modify Select	SQL / Oracle	To perform the operations.
2.	a) 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".	SQL / Oracle	Create and perform operations.

			Create and perform operations
	b) **Queries:** k. Retrieve customer ids with 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.		
3.	a) **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. To create DDL command for the following: **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)	SQL / SQL Server	Create and perform operations

	b) **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 at least 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.		
	a).Consider the text file, "Std.txt", with the details of students like SRN, NAME, SEMESTER, SECTION AND AVG_MARKS. Read the file, "Std.txt" and display the details of all the students of 4th Semester " A" Section who have scored more than 75%.	MongoDB	Create and perform operations
4.	b).Consider the text file "Emp.txt", with the details of Employees like EMP_CODE, EMP_NAME, BASIC_SALARY, DA, GROSS_SALARY, NET_SALARY, LIC, PF and TOTAL-DEDUCTIONS. Read EMP_CODE, EMP_NAME, BASIC_SALARY, DA, LIC and PF from the user using input() and compute the following: i) TOTAL_DEDUCTIONS= (LIC+PF) ii) GROSS_SALARY= BASIC_SALARY+ DA iii) NET_SALARY= GROSS_SALARY – TOTAL_DEDUCTIONS. Write the above data to file for each employee. Read the content of "Emp.txt" and display the details of each employee		Create and perform operations
5.	a). A "CAR" has the attributes COMPANY_NAME, MODEL, COLOR, MANUFACUTING_YEAR and PRICE. A Class is required to be created for "CAR" to store the above attributes and perform the following operations: i) Get the details of "CAR" object from user and store into Array of objects ii) Display the details of "CAR" object based on "COMPANY", "MODEL" and "PRICE".	MongoDB	Create and perform operations

	b). **Airline Reservation System**: It contains the attributes of passengers such as NAME, PAN_NO. MOBILE_NO, EMAIL_ID, SOURCE, DESTINATION, SEAT-NO, AIR-FARE and TRAVEL_DATE. A Class is required to be created for "Airlilne" with the above attributes and perform the following operations: Get the details of "Airline" object from user and store into Array of objects List details of all the passengers who travelled From "Bengaluru to London". List details of all the passengers who travelled From "Chicago to Beijing" on 10th of Feb, 2020.		
6.	a). "Arr_1" is an integer array of size M x N. Size and content of the array is to be read using input() by using the user defined function READ_DATA(). It is required to display the Diagonal elements of "Arr_1" Elements of mth row (row no should be entered by user) Elements of nth column (column no should be entered by user)		Create and perform operations
	b).The dictionary "DICT1" contains the pass percentage of each semester of B. Tech in CSE, where, " Semester" acts as the key and "Pass Percentage" acts as the value. A Python Pandas dataframe is required to be created using the dictionary "DICT1" and display it using a user defined function.		Create and perform operations
	Part-B (Mini Project: Library Management System)		
1.	Develop a program to create the class "USER" with the attributes USER_NAME, USER_ID, SCHOOL_NAME, ADDRESS, PHONE_NO, EMAIL_ID, DOB and AGE. The functions add_user(), delete_user(), edit_user(), search_user() should be part of the class. Instantiate "User" class with 10 objects. Read the attributes of each "User" object using input() and store them in the file	MongoDB	Create a class user to read the attributes of user and store them in a file.
2	Develop a program to get the name of the "User" object whose details are to be deleted. Read the "User_File.txt" and delete the "User" object if found. Display the contents of "User_File.txt" after deletion.	MongoDB	Create a class user to read the attributes and delete the object.
3	Develop a program to get the name of the "User" object whose details are to be edited (modified). Edit the details of the user object in the file "User_File.txt" and display the contents after modification.	MongoDB	To create a class and edit the file.

