NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

1.1.1- Curriculum Design and Development

(2021-2022)

Additional information

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Department of Civil Engineering
Vision – Mission – PEOs – PSOs – POs

Vision		To be a centre of excellence with state of art infrastructure and imbibe knowledge on advanced technologies in the field of Civil engineering with a focus on research and sustainable development for the benefit of society.
Mission		M1: Train the students as technologically motivated Civil engineers who can serve the society competently, collaboratively and ethically as Planners, designers, constructors and operators. M2: To provide quality-based consultancy services to the communities for the development of civil engineering industry and other allied fields. M3: To ignite innovative thinking, entrepreneur skills and research among students.
Program Educational Objectives	PEO 1	Analyze and design infrastructural projects of civil engineering
	PEO 2	Lead their teams to complete the projects ethically and sustainably.
	PEO 3	Apply innovative technologies and update skills through lifelong learning.
Program Specific Outcomes	PSO1	The students will be able to apply fundamental concepts of structural, geotechnical, water Resources and environmental engineering to make best projects in civil engineering.
	PSO2	The students will develop skills to design sustainable solutions for real time problems of Civil engineering by adopting modern technologies and designing tools.
Program Outcomes	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
	PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
	PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	PO5	**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.
	PO6	**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.
	PO7	**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.
	PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
	PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
	PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
	PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
	PO12	**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.

IQAC

PRINCIPAL
NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)
NARASARAOPET - 522 601
Guntur (Dist.) A.P.

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Department of Electrical and Electronics Engineering
Vision – Mission – PEOs – PSOs – POs

Vision		To impart student centric education in the field of Electrical and Electronics Engineering to transform the individuals into competent engineers with a focus on research and ethics.
Mission		M1: To provide knowledge-based technology and infrastructure to meet the needs of industry and society. M2: To assimilate innovation and research-oriented culture to make successful professionals and entrepreneurs. M3: To encourage lifelong learning with ethics among the students so as to make them as responsible individuals.
Program Educational Objectives	PEO 1	Apply the science and engineering knowledge to solve complex problems of electrical and electronics engineering.
	PEO 2	Continue their education to become as researchers and entrepreneurs.
	PEO 3	Work effectively with high ethical values, as individuals and as team members.
	PEO 4	Adopt new methodologies as lifelong learners for their career growth.
Program Specific Outcomes	PSO1	Apply appropriate techniques and modern tools in the field of electrical and electronics engineering.
	PSO2	Demonstrate the sustainable development in non-conventional Energy sources.
Program Outcomes	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
	PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
	PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	PO5	**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.
	PO6	**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.
	PO7	**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.
	PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
	PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
	PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
	PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
	PO12	**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.

IQAC

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Department of Mechanical Engineering
Vision – Mission – PEOs – PSOs – POs

Vision		To strive for making competent **mechanical engineering Professionals** to cater the real time needs of Industry and **Research** Organizations of high repute with **entrepreneurial skills and ethical values.**
Mission		**Mission 1:** To train the students with **state of art infrastructure** to make them industry ready professionals and to promote them for higher studies and **research.** **Mission 2:** To employ committed **faculty** for developing competent mechanical engineering graduates to deal with **complex** problems. **Mission 3:** To support the students in developing professionalism and make them **socially** committed mechanical engineers with morals and **ethical values.**
Program Educational Objectives	PEO 1	Excel in profession with sound knowledge in mathematics and applied sciences
	PEO 2	Demonstrate leadership qualities and team spirit in achieving goals
	PEO 3	Pursue higher studies to ace in research and develop as entrepreneurs
Program Specific Outcomes	PSO1	The students will be able to apply knowledge of modern tools in manufacturing enabling to conquer the challenges of Modern Industry.
	PSO2	The students will be able to design various thermal engineering systems by applying the principles of thermal sciences.
	PSO3	The students will be able to design different mechanisms and machine components of transmission of power and automation in modern industry.
Program Outcomes	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
	PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
	PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	PO5	**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.
	PO6	**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.
	PO7	**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.
	PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
	PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
	PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
	PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
	PO12	**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.

IQAC

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Department of Electronics and Communication Engineering
Vision – Mission – PEOs – PSOs – POs

Vision		To emerge as a centre of excellence in Electronics and Communication Engineering through student centric education and research focus to cater the current and future needs of society.
Mission		M1: To provide best infrastructure for empowering the students with quality education to motivate them towards higher studies and research. M2: To provide qualified and experienced faculty for student centric teaching in order to mould the students as successful professionals in modern Electronics industry. M3: To inculcate leadership qualities, professional etiquette, ethical values and social responsibilities.
Program Educational Objectives	PEO 1	Demonstrate successful professional careers with strong fundamental knowledge in mathematics, science and engineering to meet real time requirements of industry.
	PEO 2	Learn continuously with a focus on advanced emerging trends in the field of ECE and allied to meet the societal needs.
	PEO 3	Pursue higher education leading to masters and research programmes for knowledge dissemination in profession.
Program Specific Outcomes	PSO1	Design and develop IoT applications using Raspberry Pi, Arduino and other advanced processors.
	PSO2	Design and synthesize various circuits using latest hardware and EDA tools.
	PSO3	Design and analyse modern communication systems to meet the present and future needs of industry with cost effective solutions.
Program Outcomes	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
	PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex enginee ring problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
	PO3	**Design/development of solutions**: Design solutions for complex engineering problemsand design system components or processes that meet the specified needs with appr opriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	PO5	**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.
	PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge toassess societal, health, safety, legal and cultural issues and the consequent responsibilities re levant to the professional engineering practice.
	PO7	**Environment and sustainability**: Understand the impact of the professionalengineering solutions in societal and environmental contexts, and demonstrate th e knowledge of, and need for sustainable development.
	PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
	PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
	PO10	**Communication**: Communicate effectively on complex engineering activities with the engineer ing community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
	PO11	**Project management and finance**: Demonstrate knowledge and understanding of the enginee ring and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
	PO12	**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.

IQAC

PRINCIPAL
NARASARAOPETA ENGINEERING COLLEGE
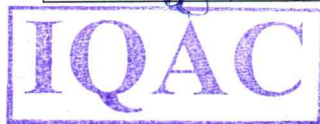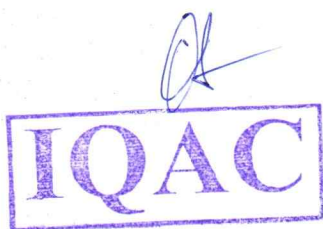(AUTONOMOUS)
NARASARAOPET - 522 601
Guntur (Dist.), A.P.

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Department of Computer Science &Engineering
Vision – Mission – PEOs – PSOs – POs

Vision		To become a centre of excellence in nurturing the quality Computer Science & Engineering professionals embedded with software knowledge, aptitude for research and ethical values to cater to the needs of industry and society.
Mission		M1: Mould the students to become Software Professionals, Researchers and Entrepreneurs by providing advanced laboratories. M2: Impart high quality professional training to get expertize in modern software tools and technologies to cater to the real time requirements of the Industry. M3: Inculcate team work and lifelong learning among students with a sense of societal and ethical responsibilities.
Program Educational Objectives	PEO 1	Apply the knowledge of Mathematics, Science and Engineering fundamentals to identify and solve Computer Science and Engineering problems.
	PEO 2	Use various software tools and technologies to solve problems related to academia, industry and society.
	PEO 3	Work with ethical and moral values in the multi-disciplinary teams and can communicate effectively among team members with continuous learning.
	PEO 4	Pursue higher studies and develop their career in software industry.
Program Specific Outcomes	PSO1	Apply mathematical and scientific skills in numerous areas of Computer Science and Engineering to design and develop software-based systems.
	PSO2	Acquaint module knowledge on emerging trends of the modern era in Computer Science and Engineering
	PSO3	Promote novel applications that meet the needs of entrepreneur, environmental and social issues.
Program Outcomes	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering s pecialization to the solution of complex engineering problems.
	PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
	PO3	**Design/development of solutions:** Design solutions for complex engineering problemsand design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	PO5	**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.
	PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge toassess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
	PO7	**Environment and sustainability**: Understand the impact of the professionalengineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
	PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
	PO9	**Individual and team work**: Function effectively as an individual, and as a·member or leader in diverse teams, and in multidisciplinary settings.
	PO10	**Communication**: Communicate effectively on complex engineering activities with the enginee ring community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
	PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineer ing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
	PO12	**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.

DEPARTMENT OF IT

Vision – Mission – PEOs – PSOs – POs

Vision		To transform into a research and technological hub to develop prominent IT professionals to serve the needs of industry and society.
Mission		M1: Induce preliminary and contemporary IT principles of the industry among the students. M2: Develop strong force of students to solve the real time problems of the IT industry. M3: Incubate the students with emerging entrepreneur intelligence.
Program Educational Objectives	PEO 1	Apply the knowledge of mathematics, science and engineering fundamentals to identify and solve IT and engineering problems.
	PEO 2	Use various software tools and technologies to solve problems related to Academia, industry and society.
	PEO 3	Work with ethical and moral values in the multi-disciplinary teams and can Communicate effectively among team members with continuous learning.
	PEO 4	Pursue higher studies and develop their career in software industry.
Program Specific Outcomes	PSO1	Ability to analyze and develop computer programs in the areas related to Algorithms, system software, application software, web design, big data analytics, database design and networking for efficient design of computer based systems of varying complexity.
	PSO2	Design, Implement and evaluate a computer-based system to meet desired needs.
	PSO3	Develop IT application services with the help of different current engineering tools.
Program Outcomes	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
	PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
	PO3	**Design/development of solutions:** Design solutions for complex engineering problemsand design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	PO5	**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.
	PO6	**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.
	PO7	**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.
	PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
	PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
	PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
	PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
	PO12	**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.

IQAC

PRINCIPAL
NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)
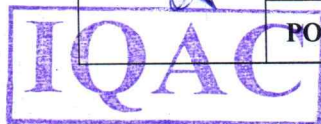NARASARAOPET - 522 601
Guntur (Dist.), A.P.

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF CSE (AI)
Vision – Mission – PEOs – PSOs – POs

|		
Vision		To be renowned department that imparts creative, learning and research skills to students in the domain of artificial intelligence.
Mission		1. To establish high performance computational facilities and tools to develop innovative and intelligent solutions. 2. To collaborate with renowned companies for multidisciplinary research and development. 3. To guide the students in learning and creative for developing intelligent technology based solutions to societal problems.
Program Educational Objectives	PEO 1	To Formulate, analyze and solve Engineering problems with strong foundation in Mathematical, Scientific, Engineering fundamentals and modern computing practices through advanced curriculum.
	PEO 2	Analyze the requirements, realize the technical specification and design the Engineering solutions by applying artificial intelligence theory and principles.
	PEO 3	Demonstrate technical skills, competency in AI and promote collaborative learning and team work spirit through multi -disciplinary projects and diverse professional activities.
	PEO 4	Equip the graduates with strong knowledge, competence and soft skills that allows them to contribute ethically to the needs of society and accomplish sustainable progress in the emerging computing technologies through life-long learning.
Program Specific Outcomes	PSO1	Ability to analyse and apply the knowledge of human cognition, Artificial Intelligence, Machine Learning and data engineering in terms of real world problems to meet the challenges of the future.
	PSO2	Ability to develop computational knowledge and project development skills using innovative tools and techniques to solve problems in the areas related to Deep Learning, Machine learning, Artificial Intelligence.
	PSO3	Ability to lead a product development company/team and use the acquired knowledge to identify real-world research problems.
Program Outcomes	PO1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
	PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
	PO3	**Design/development of solutions:** Design solutions for complex engineering problemsand design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
	PO5	**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.
	PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge toassess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
	PO7	**Environment and sustainability**: Understand the impact of the professionalengineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
	PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
	PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
	PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
	PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
	PO12	**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.