4	Develop a program to create the class "BOOK" with the attributes TITLE, AUTHOR, PUBLISHER, YEAR, PRICE, SCHOOL_NAME and the functions add_book(), delete_book(), edit_book() and search_book(). Instantiate "Book" class with 10 objects. Read the attributes of each "BOOK" object using input () and store them in the file "Book_File.txt".	MongoDB	Create a class book to read the attributes of user and store them in a file.
5	Develop a program to get the name of the "BOOK" object whose details are to be deleted. Read the "Book_File.txt" and delete the "BOOK" object whose details match with the data entered. Display the contents of "Book_File.txt" after deletion.	MongoDB	Create a class book to read the attributes and delete the object.
6	Develop a program to get the name of the "BOOK" object whose details are to be edited (modified). Edit the details of the "Book" object in the file "Book_File.txt" and display the contents after modification.	MongoDB	To create a class and edit the file.
7	Develop a program to create the class "TRANSACTION" with the attributes USER_ID, USER_NAME, AUTHOR, TITLE, EDITION, ISSUE_DATE,DUE_DATE and RETURN_DATE and the functions issue_book(), return_book() and search_book(). Instantiate "Transaction" class with 10 objects. Read the attributes of each "Transaction" object using input() and store them in the file "TransactionFile.txt". Develop a program to issue the book as requested by the user. Update the attributes in "Transaction _File" and display the contents of file.	MongoDB	Create class and perform string operations.
8	Develop a program to return the book. Edit the details of the user like USER_ID, USER_NAME, AUTHOR, TITLE, EDITION, ISSUE_DATE, DUE_DATE and RETURN_DATE in "TransactionFile.txt" and display the contents after modification. Compute the fine amount to be paid if return_date is not same as due_date. If both return_date and due_dateare same and put zero in fine_amount.	MongoDB	Create class and perform string operation.
9	Develop a program to search for a book using its "author". Display the message "available" if search is successful otherwise display the message "not available".	MongoDB	Create class and object, perform file operations and regular expressions.
10	Develop a program to get a list of users by referring to "User_File.txt" and "Transaction_File.txt".	MongoDB	Create class and object, perform file operations and regular expressions.

11	Develop a program to get List of Books in stock by referring to "Book_File.txt" and "Transaction_File.txt".	MongoDB	Create class and object, perform file operations and regular expressions.
12	Develop a program to get List of Books Issued by referring to "User_File", "Book_File" and "Transaction_File".	MongoDB	Create class and object, perform file operations and regular expressions.
13	Develop a project by integrating User, Books, Transaction and Reports Modules.	MongoDB	Module integration and project development.

TEXTBOOKS:

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.

REFERENCEBOOKS:

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. Jiawei Han, Micheline Kamber, Jian Pei, Data Mining: Concepts and Techniques, Elsevier, 2011.
4. Connolly and Begg, Database Systems, 4th Edition, Pearson Education, 2002.

JOURNALS/MAGAZINES:

1. IEEE, IEEE Transactions on Knowledge and Data Engineering
2. Elsevier, Elsevier Data and Knowledge Engineering
3. ACM, ACM Transactions on Database Systems

SWAYAM/NPTEL/MOOCs:

1. https://www.coursera.org/courses?query=database

2. https://www.edx.org/learn/databases

3. https://academy.oracle.com/en/solutions-curriculum.html

SELF-LEARNINGEXERCISES

1. Data warehousing, Data Marts, Getting data into the warehouse More exploration on GIThub
2. Data warehousing &KM, Data warehousing & CRM C modules interface.

Detailed Syllabus
Semester 7

Course Title	MULTIMEDIA SYSTEMS (PE-V)				Course Type		Theory	
Course Code	B20EJS701	Credits	3		Class		VII semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

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 OBJECTIVES:

The objectives of this course are to:

1 Gain fundamental knowledge in understanding the basics of different multimedia networks and constraint's for a good Quality of service in multimedia environment.
2. Demonstrate the process management and multimedia buffer management technique.
3. Explain the Network Services and Protocols for Multimedia Communications
4. Gain fundamental knowledge about multimedia communication across different networks.

COURSE OUTCOMES:

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the multimedia Components required for developing real world applications	1 to 4, 9, 12	1
CO2	Choose a suitable Lossy and Lossless compression techniques for compressing the given multimedia data.	1 to 3,5,9,12	2
CO3	Design the applications using different compression techniques for Image and video	1 to 3,5,9, 12	3
CO4	Analyse the working of synchronization in multimedia data.	1 to 5, 9, 12	2,3
CO5	Apply Multimedia to wireless networking environments	1 to 5, 7,9,10,11,12	3
CO6	Develop an algorithm to multimedia technologies	1 to 6, 8,9,10,12	3

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2		√				
CO3			√			
CO4						√
CO5			√			
CO6					√	√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	0	0	0	0	2	0	0	2	3	0	0
CO2	3	2	2	0	2	0	0	0	1	0	0	1	0	3	0
CO3	3	1	1	0	2	0	0	0	1	0	0	1	0	0	3
CO4	3	2	2	2	2	0	0	0	2	0	0	2	0	3	3
CO5	2	3	2	3	1	0	3	0	2	3	3	2	0	0	3
CO6	3	3	2	3	2	3	0	2	3	3	0	2	0	0	3

Note: 1-Low,2-Medium,3-High

COURSE CONTENT:
Theory

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 Computer Communication 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.