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Department of MCA
Vision – Mission – PEOs – PSOs – POs

Vision		To impart quality technical education to students focusing on computer application knowledge imbibed of Software Development and maintenance with entrepreneurship and real time usage of industry and societal needs.
Mission	M1	Impart the knowledge of modern software tools to meet the challenges in Competitive fields of Computer Science and engineering
	M2	Imparting employability skills to students.
	M3	Encourage research activities among students with advanced softwares and tools.
Program Educational Objectives	PEO 1	Apply their knowledge to solve real-world problems using Computer Apps.
	PEO 2	Get employment as Software Professional capable of undertaking software development matching with the current and future needs through technological innovations, and inter-disciplinary works.
	PEO 3	Functions effectively as individuals and in any team at the workplace demonstrating ethical behavior, quality conscious Software Professional with sensitivity to the impact of technology on society.
	PEO 4	Work with confidence, commitment, capabilities to grow technically, temperamentally as; highly technical professionals, project management team members and leaders etc., through their continued efforts for lifelong learning to remain up to date in their professional pursuits.
	PEO 5	Perform search, research and feasibility studies to develop; Project Planning Documents (PPDs), User Requirements Documents (URDs), Modules on Business Process Modeling (BPM), Software Requirements Document (SRD) etc., with awareness and adaptation of various models and to replace waterfall life cycle models by other alternatives like 'Unified Process Model' and 'Agile Software Development' with abilities to; collect, analyze, translate end user requirements in to system and software requirements, architectural design etc.
Program Specific Outcomes	PSO1	To design and develop effective algorithms for computer applications.
	PSO2	To apply security mechanisms for computer applications.
	PSO3	To apply standard practices and techniques in software development.
Program Outcomes	PO1	Grasp, understand and comprehend the fundamentals of Information Technology and computer-based systems enabling them to apply their learnt knowledge, skills with right attitude after critical evaluation of approaches, procedures, trade-offs, results related engineering problems and issues in ethically responsible manner for the good of the society through the developments in the current state of the art, and future issues.
	PO2	Apply knowledge of Mathematics, Science, and Computer Applications.
	PO3	Design and conduct experiments, as well as to analyze and interpret data.
	PO4	Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
	PO5	Function on multidisciplinary teams.
	PO6	Identify, formulate, and solve real-world problems using Computer Apps.
	PO7	Get an understanding of professional and ethical responsibility.
	PO8	Communicate effectively.
	PO9	Appreciate the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
	PO10	Recognize the need for, and an ability to engage in life-long learning.
	PO11	Possess the knowledge of contemporary issues.
	PO12	Have abilities to use the techniques, skills, and modern engineering tools necessary for software engineering practice.
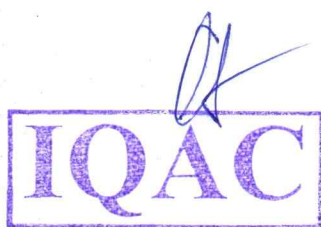
IQAC

PRINCIPAL
NARASARAOPETA ENGINEERING COLLEG
(AUTONOMOUS)
NARASARAOPET - 522 601
Guntur (Dist.), A.P.

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Department of Master of Business Administration
Vision – Mission – PEOs – PSOs – POs

Vision		To evolve as a centre of excellence in Management transmitting innovative education to magnify students to be harbingers(initiative to change) in business and research focus to cultivating the social responsibilities and ethical values among budding managers.
Mission		M1: To provide all required inputs, means and support the students to gain a distinctive competitive edge and excel in the corporate world. M2: To accommodate enriched and skilful faculty for learner-centred teaching in order to shape the students as a corporate competent. M3: To instil (create) world class, socially responsible, creative leaders and triumphant (victorious) entrepreneurs.
Program Educational Objectives	PEO 1	The MBA graduates will be successfully engaged in multidisciplinary domains in the chosen management discipline.
	PEO 2	The MBA graduates will be able to exhibit personal and professional leadership in the work and community environment.
	PEO 3	The MBA graduates engaging formal and informal learning opportunities to maintain and enhance professional and personal growth.
Program Specific Outcomes	PSO1	Equip students with necessary knowledge and managerial skills and competencies to occupy positions of management and administration in business, industry, public system and the government.
	PSO2	Develop the ability to examine and analyse the impact of the changing environment and to respond appropriately at tactical and strategic level.
	PSO3	Develop essential decision making, critical and creative thinking, leadership and entrepreneurial abilities.
Program Outcomes	PO1	Ability to apply the knowledge of business management in to practice.
	PO2	Ability to apply the knowledge of areas of economics, technology, law, accounting into complex situations and provide solution.
	PO3	Able to receive and give clear instructions, comprehend, write reports, prepare documentation and make effective presentations.
	PO4	Ability to work independently and also in a team in a diverse and multidisciplinary situations.
	PO5	Ability to apply management principles in to practice and exhibiting leadership qualities.
	PO6	Ability to keep abreast with the latest developments in the business environment by environmental scanning.
	PO7	Ability to do research and apply modern statistical tools and computational tools to analyse the situations and take a right decisions.
	PO8	Demonstrate IT knowledge and skills for efficient and effective business processes and develop innovative methods of applying IT and e-commerce for competitive advantage.
	PO9	Ability to generate new & innovative ideas, putting it into practice by knowing the particulars of starting a business.
	PO10	Demonstrate ethical conduct in personal and professional decisions and appreciation of business ethics and social responsibility and environmental concerns in the decision making process.
	PO11	Ability to actively involve and understanding the importance of independent and continuous learning and research.
	PO12	Formulate and communicate an original business idea to the broader business public and or formulate and communicate business plan

IQAC

Course Outcomes

COURSE OUTCOMES

B. TECH.(CE) - COURSE OUTCOMES ACADEMIC YEAR: 2021-22	
I B. TECH (R 20)	
I Semester	**II Semester**
ENGINEERING CHEMISTRY R20CC1103 CO 1: Analyze the suitable method of water treatment depending on the quality treatment. -Analyzing CO 2: Compare different types of polymers, fuels and their importance-Analyzing CO 3: Utilize the advanced materials as engineering materials and apply them in domestic and industrial life-Applying CO 4: Distinguish electrical energy sources and importance of corrosion science-Analyzing CO 5: Identify different types of engineering materials and applications in engineering. -Applying	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS R20CC1201** 1. Apply first order ordinary differential equations to real life situations. [Apply - K3] 2. Identify and apply suitable methods in solving the higher order differential equations. Apply - K3] 3. Solve the partial differentiation equations. [Apply - K3] 4. Interpret the physical meaning of different operators as gradient, curl and divergence. [Understanding - K3] 5. Estimate the work done against a field, circulation and flux using vector calculus. [Evaluating – K5]
LINEAR ALGEBRA and CALCULUS R20CC1102 1. Solve the system of linear equations. [Apply - K3] 2. Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors. [Analyzing-K4] 3. Relate the results of mean value theorems in calculus to Engineering problems. [Understanding-K2] 4. Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. [Apply - K3] 5. Identify the area and volume by interlinking them to appropriate double and triple integrals. [Apply - K3]	**Engineering Physics R20CC1203** CO 1: Recognize the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polarization in various fields. (Remember) K1 CO 2: Analyze and understand various types of lasers and optical fibers. (Analyze) K4 CO 3: Identifies the crystal structures and XRD techniques. (Remember) K1. CO 4: Knowing the applications of magnetic and superconducting materials in engineering field. (Remember) K1 CO 5: Identifies the use of Acoustics and Ultrasonic in engineering field. (Analyze) K4
TECHNICAL AND COMMUNICATIVE ENGLISH – I R20CC1102 CO1: Infer explicit and implicit meaning of a text, recognize key passages; raise questionsand summarize it (Apply-3). CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. (Creating-5). CO3: Build grammatically correct sentences using a variety of sentence structures (Apply3). CO4: Enhance word power and usage of lexicons (Apply3).	**ENGINEERING DRAWING R20CC1207** CO1: Construct the geometrical shapes of regular polygons, Engineering Curves, and scales. CO2: Illustrate the orthographic projections, projections of points, and lines inclined to both the planes. CO3: Construct the projection of planes inclined to both the planes. CO4: Analyse the projection of solids and the development of surfaces for regular solids. CO5: Analyse the conversion of isometric views to orthographic views vice versa.
ENGINEERING MECHANICS R20CC1107 CO 1: Apply the principles of mechanics to determine the resultant of several concurrent forces acting on a particle. CO 2: Analyze the trusses using method of joints and method of sections; apply the basic concepts of dry friction and wedges. CO 3: Illustrate the centroid and center of gravity bodies and composite sections. CO 4: Determine the Area Moment of Inertia and Mass Moment of Inertia of areas bodies and Composite sections. CO 5: Apply the work-energy principle to particles and connected systems for engineering Applications	**ELEMENTS OF MECHANICAL AND ELECTRICAL ENGINEERING R20CC1212** • Illustrate the types of power plants and applications • Demonstrate various methods of joining and material processing • Analyze the behaviour of an electrical circuit. • Measure the performance quantities such as losses, efficiency of DC machines