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.

JOURNALS/MAGAZINES:

2. IEEE, IEEE Transactions on Multimedia.
3. ACM, ACM Transactions on Multimedia Computing, Communications, and Applications
4. Elsevier, Elsevier Journal on Multimedia Computing. Springer, Springer Journals on Communication Networks

SWAYAM/NPTEL/MOOCs:

1. https://www.mooc-list.com/tags/multimedia
2. https://nptel.ac.in/courses/117/105/117105083/

SELF LEARNING:

Social Media Sharing- Representative Social Media Services, User-Generated Media Content Sharing, Media Propagation in Online Social Networks.

Course Title	Augmented and Virtual Reality(PE-V)				Course Type		Theory	
Course Code	B20EJS702	Credits	3		Class		VII semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

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 OBJECTIVE (S):
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 solutions using Virtual Reality system framework and development tools for industry and social relevant applications.

COURSE OUTCOMES (COs):
After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the components of Augmented Reality and Virtual Reality.	1-5,7,9 ,10,11	1
CO2	Apply multimodal user interaction and perception techniques involved in Virtual Reality.	1-5,8,9,10,11,12	3
CO3	Develop real world applications using simulation and interactive techniques.	1-5,8,9, 10,11,12	2,3
CO4	Choose the innovative Virtual Reality solutions for industrial and Social relevant applications.	1-6, 8-12	1

CO5	Evaluate current trends of AR and VR media delivery to propose options to potential clients, and discuss the benefits, challenges and misconceptions involved with working in AR and VR.	1-12	1,2
CO6	Evaluate various interaction schemes common to AR/VR experiences.	1-12	2

BLOOM'S LEVELOF THECOURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3			√			
CO4			√			
CO5					√	
CO6					√	

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	0	3	0	2	3	3	0	3	0	0
CO2	3	3	3	2	3	0	0	3	3	3	3	2	0	0	3
CO3	3	3	3	2	2	0	0	3	2	3	3	2	0	3	3
CO4	3	3	2	3	2	0	0	3	2	3	3	2	3	0	0
CO5	2	2	3	2	3	2	2	3	2	3	2	3	2	1	0
CO6	3	2	3	3	3	2	3	2	3	3	2	3	1	2	0

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY:

Contents
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 Modelling in VR: Geometric modelling, 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.

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.

JOURNALS/MAGAZINES:
1. International Journal of Virtual and Augmented Reality (IJVAR), https://www.igi-global.com/journal/international-journal-virtual-augmented-reality/145080
2. Springer, Virtual Reality, https://www.springer.com/journal/10055

SWAYAM/NPTEL/MOOCs:
1. https://www.mooc-list.com/tags/virtual-reality

2. https://nptel.ac.in/courses/106/106/106106138/

SELF-LEARNINGEXERCISES:

Unity 3D, Manus VR

Course Title	Soft Computing Systems(PE-V)				Course Type		Theory	
Course Code	B20EJS703	Credits	3		Class		VII semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50	50

COURSE OVERVIEW:

This course covers basic concepts of soft computing concepts, neural network architectures, back propagation, fuzzy logic, fuzzy membership and rules.

COURSE OBJECTIVES:

Objectives of this course are to:
1. Describe soft computing techniques and their applications
2. Explain the neural network architecture with the appropriate heuristics based on human experience.
3. Demonstrate the supervised and unsupervised learning with neural network concepts
4. Discuss fuzzy logic and neuro-fuzzy logic for real world applications

Course Out comes (Cos):
After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply soft computing techniques and their applications.	1 to 5, 7,810,11,12,	1
CO2	Analyze various neural network architectures.	1 to 5, 7,8,9,11,12	2
CO3	Design and develop the neural network with supervised and unsupervised learning.	1 to 5, 7,8,9,11,12	2, 3
CO4	Make use of fuzzy models for real world applications.	1 to 5, 8,9,10,11	3
CO5	Apply softy computing Techniques for real time applications	1-12	3

| CO6 | Develop an algorithm using soft computing to an applications | 1-12 | 3 |

BLOOM'S LEVEL

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		√	√			
CO2		√	√			
CO3		√	√			
CO4		√				
CO5			√		√	
CO6						√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	0	3	2	0	2	3	2	3	0	0
CO2	3	3	2	1	3	0	3	2	3	0	2	3	0	3	0
CO3	3	3	3	2	2	0	3	2	3	0	2	3	0	3	3
CO4	3	3	3	1	1	0	0	3	3	2	3	0	0	0	3
CO5	3	2	3	3	3	2	2	3	2	3	2	3	0	0	3
CO6	3	2	3	3	2	2	3	2	3	2	3	2	0	0	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT:

THEORY

<table>
<tr><td>

UNIT – I

Introduction and Architecture of Neural Networks: Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various Course techniques; perception and convergence rule, Auto-associative and hetero- associative memory.

</td></tr>
<tr><td>

UNIT – II

Back Propagation Networks Architecture: perception model, solution, single layer artificial neural network, multi layer perception model; back propagation Course methods, effect of Course rule co- efficient; back propagation algorithm, factors affecting back propagation training, applications.

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<tr><td>

UNIT – III

Introduction to Fuzzy Logic: Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

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UNIT – IV

Fuzzy Membership and Rules: Membership functions, interference in fuzzy logic ,fuzzy if-then rules, fuzzy implications and Fuzzy algorithms, Fuzzification and Defuzzification, Fuzzy Controller, Industrial applications.

</td></tr>
</table>

TEXT BOOKS:

1. S. Rajsekaran and G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, 2003, Prentice Hall of India.
2. N. P. Padhy, Artificial Intelligence and Intelligent Systems, 2005, Oxford University Press.

REFERENCE BOOKS:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications,2010,WileyIndia.

2. Siman Haykin, Neural Networks,2009, Prentice Hall of India
3. Kumar Satish, Neural Networks,2004,TataMc.Graw.Hill

JOURNALS/MAGAZINES

1. 1 https://www.springer.com/journal/500
2   https://www.journals.elsevier.com/applied-soft-computing

SELF LEARNING

Linear Algebra, probability and Information Theory, Genetic Algorithms.

Course Title	Python for Data Science (OE-III)				Course Type		Theory	
Course Code	B20CIO701	Credits	3		Class		VII semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50	50

COURSE OVERVIEW:

This course covers fundamentals of Python programming, data preprocessing, sampling methods, Data Visualization techniques, it involves developing a methods to analyzing data effectively to extract useful information and statistical method used in statistical decision using experimental data.

COURSE OBJECTIVE (S):

The objectives of this course are to:

1.   Explain the fundamentals of python programming
2.   Discuss the data science and issues of Data science.
3.   Describe the methods and programming tips of handling large data
4.   Summarize the fundamentals of statistics and various Data Visualization techniques

COURSE OUTCOMES (COS)
    After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply the concepts of python programming to develop simple applications.	1-5,8,9,10	1,2
CO2	Make use of the concepts of data science for solving real world problem.	1-5,8,9,11	1,2
CO3	Identify the techniques which are suitable to handle large volumes of data for distributed data storage.	1-5,7,9,10,11	1,2

CO4	Analyze the results obtained using various visualization techniques on given data.	1- 5,8,10,11,12	3
CO5	Apply python code to analyse the data science methods.	1-12	3
CO6	Develop data science application using python coding	1-12	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1			√			
CO2			√			
CO3		√				
CO4			√	√		
CO5			√		√	
CO6				√		√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	1	0	0	3	3	2	0	0	3	3	0
CO2	2	2	1	2	2	0	0	3	3	0	2	0	3	3	0
CO3	2	2	2	1	2	0	3	0	3	3	2	0	3	3	0
CO4	2	2	1	2	2	0	0	3	0	3	2	3	0	0	3
CO5	3	2	3	3	3	3	3	3	3	3	3	3	0	0	3
CO6	3	3	2	2	2	3	3	3	3	3	2	3	0	0	3

Note:1-Low,2-Medium,3-High

COURSE CONTENTS:

THEORY

UNIT- 1

Introduction to concepts of OOPs: Objects and Classes, Data Abstraction, Encapsulation, Polymorphism and Inheritance. Difference between OOP and POP. Python IDEs.

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, and Dictionaries.

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

UNIT- 2

Introduction to Data Science: Definition: Big Data and Data Science Hype, Why Data Science, Getting Past the Hype, Current Landscape, Who is Data Scientist? Data Science Process Overview, Defining goals, Retrieving data, Data preparation, Data exploration, Data modeling, Presentation.

UNIT -3

Handling large data on a single computer: The problems you face when handling large data, General techniques for handling large volumes of data, General programming tips for dealing with large data sets, Case study 1: Predicting malicious URLs, Case study 2: Building a recommender system inside a database. First Steps in Big data: Distributing data storage and processing with Frameworks, Case study: Assessing risk when loaning money.

UNIT- 4

Statistics: Introduction, Types of Statistics. Data Visualization and Interpretation: Histogram, Bar Charts, Scatter Plots, Good vs. Bad Visualization.