PROBLEM SOLVING USING C R20CC1105 CO1: Develop algorithms and flow charts for simple problems. [K3] CO2: Utilize suitable control structures for developing code in C. [K3] CO3: Make use of functions and arrays in developing modular programs. [K3] CO4: Make use of structures and pointers to write well-structured programs. [K3] CO5: Make use of file Operations in C programming for a given application. [K3]	**ELEMENTS OF BUILDING SCIENCES R20CC1216** CO1: Classify and understand the applications of basic building materials. CO2: Understand the applications of advanced building materials. CO3: Explain the principles and methods of construction of building components. CO4: Understand the building services and principles of planning. CO5: Understand the bye-laws in planning of residential buildings.
SOFT SKILLS and COMMUNICATION SKILLS LAB R20CC11L1 CO1: Communicate effectively with good pronunciation, overcoming mother tongue Influence in academic and professional environment. CO 2: Listen and comprehend several accents of English Language CO 3: Take part in various conversations/discourses using formal and informal expressions. CO 4: Adapt soft skills successfully in personal and professional life	**ELEMENTS OF IN MECHANICAL and ELECTRICAL ENGINEERING LAB** CO1: To illustrate different heat engines and its applications CO2: To join the metal sheets using welding method CO3: Determine the efficiency and regulation of 1-phase transformer CO4: Compute the performance characteristics of transformers and DC machines through
PROBLEM SOLVING USING C LAB R20CC11L2 CO1: Study, analyze and understand logical structure of computer programming and different constructs to develop programs in C Language. [K4] CO2: Compare and contrast various data types and operator precedence. [K2] CO3: Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. [K4] CO4: Analyze simple data structures, use of pointers and dynamic memory allocation techniques. [K4] CO5: Make use of functions and file I/O operations in developing C Programs. [K3]	**Engineering Physics Lab R20CC12L5** CO1: Understand the principle of physics and interpret them in engineering field and compares the results with theoretical calculations. CO2: Ability to use modern engineering physics techniques and tools in real time applications in engineering studies. CO3: The student will be enabled to know about the characteristics and the behaviour of materials in a practical manner and gain knowledge and its usage.
ENGINEERING CHEMISTRY LAB R20CC11L5 CO 1: Develop and perform analytical chemistry techniques to address the water related problems (hardness, alkalinity, Chlorine, DO)-Creating CO 2: Explain the functioning of different analytical instruments-Applying CO 3: Compare viscosity and surface tension of different oils-Analyzing CO 4: Measure molecular/system properties such as strength of solutions, conductance of solutions and acid number of lubricating oils, etc-Evaluating	**ENGINEERING WORKSHOP R20CC12L4** CO 1: Make Use of the various carpentry tools, machines, devices used in engineering practice for preparing different carpentry joints. CO 2: Make Use of the various fitting tools, machines, devices used in engineering practice for preparing different Fits. CO 3: Develop different components using Tin Smithy and black smithy tools. CO 4: Demonstrate the various house wiring connections for different house wiring connections CO5: Demonstrate the need of PC hardware components, applications and softwares. CO6: Explain the knowledge of networks, internet and World Wide Web, Search engines, Netiquette. CO7: Install and use different software like Windows XP, Linux CO8: Identify and fix the defective PC and software related issues. CO9: Formalize with parts of windows word, Excel and Power point.

	ENVIRONMENTAL STUDIES R20CCMC1
	CO-1 Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.
	CO-2 Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.
	CO-3 Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity.
	CO-4 Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices.

B. TECH.(CE) - COURSE OUTCOMES
ACADEMIC YEAR: 2021-22
II B. TECH (R 20)

I Semester	II Semester
NUMERICAL METHODS AND TRANSFORMATIONS R20CC2101 1. Evaluate approximating roots of polynomials and transcendental equations by different algorithms. [Evaluating – K5] 2. Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. [Apply – K3] 3. Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations. [Apply – K3] 4. Select appropriate technique of Laplace transforms in solving differential equations. [Apply – K3] 5. Relate Fourier series, integral, transforms techniques in their core. [understanding – K2]	**TECHNICAL AND COMMUNICATIVE ENGLISH – II R20CC2201** CO1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it (Apply-3). CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. (Creating-5). CO3: Build grammatically correct sentences using a variety of sentence structures (Apply3). CO4: Enhance word power and usage of lexicons (Apply3).
FLUID MECHANICS : R20CE2102 CO1: Understand the various properties of fluids and their influence on fluid motion and calculate the forces that act on submerged planes and curves. CO2: Identify and analyse various types of fluid flows and variety of problems in fluid statics. CO3: Analyse a variety of problems in fluid dynamics and measure the quantities of fluid flowing in pipes CO4: Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes and ducts in order to predict relevant pressures, velocities and forces. CO5: Measure the quantities of fluid flowing in tanks and channels.	**ENGINEERING GEOLOGY R20CE2202** CO1: To know the weathering process and mass movement CO2: Distinguish geological formations CO3: Identify geological structures and processes for rock mass quality CO4: Identify subsurface information and groundwater potential sites through geophysical investigations CO5: Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels.
STRENGTH OF MATERIALS – I R20CE2103 CO1: Understand the basic materials behavior under the influence of different external loading conditions and the support conditions CO2: Draw the diagrams indicating the variation of the key performance features like bending moment and shear forces CO3: Bending concepts and calculation of section modulus and for determination of stresses developed in the beams and	**STRUCTURAL ANALYSIS R20CE2203** CO1: Distinguish between the determinate and indeterminate structures. CO2: Identify the behavior of structures due to the expected loads, including the moving loads, acting on the structure. CO3: Estimate the bending moment and shear forces in beams for different fixity conditions. CO4: Analyze the continuous beams using various methods -, three moment method, slope deflection method, energy

CO4: Have knowledge of deflections due to various loading conditions. CO5: Assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure using Lame's equation.	theorems. CO5: Draw the influence line diagrams for various types of moving loads on beams/bridges.
SURVEYING AND GEOMATICS R20CE2104 CO1: Apply the knowledge to calculate angles, distances and levels. CO2: Identify data collection methods and prepare field notes. CO3: Understand the working principles of survey instruments, measurement errors and corrective measures. CO4: Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies. CO5: understand about Photogrammetry surveying.	**STRENGTH OF MATERIALS – II R20CE2204** CO1: The student will be able to understand the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes and design the sections. CO2: The student can assess stresses in different engineering applications like shafts and springs subjected to different loading conditions. CO3: The student can assess stresses in different engineering applications like columns and struts subjected to different loading conditions. CO4: The student will be able to understand the direct and bending stresses. CO5: The student will be able to understand the Unsymmetrical bending and Shear center
CONCRETE TECHNOLOGY R20CE2105 CO1: Know about the composition, manufacturing process, types and testing of cement and properties of materials used for making concrete. CO2: Understand the properties and behavior of concrete during fresh state and hardened state by various theories, concepts and tests. CO3: Understand the composition and effects of admixtures and construction chemicals used to improve the properties of concrete. CO4: Understand about Hardened concrete CO5: Knowledge about special concretes and able to design concrete mix as per IS10262 code.	**HYDRAULICS & HYDRAULIC MACHINES R20CE2205** CO1: Solve uniform open channel flow problems. CO2: Solve non uniform open channel flow problems. CO3: Understand about Basics of Turbo machinery. CO4: Understand the working principles of various hydraulic turbines. CO5: Understand the working principles of various pumps.
STRENGTH OF MATERIALS LABORATORY R20CE21L1 CO1: Behavior of materials like steel, wood, concrete etc under direct tension, compression, shear, torsion and bending. CO2: Finding properties like young's modulus, modulus of rigidity of materials. CO3: Determining hardness, impact resistance of the given materials by conducting relevant tests. CO4: Determining the percentage of water absorption of bricks.	**ENGINEERING GEOLOGY LAB R20CE22L1** CO1: Students are able to understand the importance of geology in civil engineering CO2: Students are familiar with identifying the geological process of the region related to the civil engineering works CO3: Students are able to evaluate the formation and properties of the minerals, rocks CO4: Develops the ability to prepare the geological section and maps and interpret the site
COMPUTER AIDED BUILDING DRAWING LAB R20CE21L2 CO1: Basic Auto CAD commands CO2: Various conventional signs, symbols of materials and building services CO3: Drawing plan, section and elevations of buildings and various building components CO4: Basics of creating 3D building model and rendering the model.	**FLUID MECHANICS AND HYDRAULIC MACHINERY LAB R20CE22L2** CO1: Determine the discharge using various flow measuring devices. CO2: Compute the minor and major losses in pipes. CO3: Obtain performance curves of turbines and pumps.
SURVEYING FIELD WORK LABORATORY R20CE21L3 CO1: Apply the basic principles of engineering surveying and for linear and angular measurements. CO2: Comprehend effectively field procedures required for a professional surveyor. CO3: Use techniques, skills and conventional surveying	**CONCRETE TECHNOLOGY LAB R20CE22L3** CO1: Finding the properties of concrete making materials like cement, fine aggregate and coarse Aggregate for design mix of concrete CO2: Properties and behavior of concrete in fresh and hardened states

instruments necessary for engineering practice.	CO3: Using non-destructive testing methods to estimate quality of concrete CO4: Know the properties of self-compacting concrete and fibre reinforced concrete
BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY LAB R20CE21SC1 CO1: Evaluate civil engineering materials using various tools and techniques to solve complex civil engineering material problems by following relevant IS codes and latest developments ensuring cost effectiveness, safety, environment and sustainability. CO2: Analyze construction techniques to solve complex construction technology problems by following current developments ensuring cost effectiveness, resource management, safety, environment and sustainability. CO3: Perform individually or in a team besides communicating effectively in written, oral and graphical forms on civil engineering materials and construction technology.	**ADVANCED SURVEYING R20CE22SC1** CO1: Apply the basic principles of engineering surveying and for linear and angular measurements. CO2: Comprehend effectively field procedures required for a professional surveyor. CO3: Use techniques, skills and conventional surveying instruments necessary for engineering
ENVIRONMENTAL STUDIES R20CC21MC1 CO-1 Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web. CO-2 Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources. CO-3 Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity. CO-4 Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices. CO-5 Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.	

B. TECH.(CE) - COURSE OUTCOMES ACADEMIC YEAR: 2021-22	
III B. TECH (R19)	
I Semester	**II Semester**
ENTREPRENEURSHIP & INNOVATION 19BCC5TH01 CO1: Outline the concepts of Entrepreneurship.[K2] CO2: Create the awareness on creativity and innovation.[K6] CO3: Adopt the Entrepreneurship Development programs[K6] CO4: Evaluate the project planning and feasibility studies.[K5] CO5: Analyze the concept of small and micro enterprises.[K4]	**DESIGN AND DRAWING OF STEEL STRUCTURES 19BCE6TH01** CO1: Work with relevant IS codes, Connections in steel structures. CO2: Carryout analysis and design of flexural members- compression members- tension members. CO3: Design of columns and its foundations CO4: Design of Gantry Girder