Sampling distributions: Point estimation - estimators, minimum variance unbiased estimation, maximum likelihood estimation, method of moments, consistency; Interval estimation.

TEXT BOOKS:

1. Mark Pilgrim, "Dive into Python 3", Apress Special Edition, Second Edition, 20l5.
2. Davy Cielen, Arno D. B. Meysman, Mohamed Ali, "Introducing Data Science", Manning Publications Co., 1st edition, 2016.
3. Travis E. Oliphant, "Guide to NumPy", Trelgol publishers,2006.
4. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Morgan Kaufmann, 2011.
5. William Navidi, "Statistics for Engineers and Scientists", McGraw Hill Education, India, 3rd Edition, 2013.

REFERENCE BOOKS:

1. Mark Lutz, "Learning Python", Oreilly.2003.
2. John M. Zelle, "PYTHON Programming: An Introduction to Computer Science", Franklin, Beedle & Associates, 2009.
3. Michael Dawson, "Python Programming for the Absolute Beginners", 3rd Edition, CENAGE Learning, 2011.
4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.
5. K.P. Soman, Shyam Diwakar and V. Ajay ", Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2016.

JOURNALS/MAGAZINES

1. https://datascience.codata.org
2. https://www.springer.com/journal/41060
3. https://ieeexplore.ieee.org/document/8757088
4. https://www.ijcseonline.org/pub_paper/57-IJCSE-03229.pdf

SWAYAM/NPTEL/MOOCs:

1. https://onlinecourses.nptel.ac.in/noc21_cs33/preview
2. Python for Data Science, AI & Development -Coursera

Self-Learning Exercises:

Data Science using R, Creating own datasets, functions and packages in R and using packages in R

Course Title	Deep Learning (OE III)				Course Type		Theory	
Course Code	B20CIO702	Credits		3	Class		VII semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50%	50%

COURSE OVERVIEW:

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 OBJECTIVE (S):

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 (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Apply the basic concepts of mathematics to solve problems based on deep learning concepts.	1-10	1,2
CO2	Make use of suitable machine learning algorithms on real world problems (classification, clustering).	1,-11	1,2
CO3	Utilize deep learning neural network model on real time applications.	1-10	1,3

CO4	Develop Recommender systems applications using CNN concepts of NLP.	1-12	1
CO5	Analyse real world problems	1-12	3
CO6	Create a solution to solve real world problems	1-12	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		√	√			
CO2			√			
CO3			√			
CO4						√
CO5				√	√	
CO6				√	√	√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	2	3	3	2	3	0	0	3	3	0
CO2	2	3	1	2	1	3	3	2	2	2	3	0	3	3	0
CO3	1	3	1	2	2	3	2	1	2	3	0	0	3	0	3
CO4	1	1	3	2	1	3	2	3	2	3	33	2	3	0	0
CO5	2	3	2	3	3	3	3	3	3	2	3	2	0	0	3
CO6	3	2	3	3	3	3	2	3	2	3	3	2	0	0	3

Note:1-Low,2-Medium,3-High

COURSE CONTENT
THEORY:

Contents
UNIT-1
Machine Learning Basics: Linear Algebra-Scalors, 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.

TEXTBOOKS:
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-Inder science. 2nd Edition. 2001.
2. Theodoridis, S. and Koutroumb as, 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.

JOURNALS/MAGAZINES:
1. Springer Journal of Machine Learning, https://www.springer.com/journal/10994
2. http://ieeexplore.ieee.org/document/8297269/

SWAYAM/NPTEL/MOOCs:
1. https://www.my-mooc.com/en/categorie/deep-learning
2. https://nptel.ac.in/courses/106/105/106105215/

Linear factor Models, Structured probabilistic Models, Monte-Carlo Methods, Deep generative Models.

course Title	Summer Internship/Global Certification				Course Type		Theory	
Course Code	B20CI0701	Credits	3		Class		VII semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	3	6	6	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	6	6	-	78	-	100

COURSE OVERVIEW:

This course covers student's knowledge with industry.

COURSE OBJECTIVES:

Objectives of this course are to:
1. Learn industry knowledge
2. Get certificate of emerging technologies

Course Out comes (Cos):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Study emerging technologies	1 to 5, 7,810,11,12,	1
CO2	Analyze real time problems	1 to 5, 7,8,9,11,12	2
CO3	Design and develop the for the solution	1 to 5, 7,8,9,11,12	2, 3
CO4	Make use of emerging models for real world applications.	1 to 5, 8,9,10,11	3
CO5	Apply new Techniques for real time applications	1-12	3
CO6	Develop an algorithm using latest technology to an applications	1-12	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		√	√			
CO2		√	√			
		√	√			
CO4		√				
CO5			√		√	
CO6						√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	0	3	2	0	2	3	2	3	0	0
CO2	3	3	2	1	3	0	3	2	3	0	2	3	0	3	0
CO3	3	3	3	2	2	0	3	2	3	0	2	3	0	3	3
CO4	3	3	3	1	1	0	0	3	3	2	3	0	0	0	3
CO5	3	2	3	3	3	2	2	3	2	3	2	3	0	0	3
CO6	3	2	3	3	2	2	3	2	3	2	3	2	0	0	3

Note: 1-Low, 2-Medium, 3-High

JOURNALS/MAGAZINES

1. https://www.springer.com/journal/500
2. https://www.journals.elsevier.com/
3. Https://IEEE.org

SWAYAM/NPTEL/MOOCs:

1. https://nptel.ac.in/courses/106/105/106105173

SELF LEARNING

Linear Algebra, probability and Information Theory, Genetic Algorithms.

Course Title	Project Phase-1				Course Type		Theory	
Course Code	B20CI0702	Credits	4		Class		VII semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	4	8	8	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	4	8	8	-	104	-	100

COURSE OVERVIEW:

This course covers student's innovation in current trends.

COURSE OBJECTIVES:

Objectives of this course are to:
1. Learn current trends
2. Expose their knowledge with innovation methods to develop new technology

Course Outcomes (Cos):
After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Study emerging technologies	1 to 5, 7,810,11,12,	1
CO2	Analyze real time problems	1 to 5, 7,8,9,11,12	2
CO3	Design and develop the for the solution	1 to 5, 7,8,9,11,12	2, 3
CO4	Make use of emerging models for real world applications.	1 to 5, 8,9,10,11	3

CO5	Apply new Techniques for real time applications	1-12	3
CO6	Develop an algorithm using latest technology to an applications	1-12	3

BLOOM'S LEVEL

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		√	√			
CO2		√	√			
		√	√			
CO4		√				
CO5			√		√	
CO6						√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	0	3	2	0	2	3	2	3	0	0
CO2	3	3	2	1	3	0	3	2	3	0	2	3	0	3	0
CO3	3	3	3	2	2	0	3	2	3	0	2	3	0	3	3
CO4	3	3	3	1	1	0	0	3	3	2	3	0	0	0	3
CO5	3	2	3	3	3	2	2	3	2	3	2	3	0	0	3
CO6	3	2	3	3	2	2	3	2	3	2	3	2	0	0	3

Note:1-Low,2-Medium,3-High

JOURNALS/MAGAZINES

1. https://www.springer.com/journal/500
2. https://www.journals.elsevier.com/
3. Https://IEEE.org

1. https://nptel.ac.in/courses/106/105/106105173
SELF LEARNING

Linear   Algebra,   probability   and   Information   Theory,   Genetic   Algorithms

Detailed Syllabus
Semester 8

Course Title	Capstone - Project Phase-II				Course Type		Theory	
Course Code	B20CI0801	Credits		8	Class		VIII semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	-	-	-				
	Practice	8	16	16	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	8	16	16	-	208	-	100

COURSE OVERVIEW:

This course covers student's innovation in current trends.

COURSE OBJECTIVES:

Objectives of this course are to:
1. Learn current trends
2. Expose their knowledge with innovation methods to develop new technology

Course Outcomes (Cos):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Study emerging technologies	1 to 5,7,810,11,12,	1
CO2	Analyze real time problems	1 to 5, 7,8,9,11,12	2
CO3	Design and develop the for the solution	1 to 5, 7,8,9,11,12	2, 3
CO4	Make use of emerging models for real world applications.	1 to 5, 8,9,10,11	3
CO5	Apply new Techniques for real time applications	1-12	3
CO6	Develop an algorithm using latest technology to an applications	1-12	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		√	√			
CO2		√	√			
CO3		√	√			
CO4		√				
CO5			√		√	
CO6						√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	0	3	2	0	2	3	2	3	0	0
CO2	3	3	2	1	3	0	3	2	3	0	2	3	0	3	0
CO3	3	3	3	2	2	0	3	2	3	0	2	3	0	3	3
CO4	3	3	3	1	1	0	0	3	3	2	3	0	0	0	3
CO5	3	2	3	3	3	2	2	3	2	3	2	3	0	0	3
CO6	3	2	3	3	2	2	3	2	3	2	3	2	0	0	3