STRUCTURAL ANALYSIS 19BCE5TH02	IRRIGATION & WATER RESOURCES ENGINEERING 19BCE6TH02
CO1: Draw the shearing force and bending moment diagrams for Propped and fixed beams by consistent deformation method. C O2: Apply the Clapeyron's theorem of three moments to analyze continuous beams. CO3: Apply the slope-deflection method to analyze statically indeterminate structures. CO4: Apply the moment distribution method to analyze statically indeterminate structures.	CO1: To distinguish the theories and principles governing the hydrologic processes, CO2: To quantify major hydrologic components and apply key concepts to several practical areas of engineering hydrology and related design aspects CO3: Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures. CO4: Develop unit hydrograph and synthetic hydrograph CO5: Estimate irrigation water requirements CO6: Design irrigation canals and canal network CO7: Plan an irrigation system
DESIGN OF REINFORCED CONCRETE STRUCTURES 19BCE5TH03 CO1:Work on different types of design philosophies. CO2:Carryout analysis and design of flexural members-structures subjected to shear- bond and torsion. CO3: Design different types of compression members and footings. CO4: Design of slabs and stair case.	**FOUNDATION ENGINEERING 19BCE6TH03** CO1: Collect the soil sample below ground surface disturbed and undisturbed the soil exploration & analyze for slope stability of soil. CO2: Find out earth pressure. CO3: Evaluate the Principle and design of retaining walls and design of various type shallow foundations and bearing capacity of soil. CO4: To distinguish various types of piles CO5: To know the allowable settlement analysis and design of well foundation.
SOIL MECHANICS 19BCE5TH04 CO1: To find out formation of soil properties and basic definition. CO2: Determine and classify the soil for engineering and index properties of soil and Coefficient of permeability. CO3: Analyze the Principle of effective stress and point loads for different shapes. CO4: Determine the compaction and consolidation characteristics of soil. CO5: Determine the shear strength and compressibility of soil.	**TRANSPORTATION ENGINEERING 19BCE6TH04** CO1: Plan highway network for a given area. CO2: Design highway geometrics. CO3: Design Intersections and prepare traffic management plans. CO4: Judge Suitability of pavement materials and design flexible and rigid pavements. CO5: To know the construction and maintenance of various types of roads
CONCRETE TECHNOLOGY CODE:19BCE5TH05 CO1: Explain the properties and tests of various constituents present in Concrete. CO2: To distinguish various manufacturing process of concrete and properties and workability tests Of fresh concrete. CO3: Design concrete mix as per IS and ACI standards. CO4 : Enumerate the mechanical behavior and properties of hardened Concrete. CO5: Demonstrate the long term properties of concrete and identify the solutions for field problems. CO6: Select the suitable type of special concrete for real time situations Concrete making Materials:	**ADVANCED DESIGN OF CONCRETE STRUCTURES 19BCE6TH05** CO1:- Design raft foundations and different types of RCC retaining walls, RCC water tanks CO2:- Carryout analysis and design of flat slabs CO3:- Design of RCC Bunkers, Silos and Chimneys CO4:- Classify various types of transmission towers and loading on them.
SOIL MECHANICS LABORATORY 19BCE5LB01 CO1: To determine basic soil properties and classify the soil for Engineering application CO2: To investigate the engineering properties of the soil such as Strength- Compressibility and permeability and apply the same to the engineering problems.	**NUMERICAL METHODS IN CIVIL ENGINEERING 19BCE6TH06** CO1: Solve algebraic equations. CO2: Obtain numerical solution of ordinary and partial differential equations. CO3: Apply integration method/s for structural analysis. CO4: Carry out interpolations and curve fitting, CO5: Obtain solution of Eigen value problems and Fourier series for structural analysis. CO6: Apply iterative and transformation methods in structural engineering.

CONCRETE TECHNOLOGY LAB 19BCE5LB02 CO1: Conduct test on properties of cement CO2: Conduct test on properties of Aggregates CO3: Conduct test on properties of concrete	**GROUND WATER HYDROLOGY 19BCE6TH07** CO1: Have a thorough getting about Groundwater hydrology. CO2: Be able to determine aquifer parameters and yield of wells. CO3: Be able to learn about groundwater management and transport process.
ADVANCED COMMUNICATION SKILLS LAB 19BCE5LB02 CO 1: Compile emails, letters, reports and resume. (Create-6) CO 2: Develop presentation Skills and make formal presentations using strategies. (Apply 3) CO 3: Analyse problem solving skills effectively to participate in Group Discussions (Analyze-4) CO 4: Build interview skills for employability. (Apply -3)	**ALTERNATIVE CONSTRUCTION TECHNOLOGY 19BCE6TH08** CO1: To identify various building materials and select suitable type of building material for given situation. CO2: To be aware of various traditional building materials and also the emerging materials in the field of Civil Engineering construction. CO3: To select suitable type of Agro and industrial wastes-properties and its applications CO4: To select Equipment for production of alternative materials as per their need of work.
	TRANSPORTATION ENGINEERING LAB 19BCE6LB01 CO1: Conduct traffic studies for estimating traffic flow characteristic. CO2: Perform quality control tests on pavement materials CO3: Estimate earth work from longitudinal and cross-section details
	FIELD WORK WITH DIGITAL TECHNOLOGIES LAB 19BCE6LB02 CO1: Measuring the vertical distances and difference in elevation using Total station. CO2: Measure the horizontal and vertical angles using Total station. CO3: Mapping the real time data on the drawing sheet using the plane table.

B. TECH.(CE) - COURSE OUTCOMES
ACADEMIC YEAR: 2021-22

IV B. TECH (R16)

I Semester	II Semester
ESTIMATING COSTING & VALUATION • Estimating quantities required for different civil engineering works like single storey residential building, BT road, canal etc. • Cost estimation of different civil engineering works like single storey residential building, BT road, canal etc. • Finding the unit rate of different items of work. • Analysing a project and finding critical activities and hence allocate resources as per the schedule.	**BUSINESS MANAGEMENT CONCEPTS FOR ENGINEERS** • After completion of this course, the students would be able to • Learns necessary skills relating to the economics, management and accountancy which are useful for decision making. • To equip themselves with the basic principles of accounting which will be of help to them to know the fundamentals of accounting. • The student will also acquire necessary skills relating to various functional aspects of management viz., Human Resource Management, Marketing Management etc. • This course will also help the student to acquaint with the latest management concepts and practices which are used in the industry.
ENVIRONMENTAL ENGINEERING-II • Plan and design the sewerage systems. • Characterization of Sewage. • Select the appropriate appurtenances in the sewerage systems. • Selection of suitable treatment flow for sewage treatment. • Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river.	**PRESTRESSED CONCRETE** • At the end of this course the student will be able to • Understand the different methods of prestressing. • Estimate the effective prestress including the short and long term losses. • Analyze and design prestressed concrete beams under flexure and shear. • Understand the relevant IS Codal provisions for prestressed concrete

CONSTRUCTION TECHNOLOGY AND MANAGEMENT • Upon the successful completion of this course, the students will be able to: • Appreciate the importance of construction planning and Project Management. • Apply the gained knowledge to project Planning and Control. • Understand and apply the concept of Quality control and Safety Management in construction. • Understanding the function of various construction equipment's.	**ADVANCED FOUNDATION ENGINEERING** • 1. Understand safe bearing capacity of soil • 2. Determine settlement analysis of cohesive and cohesion less soil and consolidation • 3. Understand soil related problems sheet piles and anchored & coffer dams • 4. Design of different types of machine foundation • 5. Find out different shapes well foundation • 6. Design deep foundation for expansive soil
WATERSHED MANAGEMENT • Understand the different components of watershed. • Plan for developing watershed management in a needy area. • Plan for integrating the conservation aspects such as water harvesting, land management, and ecosystem management for developing an integrated watershed with minimum disturbance to the natural resources.	**PAVEMENT DESIGN** • Characterize the response characteristics of soil-aggregate- asphalt- and asphalt mixes • Analyze flexible pavements • Analyze rigid pavements • Design a flexible pavement using IRC- Asphalt Institute- and AASHTO methods • Design a rigid pavement using IRC- and AASHTO methods
SOLID AND HAZARDOUS WASTE MANAGEMENT • Comphrend Solid Waste Management program success in a city or town. • Exposure the different techniques of SWM • Assess different process techniques of solid waste • Classify different types of waste. • Analyze existing scenario of solid waste management in India	**EARTHQUAKE RESISTANT DESIGN OF STRUCTURES** • Explain fundamentals of Engineering Seismology • Able to understand the seismic design concepts • Compute equivalent lateral seismic loads and carry out a seismic design as per IS codal provisions • Able to Design multi-Storey building using Equivalent static method.
MATRIX METHODS OF STRUCTURAL ANALYSIS • Understand the static and kinematic indeterminacy of structures. • Apply the flexibility matrix concept to beams and frames. • Apply the stiffness matrix concept to beams and frames. • Apply the flexibility and stiffness matrix to solve the trusses problems. • student can apply the concept force and displacement transformation matrix to different structures	**INDUSTRIAL WASTE WATER TREATMENT** • Upon the successful completion of this course- the students will be able to: • Suggest treatment methods for any industrial wastewater. • Learn the manufacturing process of various industries. • Student will be in a position to decide the need of common effluent treatment plant for the industrial area in their vicinity.
ADVANCED DESIGN OF RC STRUCTURES CO1:- Design raft foundations and different types of RCC retaining walls, RCC water tanks • CO2:- Carryout analysis and design of flat slabs • CO3:- Design of RCC Bunkers, Silos and Chimneys • CO4:- Understand various types of transmission towers and loading on them	**PRE-FABRICATED STRUCTURES** • The student shall be able to design the prefabricated elements and also have the knowledge of the construction methods in using these elements. • The student shall be able to know about the applications of prefabricated elements for the civil engineering structures • To successfully complete the exercising part of course- each student has to develop their own reports describing real-time usage of prefabricated structure according to their own choice.
EARTH AND EARTH RETAINING STRUCTURES • Concepts of lateral pressure • Design retaining walls, • Classified anchored bulkheads, • Excavation of braced cuts and coffer dams • Stability of earth dams analysis. • Construction of earth dams	**DESIGN AND DRAWING OF HYDRAULIC STRUCTURES** • Work on different types of design philosophies. • Carryout analysis and design of tank sluice and glacis weir. • Design different types of aqueducts and surplus weir. • Design of fall and canal regulator.

HIGHWAY GEOMETRIC DESIGN	FINITE ELEMENT ANALYSIS
• Design the longitudinal and cross sectional elements of a highway. • Design the intersections, interchanges, and parking facilities. • Design the facilities for bicyclists and pedestrians. • Design parking facilities. • Understand the facilities & standards design.	• Solve simple boundary value problems using Numerical technique of Finite element method. • Develop finite element formulation of one and two dimensional problems and solve them. • Assemble Stiffness matrices- apply boundary conditions and solve for the displacements. • Compute Stresses and Strains and interpret the result.
OPEN CHANNEL HYDRAULICS • They will possess the skills to solve problems in uniform, gradually and rapidly varied flows Problems in open channels. • They will have knowledge in hydraulic machineries (pumps and turbines) in steady state conditions. • They will have knowledge of Groundwater hydraulics and its applications.	REINFORCED EARTH STRUCTURES • understand components of reinforced soil • Find reinforced earth structure- • Design the reinforced earth structure- • Use the soil nailing techniques- • Apply geosynthetics. • Use the fiber reinforced soil
ADVANCED SURVEYING • They will possess the skills to solve problems in uniform, gradually and rapidly varied flows Problems in open channels. • They will have knowledge in photogrammetric survey. • They are going to get good knowledge on remote sensing and digital image processing. • Students are having good knowledge on concept of GPS surveying concepts. • Students are going to know the concept of GIS applications in civil engineering. • They are going to know the Types of Map Projections, Map projection to a plane.	URBAN TRANSPORT PLANNING • Identify urban transportation problems. • Estimate urban travel demand. • Plan urban transport networks. • Identify urban transport corridors. • Prepare urban transportation plans
NUMERICAL METHODS IN CIVIL ENGINEERING • Solve algebraic equations. • Obtain numerical solution of ordinary and partial differential equations. • Apply integration method/s for structural analysis. • Carry out interpolations and curve fitting, • Obtain solution of Eigen value problems and Fourier series for structural analysis. • Apply iterative and transformation methods in structural engineering.	GEOGRAPHIC INFORMATION SYSTEM • To Know the fundamentals of GIS • Should be able to identify and clear the errors in Spatial data • Should be able to analyse the data from different sources • Individual should be able to identify and solve the problems with the GIS
THEORY OF ELASTICITY • To understand the deformations and strains in a body when subjected to stresses. Plane stress and plane strain problems. • To learn about stress and strain in a 2D field. Problems in 2D -Polar coordinate. • To understand the concept of stress concentration, torsion. • To understand about the membrane analogy theory.	WATER RESOURCES ENGINEERING • students to know various components of hydrologic cycle that affect the movement of water in the earth • students to know various sources of the water • the concepts of movement of ground water beneath the earth • distribution of water through the canal& head workS-dams and reservoirs head works and the basics of design of unlined and lined irrigation canals design • basic components of diversion and impounding structures • Apply math- science- and technology in the field of water resource Engineering
PAVEMENT MATERIALS AND CONSTRUCTION • Determine the proportions of ingredients required for the mix design of both asphalt mixtures and cement concrete. • Characterize the pavement materials including soil,	ENVIRONMENTAL IMPACT ASSESSMENT • Prepare EMP- EIS- and EIA report • Identify the risks and impacts of a project • Selection of an appropriate EIA methodology • Evaluation the EIA report