Note:1-Low,2-Medium,3-High

JOURNALS/MAGAZINES

1   https://www.springer.com/journal/500

2

Course Title	IoT Programming(OE-IV)				Course Type		Theory	
Course Code	B20CIO801	Credits	3		Class		VIII Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50	50

3
SWAYAM/NPTEL/MOOCs:
1.   1 https://nptel.ac.in/courses/106/105/106105173
Self Learning

Linear Algebra, probability and Information Theory, Genetic Algorithms

COURSE OVERVIEW:

   The course covers the importance of IoT in society, the current components of typical IoT devices and trends for the future. IoT design considerations, constraints and interfacing between the physical world and your device will also be covered. This course will get to know how to make design trade-offs between hardware and software. It also covers key components of networking to ensure that students understand how to connect their device to the Internet.

COURSE OBJECTIVE (S):

The objectives of this course are to:
1.   Explain basics of Arduino program.
2.   Illustrate sample programs to interface sensors to aurdino board storead, process and analyze data.
3.   Demonstrate WebApp stored and stored at a from sensors, and to monitor and control IoT devices.
4.   Discuss IoT programming to develop larger smart products useful for the society.

COURSE OUTCOMES (COs):

After the completion of the course, the student will be able to:

CO#	Course Outcomes	Pos	PSOs
CO1	Develop programs to interface sensors to Aurdino board stored, process and analyze data.	1-6,8-10	3
CO2	Analyse the performance of Communication Protocols used in real time IoT Projects.	1-6,8,9	1
CO3	Make use of different IoT Patterns to develop the real-world applications.	1-6,9,11	2

CO4	Identify the IoT security requirements to solve the given real world problem.	1-6, 8,10,11,12	1
CO5	Analyze Real world IoT applications	1-12	3
CO6	Develop an real time application in IoT environment	1-12	3

BLOOM'S LEVEL OF THE COURSE OUTCOMES:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1				√		√
CO2				√		
CO3			√			√
CO4		√	√			
CO5				√	√	
CO6					√	√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	3	2	0	3	2	3	0	0	0	0	3
CO2	2	3	3	2	2	3	0	3	2	0	0	0	3	0	0
CO3	3	3	2	2	3	3	0	0	3	3	2	3	3	0	0
CO4	3	3	3	3	3	2	0	3	0	3	3	3	3	0	0
CO5	3	2	3	3	2	3	3	2	2	1	2	3	0	0	3
CO6	2	3	3	3	2	3	2	3	2	3	3	3	0	0	3

Note:1-Low,2-Medium,3-High

COURSE CONTENTS:

THEORY:

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(Wi-Fi), 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.   **Security Requirements in IoT Architecture:** Security in Enabling Technologies - Security Concerns in IoT Applications. Security Architecture in the Internet of Things - Security Requirements in IoT.   **Insufficient Authentication/Authorization** - Insecure Access Control - Threats to Access Control, Privacy, and Availability - Attacks Specific to IoT. Vulnerabilities - Secrecy and Secret-Key Capacity - Authentication/Authorization for Smart Devices - Transport Encryption - Attack & Fault trees.   **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",Apress,2015.
2. Brian Russell, Drew Van Duren, "Practical Internet of Things Security" (Kindle Edition),2016

REFERENCE BOOKS:
1. 1.Agus Kurniawan, "Smart Internet of Things Projects",Packt Publishing, 2016.
2. 2.IEEE Internet of Things Journal.
3. Elsevier Journal of Internet of Things.

JOURNALS/MAGAZINES:
1 IEEE Internet of Things Journal.
2. Elsevier Journal of Internet of Things.

SWAYAM/NPTEL/MOOCs:

1. https://onlinecourses.nptel.ac.in/noc20_cs66/preview
2. An Introduction to Programming the Internet of Things (IOT) Specialization -Coursera

Self-Learning Exercises:
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, MediatekLinkit One, Particle Photon, Tessel, Adafruit Flora, LightBlue Bean, Udoo Neo, Intel Edison)

Course Title	Reinforcement Learning (OE-IV)				Course Type		Theory	
Course Code	B20CIO802	Credits	3		Class		VIII Semester	
Course Structure	TLP	Credits	Contact Hours	Work Load	13Hrs/ Semester		Assessment in Weightage	
	Theory	3	3	3				
	Practice	-	-	-	Theory	Practical	CIE	SEE
	Tutorial	-	-	-				
	Total	3	3	3	39	0	50	50

Course Overview:

This course covers fundamental principles and techniques in deep and reinforcement learning. Topics include convolutional neural networks, recurrent and recursive neural networks, back propagation algorithms, regularization and optimization techniques for training such networks, dynamic programming, Monte Carlo, and temporal difference, and function approximation reinforcement learning algorithms, and applications of deep and reinforcement learning.