aggregate, asphalt, cement, asphalt mixtures, cement concrete. • Select appropriate asphalt binder for construction of a flexible pavement depending upon the traffic and climatic conditions. • Choose appropriate stabilization technique for pavement.	• Estimate the cost benefit ratio of a project • Know the role of stakeholder and public hearing in the preparation of EIA
AIR POLLUTION AND CONTROL • Identify different sources of air pollution and its effects and suggest control measures. • Judge the plume behaviour in a prevailing environmental condition • Explain control of gaseous pollution at sources.	**PROJECT WORK** • Up on completion of the project work, the student will be able to • Apply all levels of engineering knowledge in solving the engineering problems • Work together with team spirit. • Use civil engineering software at least one. • Document the projects.
PHOTOGRAMMETRY AND REMOTE SENSING • On completion of this course, the student shall be able to • Acquire knowledge about concepts of Remote sensing, sensors and their characteristics. • Gain skills in image analysis and interpretation in preparing thematic maps. • Acquire knowledge in basic concepts of Photogrammetry and Mapping.	
ADVANCED DESIGN OF STEEL STRUCTURES • To introduce the concept of industrial stacks, industrial buildings. • To design Gantry girders and different types of towers. • To study the types of beam connections and cold formed steel sections. • Design of compression and tension members, concepts of Plastic analysis.	
BRIDGE ENGINEERING • Explain different types of Bridges with diagrams and Loading standards. • Carryout analysis and design of Slab bridges, with proper investigation. T Beam bridges, Box culvers and suggest structural detailing. • Carryout analysis of Indian road congress specifications. • Organize for attending inspections and maintenance of bridges and prepare reports.	
ENVIRONMENTAL ENGINEERING LAB • Test the quality of water as per IS standards. • Decide whether the water body is polluted or not. • Assess the quality of sewage. • Draw some conclusion and decide whether the water is potable or not.	

B. TECH.(EEE) - COURSE OUTCOMES	
ACADEMIC YEAR: 2020-21	
I B. TECH (R 20)	
I Semester	**II Semester**
Technical and Communicative English – I [20CC1101] **CO1**:Infer explicit and implicit meaning of a text, recognizeKey passages; raise questions and summarize it. **CO2**: Compose paragraphs, essays, emails, letters, reports,resume and transfer information into tables, Pie and bar diagrams. **CO3**: Build grammatically correct sentences using a variety of sentence structures. **CO4**: Enhance word power and usage of lexicons.	**Differential Equations and Vector calculus [R20CC1201]** **CO1**: Apply first order ordinary differential equations to real life situations. **CO2**:Identify and apply suitable methods in solving the higherorder differential equations. **CO3**:Solve the partial differentiation equations. **CO4**:Interpret the physical meaning of different operators asgradient, curl and divergence. **CO5**: Estimate the work done against a field, circulation and flux using vector calculus.
Matrix Algebra and Calculus [R20CC1102]CO1: Solve the system of linear equations. **CO2**:Analyse the applications of matrices in variousfields and obtain Eigen values and Eigenvectors. **CO3**:Relate the results of mean value theorems in calculus to Engineering problems. **CO4**: Apply the functions of several variables to valuate the rates of change with respect to time and space variables in engineering. **CO5**: Identify the area and volume by interlinking them toappropriate double and triple integrals.	**Applied Physics [R20CC1205]** **CO1**: Interpret the experimental evidence of wave nature of light and interference in thin Films, Diffraction grating and Polaraisation in various fields. **CO2**: Analyse and understand various types of lasers and Optical fibers. **CO3**: Identify the crystal structures and XRD techniques. **CO4**: Apply the magnetic materials in engineering field. **CO5**: Identify the various applications of semiconductors in engineering field.
Basics in Mechanical and Civil engineering[20EE1109] **CO1**:Illustrate the types of power plants and applications.**CO2**: Estimate the flow parameters in various devices. **CO3**: Understand the basics elements and measurements of civil engineering. **CO4**:Explain the usage and proper selection of construction materials.	**Electronics Devices and Circuits [R20EE1209]CO1**: Use P-N diodes in electronic circuits. **CO2**: Use special diodes and rectifiers in electronic circuits. **CO3**: Explore the operation of BJT and its applications. **CO4**: Analyse the thermal stability of BJT. **CO5**: Explore the operation of FET, other transistors and theirapplications.
Problem Solving Using C [R20CC1105] **CO1**: Develop algorithms and flow charts for simple problems. **CO2**: Utilize suitable control structures for developing codein C. **CO3**: Make use of functions and arrays in developing modular programs. **CO4**: Make use of structures and pointers to write well-structured programs. **CO5**:Make use of file Operations in C programming for a given application.	**Electrical CircuitAnalysis-I [R20EE1213]** **CO1**: Analyze basic electrical circuits using mesh and nodal analysis. **CO2**: Illustrate phase and phase relationship of basic electricalelements and circuits. **CO3**: Design of tank circuit for given frequency and analyse the coupled circuits. **CO4**: Analyze the electrical circuits using network theorems for D.C. excitation. **CO5**: Analyze the electrical circuits using network theorems for A.C. excitation.
Engineering Drawing and Design [R20EE1112] **CO1: Construct** the geometrical shapes of regular Polygons,Engineering Curves, and scales. **CO2: Illustrate** the orthographic projections, projections ofpoints, and lines inclined to both the planes. **CO3:Construct** the projection of planes inclined to both theplanes **CO4: Construct** the projection of solids for engineering applications. **CO5: Analyse** the conversion of isometric views to orthographic views vice versa.	**Data Structures using C [R20EE1217]** **CO1**: Illustrate sorting and searching algorithms. **CO2**: Summarize elementary data structures such as stacks, queues and linked lists. **CO3**: Compare and contrast various forms of trees. **CO4**: Outline graph data structures and various graph traversaltechniques.

Soft Skills and Communication Skills Lab[R20CC11L1] **CO1:** Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment. **CO2**: Listen and comprehend several accents of English Language **CO3**: Take part in various conversations/discourses using formal and informal expressions. **CO4**: Adapt soft skills successfully in personal and professional life.	**Applied Physics Lab [R20CC12L10]** **CO1**: Apply the principle of physics in engineering field. **CO2**: Utilize the modern engineering physics techniques and tools in real time applications. **CO3**: Analyse characteristics, usage and the behaviour of Materials.
Basics in Mechanical and Civil Engineering Lab [R20EE11L6]CO1: Estimate the discharge through flow measurement Device. **CO2**: **Solve** the flow equations to estimate performance ofthe turbines and pumps. **CO3: Determine** the calorific value of fuel and to perform tests on engines and compressor. **CO4: Classify** and understand the applications of basic building materials. **CO5: Apply** the basic principles of engineering surveying, linearand Angular measurements**.**	**Electronics Devices and Circuits Lab [R20CC12L9]** **CO1**: Understand and analyze the behaviour of PN junction diode,Zener diode. **CO2**: Understand the operational difference between half wave and Full wave Rectifiers. **CO3**: Identify the switching characteristics of transistor. **CO4**: Analyze the characteristics of transistor. **CO5**: Identify and analyze the UJT characteristics and its Applications.
Problem Solving Using C Lab [R20CC11L2] **CO1**: Study, analyze and understand logical structure of computer programming and different Constructs to develop programs in C Language. **CO2**: Compare and contrast various data types and operatorprecedence. **CO3**: Analyze the use of conditional and looping statementsto solve problems associated with conditions and repetitions. **CO4**: Analyze simple data structures, use of pointers and dynamic memory allocation techniques. **CO5**: Make use of functions and file I/O operations in developing C Programs.	**Data Structures using C Lab [R20CC12L8]** **CO1**: Develop various algorithms using recursive andNon-recursive functions. **CO2**: Experiment with linear data structures. **CO3**: Apply Tree traversal techniques in variousapplications.
	Constitution of India (MC) [R20CCMC1] **CO1**: Examine salient features of Indian Constitution and liveaccordingly in society and interpret the meaning of Fundamental Rights of State Policy. **CO2**: Discover various aspects of Union Government. legislation and live up to the Expectations of the rules. **CO3**: Critically examine State Government legislation andimprove your living standards by following the rules strictly. **CO4**: Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living . **CO5**: Analyze the powers and functions of Election Commission and The Union PublicService Commission and decide upon it for safe and secured life.

II B.TECH. EEE (R20)	
I Semester	**II Semester**
Numerical Methods and Transformations **R20CC2101** 1. Evaluate approximating roots of polynomials and transcendental equations by different algorithms. [**Evaluating – K5**] 2. Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. [**Apply – K3**] 3. Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations. [**Apply – K3**] 4. Select appropriate technique of Laplace transforms in solving differential equations [**Apply – K3**] 5. Relate Fourier series, integral, transforms techniques in their core. [**Understanding – K2**]	**Technical and Communicative English - II** **R20CC2201** CO1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it **(Apply-3)** CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **(Creating-5)** CO3: Build grammatically correct sentences using a variety of sentence structures **(Apply3)** CO4: Enhance word power and usage of lexicons **(Apply3)**
ELECTRICAL CIRCUIT ANALYSIS-II **R20EE2102** CO 1: Analyse the balanced three phase supply connected to balanced systems. CO 2: Analyse the balanced three phase supply connected to unbalanced systems. CO 3: Ability to analyse steady state and transient response of various electrical networks. CO 4: Estimate the different types of two port network parameters. CO 5: Acquire knowledge on Filters.	**COMPLEX VARIABLES, PROBABILITY AND STATISTICS** **R20CC2202** 1. Apply the probability concepts in their respective engineering data. [**Apply–K3**] 2. Apply discrete and continuous probability distributions to solve various engineering problems. [**Apply–K3**] 3. Analyze the multivariate problems in engineering. [**Analyzing–K4**] 4. Apply the method of least squares to estimate the parameters of a regression model. [**Apply–K3**] 5. Determine the confidence interval for a population parameter for single sample and two sample cases. [**Evaluating–K5**]
ELECTRICAL MACHINES-I **R20EE2103** CO 1: Determine the performance of D.C generator for various operating conditions. CO 2: Analyze the performance characteristics of various types of D.C motors. CO 3: Select suitable speed control and testing methods of D.C motor for various applications. CO 4: Analyze the performance specifications of a single-phase transformer for various loading conditions. CO 5: Interpret the operation of three-phase transformers for various connections and achieve three-phase to two-phase transformation.	**CONTROL SYSTEMS** **R20EE2203** CO1: Develop a mathematical model of electrical and physical system. CO2: Analyse the concepts of continuous time linear control systems. CO3: Assess the stability of feedback control system with classical approach. CO4: Design simple control systems and modify the parameters to meet specific Requirements. CO5: Modelling and analysis of linear control systems using state space approach.
ELECTRO MAGNETIC FIELDS **R20EE2104** CO 1: Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, and electric energy density CO 2: Describe static electric their behaviour in different media, associated laws, and boundary conditions. CO 3: Gain the knowledge in laws of Magneto statics and apply them in static magnetic field.	**ELECTRICAL MACHINES-II** **R20EE2204** **CO 1:** Explain the working of poly phase induction motor and its testing and to draw Equivalent circuit. **CO 2:** Use suitable starting and speed control methods to enhance the performance of three phase induction motors. **CO 3:** Acquire the knowledge of 1-ph induction motors and their characteristics and their applications. **CO 4:** Gain the knowledge on the construction and performance of Salient and Non-Salient Synchronous Generator

CO 4: Compute the force experienced by charged bodies in magnetic field and identifies magnetic potential and its properties. CO 5: Identify the time varying field and understand Faraday's Laws of Electromagnetic Induction.	**CO 5:** Recall the knowledge on the construction and performance of Salient and Non- Salient type Synchronous Motor.
ANALOG ELECTRONICS **R20EE2105** **CO1**: Design the operation of feedback amplifiers. **CO2**: Explain different wave shaping circuits **CO3**: Design different basic op-amp circuits. **CO4:** Design different multivibrators using op-amp and 555 timers, different oscillators. **CO5:** Analyze about different D/A and A/D converters.	**DIGITAL ELECTRONICS** **R20EE2205** CO1: Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD. CO2: Deploy simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions. CO3: Design and analyze combinational circuits for various Applications. CO4: Design and analyze sequential circuits for various Applications. **CO5:** Implement the logic circuits on PLD's such as PROM, PAL, PLA, CPLD and FPGAs.
ELECTRICAL CIRCUIT ANALYSIS LAB **R20EE21L1** CO 1: Become familiar with the basic circuit components and know how to connect them to make a real electrical circuit. CO 2: Verify the basic network theorems and understand the relationships and differences between theory and practice. CO 3: Estimate the different types of two port network parameters CO 4: Analyse the balanced three phase supply connected to balanced and unbalanced Systems.	**CONTROL SYSTEM LAB** **R20EE22L1** CO1: Analyze the performance and working Magnetic amplifier, DC and AC servo motors and synchros. CO2: Design P, PI and PID controllers and lag, lead and lag–lead compensators CO3: Control the temperature using PID controller CO4: Determine the transfer function of DC Generator and DC Motor
ELECTRICAL MACHINES-I LAB **R20EE21L2** CO 1: Select the appropriate apparatus for determining the performance of DC machines and transformers based on the capacity experimentally. CO 2: Determine the equivalent circuit parameters of transformers experimentally. CO 3: Compute the performance characteristics of transformers and DC machines through suitable tests.	**ELECTRICAL MACHINES LAB-II** **R20EE22L2** **CO 1:** Formulate and then analyse the working and operation of any electrical machine under loaded and unloaded conditions **CO 2:** Identify different speed controlling techniques of Induction motor for the given application **CO 3:** Conduct testing and experimental procedures on different types of electrical machines. **CO 4:** Troubleshoot the operation of an electrical machine
ANALOG ELECTRONICS LAB **R20EE21L3** **CO1**: Designing Adder, Subtractor, Comparator, Differentiator and Integrator using Op-amp. **CO2**: Designing LPF, HPF, and RC Phase shift oscillator (first order) using Op-amp. **CO3**: Design and analyze clippers, Clampers and also implement the applications using op-amps. **CO4**: Design of multivibrators using 555 IC timers and Schmitt trigger circuit using op-amp.	**DIGITAL ELECTRONICS LAB** **R20EE22L3** **CO1:** Realization of logic gates using universal gates and realization of Flip-Flops. **CO2:** Design the complex combinational circuit for various applications. **CO3:** Design the complex sequential circuits for various applications. **CO4:** Design and analyze the read and write operations for memory applications.

PLC AUTOMATION R20EE21SC1 CO 1: Describe the working of various blocks of basic industrial automation system. CO 2: Connect the peripherals with the PLC. CO 3: Use various PLC functions and develop small PLC programs.	NUMERICAL TECHNIQUES USING MATLAB R20EE22SC1 CO 1: Demonstrate various commands in MATLAB programming. CO 2: Solve linear equations and differential equations. CO 3: Construct an interpolating polynomial for the given data using MATAB. CO 4: Determine time response of RLC circuit.
ENVIRONMENTAL STUDIES R20CC21MC1 CO-1 Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web. CO-2 Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources. CO-3 Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity. CO-4 Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices. CO-5 Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.	

III B.TECH. EEE (R19)

I Semester	II Semester
CONTROL SYSTEMS 19BEE5TH01 1. Develop the mathematical model of the physical systems and analyse feedback characteristics of linear control system to reduce the disturbance 2. Analyse time response of first and second order control systems for different standard test signals 3. Analyse the system response and stability in both time-domain and frequency domain 4. To perform frequency domain analysis of linear control system using bode plot and nyquist stability criterion 5. Develop and analyse state space models	ENTREPRENEURSHIP & INNOVATION 19BCC6TH01 1. Outline the concepts of Entrepreneurship.[K2] 2. Create the awareness on creativity and innovation.[K6] 3. Adopt the Entrepreneurship Development programs[K6] 4. Evaluate the project planning and feasibility studies.[K5] 5. Analyze the concept of small and micro enterprises.[K4]
POWER ELECTRONICS 19BEE5TH02 1. Demonstrate the different types of power semiconductor devices and their characteristics. 2. Analyze the performance of controlled single- phase and three- phase converters. 3. Employ suitable ac voltage controllers and cyclo-converters for a particular industrial applications 4. Examine dc-dc converters without electrical isolation. 5. Develop control methods for inverters and harmonic mitigation.	MICROPROCESSORS & MICROCONTROLLERS 19BEE6TH02 1. Recall the basic concepts, elements & operations of digital computer system. 2. Demonstrate memory organization and I/O processing for microprocessor and microcontroller. 3. Make use of Instruction set to develop Assembly Language Programming for computational operations. 4. Model a microprocessor based system by interfacing different electronic devices. 5. Illustrate the instruction set present in a microcontroller for different operations.

ELECTRICAL TRANSMISSION SYSTEM 19BEE5TH03	INTERNET OF THINGS 19BEE6TH03
1. Apply the knowledge for deriving the inductance and capacitance for various conductor configurations and to find ABCD constants for different transmission lines. 2. Model the transmission line and find the efficiency and regulation. 3. Analyze the different waves and transients in power systems. 4. Acquire the knowledge on design of transmission line and estimate distribution of voltage over a string of insulators. 5. Acquire the knowledge on insulated Cables and effect of corona.	1. Examine the application areas of IoT 2. Illustrate revolution of Internet in Mobile Devices, Cloud & Sensor Networks 3. Examine communication protocols used in IoT 4. Make use of python programming to implement Internet of Things 5. Design IoT applications using Raspberry Pi
ELECTRICAL MEASUREMENTS 19BEE5TH04	POWER SYSTEM ANALYSIS 19BEE6TH04
1. Analyse and describe construction, principle of construction operation, errors, and compensations and the extension of ranges of different electrical measuring instruments. 2. To be acquainted with the knowledge of instruments that is useful for the measurement of power and energy 3. Calibrate the PF meters and Analyse the usage of DC Bridge for the measurement of resistance, 4. Analyse the usage of AC bridges for the measurement of inductance and capacitance 5. Apply the knowledge about various types of transducers: Electrical, Mechanical, Electromechanical, Optical etc.	1. Convert a power system from one base to another base. 2. Modify an impedance matrix with any addition or removal of element. 3. Formulate the power flow problem and analyse the power system. 4. Develop and solve the positive, negative, and zero sequence networks for systems consisting of machines, transmission lines and transformers. 5. Solve for the fault voltages and currents for various faults.
SPECIAL ELECTRICAL MACHINES (Professional Elective-I) 19BEE5PE05	FLEXIBLE AC TRANSMISSION SYSTEMS (Professional Elective-II) 19BEE6PE05
1. Acquire the knowledge on operation of stepper motor and design controllers for special electrical machines. 2. Acquire the knowledge principle of operation, characteristics and control of switched reluctance motors. 3. Acquire the knowledge on commutation technique and control of BLDC motors. 4. Acquire the knowledge on torque development and explain the characteristics of permanent magnet synchronous motors. 5. Analyse the operation and control of various special Machine for a particular application.	1. Outline power flow control in transmission lines using FACTS controllers. 2. Analyse operation and control of voltage source converter. 3. Compare compensation methods to improve stability and reduce power oscillations in the transmission lines. 4. Distinguish the method of shunt compensation using static VAR compensators. 5. Illustrate the methods of compensations using series compensators and outline the operation of Unified Power Flow Controller (UPFC).
INTELLECTUAL PROPERTY RIGHTS AND PATENTS (Professional Elective-I) 19BEE5PE06	ADVANCED POWER ELECTRONIC CONVERTERS (Professional Elective-II) 19BEE6PE06
1 Importance of Intellectual Property Rights and its registration process 2 Apply the Copyright Formalities and Registration. 3 Discuss the Patent Application Process and Granting of Patent. 4 Develop the Trade Mark and know the importance of Trade Mark. 5 Apply trade Secrets and Cyber Law in cyber-crimes.	1. Examine different types of power semiconductor devices and their characteristics. 2. Analyse the performance of DC-DC Switched Mode converters and its applications. 3. Demonstrate the operation of various modes DC-AC converters and their comparisons. 4. Summarize the various categories of multi-level inverters operation clearly. 5. Analyze the working of Zero voltage and zero current switching & resonant switch converters.