Course Objectives:
The objectives of this course are to:

3. Describe back propagation algorithms to train deep neural networks and apply regularization techniques.
4. Explain optimization techniques to train deep neural networks and convolutional neural networks.
5. Discuss recurrent neural networks to analyze basic deep learning algorithms for speech recognition, face recognition, object recognition and NLP.
6. Demonstrate reinforcement learning algorithms for real time applications

Course Outcomes:

After the completion of the course, the student will be able to:

CO#	Course Outcomes	POs	PSOs
CO1	Identify the concepts of Deep Feed forward Networks to train deep neural networks.	1- 6, 8,10	1
CO2	Utilize optimization techniques in deep neural networks and convolutional neural networks for real world application.	1-5, 7,9,10 ,12	1
CO3	Develop recurrent neural networks algorithm for analysis of NLP applications.	1-6,9,10,12	1
CO4	Solve real world complex problems using reinforcement learning algorithms.	1-6, 8,9,10	1
CO5	Apply learning algorithm in various real world problems	1-12	3
CO6	Create a algorithm for solving real world problems	1-12	3

BLOOM'S LEVELOF THECOURSE OUTCOMES:

CO#	Bloom's Level					
	Remember (L1)	Understand (L2)	Apply (L3)	Analyze (L4)	Evaluate (L5)	Create (L6)
CO1		√				
CO2			√			
CO3				√		√
CO4			√			
CO5			√	√		
CO6						√

COURSE ARTICULATION MATRIX

CO#/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	2	2	0	3	0	3	0	0	3	0	0
CO2	1	2	1	1	1	0	3	0	3	2	0	2	3	0	0
CO3	3	2	1	2	2	1	0	3	2	3	0	1	3	0	0
CO4	2	1	3	2	2	1	0	3	2	3	0	0	3	0	0
CO5	3	3	3	2	2	3	2	3	2	3	2	3	0	0	3
CO6	2	3	3	3	2	3	2	3	3	2	3	3	0	0	3

Note:1-Low,2-Medium,3-High

COURSE CONTENTS:

THEORY

Unit-1
Deep Networks: Deep Feed forward Networks: Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms**. Regularization for Deep Learning**: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multitask Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier.

Unit-2
Optimization for Training Deep Models: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms. **Convolutional Networks:** The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuro scientific Basis for Convolutional Networks.

Unit-3
Sequence Modelling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence, Architectures, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Echo State Networks, Leaky Units and Other Strategies for Multiple Time Scales, The Long Short-Term Memory and Other Gated RNNs, Optimization for Long-Term Dependencies, **Applications:** Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing.
Unit-4
The Reinforcement Learning Problem: Reinforcement Learning, Elements of Reinforcement Learning, Limitations and Scope. Multi-arm Bandits :An n-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, Tracking a Non stationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandits, Associative Search, **Finite Markov Decision Processes** : The Agent–Environment Interface , Goals and Rewards, Returns, Unified Notation for Episodic and Continuing Tasks, The Markov Property, Markov Decision Processes, Value Functions, Optimal Value Function, Optimality and Approximation, Dynamic Programming: Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration.

TEXT BOOKS:

1. Ian Good fellow, Yoshua Bengio, and Aaron Courville Deep Learning, MIT Press, 2016
2. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning: An Introduction" Second Edition, the MIT Press,2015.

REFERENCE BOOKS:

1. 1 Abhishek Nandy, Manisha Biswas, Reinforcement Learning: With Open AI, Tensor Flow and
2. Keras Using Python, Apress,2017.
3. Eugene Charniak, Introduction to Deep Learning, The MIT Press, 2018.

JOURNALS/MAGAZINES:

1. https://ieeexplore.ieee.org/document/6025669
2. https://ieeexplore.ieee.org/document/7301554
3. https://www.jair.org/index.php/jair/article/view/10166
4. http://www.ijstr.org/final-print/mar2020/A-Study-Of-Reinforcement-Learning-Applications-Its-Algorithms.pdf

SWAYAM/NPTEL/MOOCs:

1   https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs27/

2   Reinforcement Learning, Practical Reinforcement Learning-Coursera

SELF-LEARNING EXERCISES:

Implement and apply Monte Carlo reinforcement learning algorithms, implement and apply temporal-difference reinforcement learning algorithms.