SIGNALS AND SYSTEMS 19BEE5PE07	CONTROL OF ELECTRICAL DRIVES 19BEE6PE07
1 Apply signal operations on basic Signals 2 Develop Fourier series representation for trigonometric and exponential signals. 3 Translate signals from time-domain to frequency-domain and vice versa. 4 Build the LTI system and responses for different inputs. 5 Evaluate different properties of Sampling.	1. Illustrate the basic requirements of motor selection for different load profiles. 2. Analyse the steady state behaviour of DC motor drive. 3. Justify the different control techniques of Induction Motor drive. 4. Select control strategy of Synchronous Motor drive. 5. Design the controller for electrical drives.
ELECTRICAL ENERGY CONSERVATION AND AUDITING (Professional Elective-1) 19BEE5PE08	ELECTRICAL MACHINE DESIGN (Professional Elective-II) 19BEE6PE08
1. Demonstrate skills required for energy audit and management. 2. Identify different areas of Energy conservation and management. 3. Develop cost-effective measures towards improving energy efficient and energy conservation. 4. Analyze the power factor and to design a good illumination system and can find the applications of all the areas in day to day life. 5. Examine pay back periods for energy saving equipment.	1. Analyze the design considerations for rotating and static electrical machines 2. design of field system for its application. 3. design sing and three phase transformer. 4. design armature and field of DC machines. 5. design stator and rotor of induction motor. 6. design and analyze synchronous machines.
ELECTRICAL MACHINES LAB-II 19BEE5LB01	MICROPROCESSORS AND MICROCONTROLLERS LAB 19BEE6LB01
1. Select the test to find the regulation of synchronous Machine. 2. Inspect the No Load and Full load tests on Induction Motor. 3. Identify the torque and speed of given Machine.	1. Build Up the assembly language programs on arithmetic, logical and string operations. 2. Construct an 8086 system by interfacing I/O and other devices. 3. Make Use of Instruction set of 8086 for modular programming and Dos/Bios programming. 4. Model the 8051 based embedded systems for various applications.
POWER ELECTRONICS LAB 19BEE5LB02	PROCESS AUTOMATION LAB (Skill Lab) 19BEE6LB02
1. Study the characteristics of various power electronic devices and analyse firing circuits and commutation circuits of SCR. 2. Analyse the performance of single–phase and half wave and Full wave bridge converters, single–phase dual converter with both resistive and inductive loads. 3. Test for the operation of AC voltage controller and cyclo converter with resistive and inductive loads. 4. Experiment with the performance characteristics of single–phase bridge inverter and PWM inverter.	1. Describe the working of various blocks of basic industrial automation system. 2. Connect the peripherals with the PLC. 3. Use various PLC functions and develop small PLC programs.
CONTROL SYSTEM & MEASUREMENTS LAB 19BEE5LB03	
1. apply servo mechanism principles in various motor control application. 2. categorize various electrical engineering parameters and quantities used in engineering practice. 3. assess the operation of Energy meter and LVDT.	
ADVANCED COMMUNICATION SKILLS LAB (Common to All Branches) 19BCC5MC01	
1. Compile emails, letters, reports and resume. (Create-6) 2. Develop presentation Skills and make formal presentations using strategies. (Applying-3) 3. Analyze problem solving skills effectively to participate in Group Discussions (Analyze-4) 4. Build interview skills for employability. (Applying-3)	

IV B.TECH. EEE (R16)	
I Semester	**II Semester**
POWER SYSTEM OPERATION AND CONTROL **CO1:** Exhibit knowledge of emerging trends in systems used for power system operation and control. **CO2:** Compute optimal hydrothermal scheduling of Generators. **CO3:** Understand the unit commitment problem. **CO4:** Ability to model and design turbine and Automatic Controller. **CO5:** Create simple architectures for single area and two area load frequency control. **CO6:** Understand reactive power control and line power compensation.	**SOFT COMPUTING TECHNIQUES TO ELECTRICAL ENGINEERING** **CO1:** Understand the Learning Process and Learning Task, Supervised Learning – Single and Multi-Layer Network. **CO2:** Understand the back propagation networks and algorithm. **CO3:** Apply the Fuzzy Sets and Membership Functions, Operations on Fuzzy Sets, Fuzzification, Fuzzy Numbers-Operations on Fuzzy Numbers, Fuzzy Relations. **CO4:** Explain the Fuzzy Inference Systems- Architecture of Fuzzy Inference System, Fuzzy Inference Rules and Reasoning, Defuzzification, Applications of Fuzzy Logic. **CO5:** Understand the Genetic algorithms and evolutionary Computation, Applications of Genetic Algorithms. **CO6:** Explain the applications of soft computing techniques.
Switchgear and Protection **CO1:** Understand the principles of arc interruption for Application to high voltage circuit breakers of air, oil, vacuum, SF6 gas type. **CO2:** Understand the working principle and constructionalfeatures of different types of electromagnetic protective relays. **CO3:** Acquire in depth knowledge of faults that is observedto occur in high power generator and transformers andProtective schemes used for all protections. **CO4:** Improves the ability to understand various types of protective schemes used for feeders and bus bar protection. **CO5:** Generates understanding of different types of staticrelays with a view to application in the system. **CO6:** Understand the different types of over voltages appearing in the system, including existing protective schemes required for insulation co–ordination.	**FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS** **(Professional Elective-V)** **CO1:** Determine power flow control in transmission lines by using FACTS controllers. **CO2:** Explain operation and control of voltage source converter. **CO3:** Discuss compensation methods to improve stability andreduce power oscillations in the transmission lines. **CO4:** Explain the method of shunt compensation by using static VAR compensators. **CO5:** Appreciate the methods of compensations by using series compensators. **CO6:** Explain the operation of modern power electronic controllers
Utilization of Electrical Energy **CO1:** Identify a suitable motor for electric drives and Industrial applications **CO2:** Identify most appropriate heating or welding techniques for suitable applications. **CO3:** Understand various level of luminosity produced by different illuminating sources. **CO4:** Estimate the illumination levels produced by varioussources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view. **CO5:** Determine the speed/time characteristics of differenttypes of traction motors. **CO6:** Understand the terms Tractive effort and Coefficient Adhesion.	**POWER SYSTEM DEREGULATION** **(Professional Elective-V)** **CO1:** Describe importance of power system deregulation and restructuring. **CO2:** Understand structure of OASIS and able to compute ATC. **CO3:** Understand transmission congestion management. **CO4:** Compute electricity pricing in deregulated environment.**CO5:** Understand power system operation in deregulated environment. **CO6:** Understand importance of ancillary services.
MODERN CONTROL SYSTEMS (Professional Elective-III) **CO1:** Analyze the characteristics of zero order system **CO2:** How to design in state variable form. **CO3:** Know various non-linear systems and linearization methods.	**SMART GRID (Professional Elective-V)** **CO1:** Differentiate Conventional and Smart Grid. **CO2:** Identify the need of Smart Grid, Micro Grid, Smart metering, and Smart storage, Hybrid Vehicles, Home Automation and Smart Communication.

CO4: Analyze of nonlinear system using the describing function technique and phase plane analysis **CO5:** Know how to design an optimal controller. **CO6:** Formulate and solve the LQR problem and Riccatti equation.	**CO3:** Get introduced to new upcoming concepts in electricalfrom Utility to Consumers. **CO4:** Able to Remember the concept of Micro grid **CO5:** Comparing and getting acquainted with emerging technologies and current professional issues in electric Grid. **CO6:** Express the necessity of global smart communication system.
VLSI DESIGN (Professional Elective-III) **CO1:** Recall the basic structural and electrical aspects of MOS transistors, architecture of FPGA and CPLD. **CO2:** Compare the properties of NMOS, PMOS, CMOS andBipolar technologies. **CO3:** Develop the basic logic circuits using MOSFETs **CO4:** Explain the pass transistor, inverters, Latch-up inCMOS circuits and scaling rules of MOS technology. **CO5:** Build the sub systems like adders, 4 -bit processors and ALU. **CO6:** Explain inverter delays, fan-in and fan- out, power calculation and clock mechanism in VLSI design and CMOS Testing. **CO7:** Illustrate various design rules and design issues in theVLSI.	**SWITCHED MODE POWER CONVERTERS (Professional Elective-V)** **CO1:** Understand the concepts, power circuit and steady states analysis of converters **CO2:** Understand the concepts isolated bridges and steady state analysis and soft switching techniques **CO3:** Understand the concepts of resonant circuit parallel, series and types of ZVS **CO4:** Understand the concepts of ZCS and L, M types of ZCS with their performance characteristics. **CO5:** Understand and remembering of the Applications of power supply and control of switch mode DC Supplies **CO6:** Understand the design considerations of practical converter like inductor and capacitor and Transformer.
EMBEDDED SYSTEMS (Professional Elective-III) **CO1:** Illustrate the classification and Characteristics of embedded systems. **CO2:** Recall the basic passive components and core of embedded systems. **CO3:** Summarize various Communication interface in Embedded Systems. **CO4:** Explain the RTOS basics and various Communication&Synchronization techniques. **CO5:** Interpret the IDE and utility tools required to designembedded systems. **CO6:** Demonstrate the application specific and domain specific embedded systems.	
POWER QUALITY (Professional Elective-III) **CO1:** Understand the power quality issues in electrical distribution network. **CO2:** Evaluate the severity of voltage sag, voltage swell, harmonics, and transients in distribution networks. **CO3:** Understand the methods to improve the power quality. **CO4:** Design circuits to mitigate power quality issues. **CO5:** Demonstrate the relationship between distributed generation and power quality. **CO6:** Understand the Power quality monitoring, considerations and Application of intelligent systems.	
HVAC&DC TRANSMISSION (Professional Elective-IV) **CO1:** Design the voltage level and ratings of the HVDC system fora given amount of power transfer. **CO2:** Identify the suitable converter and its control schemein HVDC Transmission. **CO3:** Estimate the amount of reactive power to be compensated for a given HVDC Transmission system. **CO4:** Develop a suitable model for a given AC- DC	

network.**CO5:** Choose appropriate protecting device for various faults in HVDC stations. **CO6:** Design a suitable filter to eliminate harmonics in the	
PLC AND AUTOMATION (Professional Elective-IV) CO1: Describe the Characteristics of Registers, module addressing, holding registers, input registers, output registers and determine its importance in Ladder diagram. **CO2:** Apply the knowledge of programming formats for construction of PLC ladder diagrams in Boolean algebra systems. **CO3:** Develop ladder diagrams for process control. **CO4:** Describe the Analog modules and systems, Analogsignal processing, multi bit data processing. **CO5:** Understand various Industrial applications of PLC. **CO6:** Understand PID principles, tuning and functions.	
HIGH VOLTAGE ENGINEERING (Professional Elective-IV) **CO1:** Estimate electric field intensity of different electrodeconfigurations. **CO2:** Understand the Breakdown mechanism of Gas, LiquidAnd solid insulation. **CO3:**Acquire knowledge about the generation of high voltages and Impulse currents. **CO4:** Acquire knowledge about the Measurement of highvoltages and Impulse currents. **CO5:** Understand the testing methods of high voltage equipment. **CO6:** Design the insulation of HV power equipment.	
OPTIMIZATION TECHNIQUES (Professional Elective-IV) **CO1:** Develop an objective function and obtain solution formultivariable optimization problem With equality/ Inequality constraints **CO2:** Apply different techniques to solve transportation and assignment problems. **CO3:** Apply simulation techniques for problem solving **CO4:** Apply nonlinear programming techniques for unconstrained/constrained optimization **CO5:** Apply nonlinear programming techniques constrainedoptimization **CO6:** Use soft computing techniques to solve optimizationproblems	
POWER SYSTEMS AND SIMULATION LAB **CO1:** Understand how to measure electrical parameters characteristics of a 3-phase transmission line. **CO2:** Ability to simulate Rectifier, Chopper, Inverter and ACVoltage Controller. **CO3:** Calculate the Load flow solution of power system byiterative methods **CO4:** Perform dynamic stability analysis	

R20 - B. TECH.(ME) - COURSE OUTCOMES	
I B. TECH	
I Semester	**II Semester**
TECHNICAL AND COMMUNICATIVE ENGLISH-I **CO1:** Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. **CO2:** Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **CO3:** Build grammatically correct sentences using a variety of sentence structures. **CO4:** Enhance word power and usage of lexicons.	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS** **CO1:** Apply first order ordinary differential equations to real life situations. **CO2:** Identify and apply suitable methods in solving the higher order differential equations. **CO3:** Solve the partial differentiation equations. **CO4:** Interpret the physical meaning of different operators as gradient, curl and divergence. **CO5:** Estimate the work done against a field, circulation and flux using vector calculus.
MATRIX ALGEBRA AND CALCULUS **CO1:** Solve the system of linear equations. **CO2:** Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors. **CO3:** Relate the results of mean value theorems in calculus to Engineering problems. **CO4:** Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. **CO5:** Identify the area and volume by interlinking them to appropriate double and triple integrals.	**ENGINEERING PHYSICS** **CO 1:** Recognize the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polaraisation in various fields. **CO 2:** Analyze and understand various types of lasers & optical fibers. **CO 3:** Identifies the crystal structures and XRD techniques. **CO 4:** Knowing the applications of magnetic and superconducting materials in engineering field. **CO 5:** Identifies the use of Acoustics and Ultrasonics in engineering field.
ENGINEERING CHEMISTRY **CO1:** Analyze the suitable method of water treatment depending on the quality treatment. **CO2:** Compare different types of polymers, fuels and their importance **CO3:** Utilize the advanced materials as engineering materials and apply them in domestic and industrial life **CO4:** Distinguish electrical energy sources and importance of corrosion science **CO 5:** Identify different types of engineering materials and applications in engineering.	**ENGINEERING DRAWING** **CO1:** Construct the geometrical shapes of regular polygons, Engineering Curves, and scales. **CO2:** Illustrate the orthographic projections, projections of points, and lines inclined to both the planes. **CO3:** Construct the projection of planes inclined to both the planes. **CO4:** Analyze the projection of solids and the development of surfaces for regular solids. **CO5:** Analyze the conversion of isometric views to orthographic views vice versa.
PROBLEM SOLVING USING PYTHON **CO 1:** Outline the computer system concepts and the flowcharts using raptor to solve the given problems. **CO 2:** Summarize the fundamental concepts of python programming. **CO 3:** Interpret object oriented and event driven programming in python. **CO 4:** Apply the suitable data structures to solve the real time situational problems.	**ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGG.** **CO1:** Analyze the behaviour of an electrical circuit. **CO2:** Measure the performance quantities such as losses, efficiency of DC machines **CO3:** Create the construct of transformer and Induction motor **CO4:** Classify the importance and applications of p-n junction diode. **CO5:** Evaluate the configurations and applications of Transistor.
ENGINEERING MECHANICS **CO 1:** Apply the principles of mechanics to determine the resultant of several concurrent forces acting on a particle. **CO 2:** Analyze the trusses using method of joints and method of sections; apply the basic concepts of dry friction and wedges. **CO 3:** Illustrate the centroid and center of gravity bodies and composite sections. **CO 4:** Determine the Area Moment of Inertia and Mass Moment of Inertia of areas bodies and Composite sections. **CO 5:** Apply the work-energy principle to particles and connected systems for engineering Applications.	**MATERIAL SCIENCE AND METALLURGY** **CO1:** Illustrate the knowledge related to the structure and properties of materials, crystal Systems and phase diagrams of alloys. **CO2:** Examine properties of ferrous materials and their engineering applications **CO3:** Explain the basic concepts of Heat treatment processes and their applications **CO4:** Examine nonferrous materials properties and their engineering applications. **CO5:** Choose the various types of ceramics, composite materials and basic steps involved in the Powder Metallurgy process.

SOFT SKILLS AND COMMUNICATION SKILLS LAB -1 **CO1:** Communicate effectively with good pronunciation, overcomingmother tongue influence in academic and professional environment. **CO 2:** Listen and comprehend several accents of English Language **CO 3:** Take part in various conversations/discourses using formal andinformal expressions. **CO 4:** Adapt soft skills successfully in personal and professional life.	**ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGG. LAB** **CO1:** Determine the efficiency and regulation of 1-phase transformer **CO2:** Compute the performance characteristics of transformersand DC machines through suitable tests. **CO3:** Calculate the ripple factor of half-wave & full-wave rectifiers.**CO4:** Gain practical experience related to electronics circuits;stimulate more interestand Motivation for further studies of electrical circuits.
ENGINEERING CHEMISTRY LAB **CO 1:** Develop and perform analytical chemistry techniques to addressthe water related problems (hardness, alkalinity, Chlorine, DO). **CO 2:** Explain the functioning of different analytical instruments. **CO 3:** Compare viscosity and surface tension of different oils. **CO 4:** Measure molecular/system properties such as strength ofsolutions, conductance of solutions and acid number of lubricating oils, etc.	**ENGINEERING PHYSICS LAB** **CO1:** Understand the principle of physics and interpret them in engineering field and compares the results with theoreticalcalculations. **CO2:** Ability to use modern engineering physics techniques andtools in real time applications in engineering studies. **CO3:** The student will be enabled to know about the characteristics and the behaviour of materials in a practical manner and gain knowledge and its usage.
PROBLEM SOLVING USING PYTHON PROGRAMMING LAB **CO 1:** Create interactive visual programs using Scratch. **CO 2:** Develop flowcharts using raptor to solve the given problems. **CO 3:** Develop Python programs for numerical and text based problems. **CO 4:** Develop graphics and event based programming using Python.	**ENGINEERING WORKSHOP** **CO 1:** Make Use of the various carpentry tools, machines, devicesused in engineering practice for preparing different carpentry joints. **CO 2:** Make Use of the various fitting tools, machines, devicesused in engineering practice for preparing different Fits. **CO 3:** Develop different components using Tin Smithy and blacksmithy tools. **CO 4:** Demonstrate the various house wiring connections fordifferent house wiring connections. **CO 5:** Demonstrate the need of PC hardware components, applications and software.
	CONSTITUTION OF INDIA (MC) **CO1:** Examine salient features of Indian Constitution and liveaccordingly in society & interpret the meaning of Fundamental Rights of State Policy **CO2:** Discover various aspects of Union Government legislationand live up to the expectations of the rules. **CO3:** Examine State Government legislation and improve yourliving standards by following the rules strictly **CO4:** Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living **CO5:**Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.
R20 - B. TECH.(ME) - COURSE OUTCOMES **II B. TECH.**	
I Semester	**II Semester**

NUMERICAL METHODS AND TRANSFORMATIONS R20CC2101	APPLIED THERMODYNAMICS R20ME2204
CO1: Evaluate approximating roots of polynomials and transcendental equations by different algorithms. **CO2:** Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. **CO3:** Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations. **CO4:** Select appropriate technique of Laplace transforms in solving differential equations. **CO5:** Relate Fourier series, integral, transforms techniques in their core.	CO 1: Illustrate the reasons and effects of various losses that occur in the actual engine operation. CO 2: Analyze the combustion phenomenon and knocking in SI and CI engines CO 3: Explain the performance and emission parameters of SI and CI engines CO 4: Evaluate the parameters of performance and measurement of IC engines. CO 5: Examine the working of different types of compressors.
FLUID MECHANICS AND HYDRAULIC MACHINERY R20ME2102	**COMPLEX VARIABLES, PROBABILITY AND STATISTICS R20CC2202**
CO 1: Explain about Fluid Properties and hydrostatic forces acting on different surfaces **CO 2:** Apply conversation laws to fluid flow problems in engineering applications **CO 3:** Compute theory of Boundary layer flows, Identifies dimensionless parameters **CO 4:** Illustrate the force required to move the vane using by Jet **CO 5:** Demonstrate the turbines and its functions & Operating conditions of Centrifugal and Reciprocating pumps.	**CO1:** Apply the probability concepts in their respective engineering data. **CO2:** Apply discrete and continuous probability distributions to solve various engineering problems. **CO3:** Analyze the multivariate problems in engineering. **CO4:** Apply the method of least squares to estimate the parameters of a regression model. **CO5:** Determine the confidence interval for a population parameter for single sample and two sample cases.
METROLOGY AND INSTRUMENTATION R20ME2103	**KINEMATICS OF MACHINERY R20ME2205**
CO 1: Explain the design tolerances and fits for selected product quality. **CO 2:** Illustrate the standards of length, angle measurement. **CO 3:** Demonstrate the concepts of limit gauges and optical measurements. **CO 4:** Explain of various transducers to measure displacement **CO 5:** Analyze various temperature and pressure transducers for engineering applications	**CO 1:** Illustrate the various types of kinematic links, kinematic joints & mechanisms. **CO 2:** Interpret the various types of lower pair mechanisms for engineering applications.. **CO 3:** Construct the velocity and acceleration diagram of different mechanisms. **CO 4:** Construct the different CAM profiles under motion. **CO 5:** Demonstrate the Gears and Gear Trains.
THERMODYNAMICS R20ME2104	**MANUFACTURING TECHNOLOGY R20ME2203**
CO 1: Illustrate the concepts of heat, work, and forms of energy **CO 2:** Classify various thermal systems using thermodynamic laws and principles. **CO 3:** Apply the laws of thermodynamics for various thermodynamic systems. **CO 4:** Evaluate the performance parameters of pure substances and gas mixtures. **CO 5:** Analyze different thermodynamic cycles and estimate work done and performance	**CO 1:** Explain various manufacturing processes and fundamentals of casting process **CO 2:** Outline different types of welding process for fabrication of metals **CO 3:** Demonstrate advanced welding processes by make use of sketches **CO 4:** Compare the characteristics of cold and hot working processes of Forming, forging and Rolling **CO 5:** Explain principles of Extrusion and Drawing processes by make use of sketches

MECHANICS OF SOLIDS R20ME2105

CO 1: Illustrate the concepts of stress and strain and thermal stress in members, strain energy due gradually, suddenly applied loads.

CO 2: Analyze shear force diagrams and bending moment diagrams to the different loads for the different support arrangements.

CO 3: Determine shear stresses induced in the beams which are made with different cross sections like rectangular, circular, I, T sections.

CO 4: Solve the equations of slope and deflection for different support arrangements by double integration method, Macaulay's method.

CO 5: Determine stresses induced in cylinders subjected to internal, external pressures.

TECHNICAL AND COMMUNICATIVE ENGLISH-II R20CC2201

nfer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it**.**

ompose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams.

Build grammatically correct sentences using a variety of sentence structures.

nhance word power and usage of lexicons.

CO 1: Experiment with the flow discharge measuring devices used in pipes, channels and tanks.

CO 2: Solve the flow equations to estimate performance of the pump

CO 3: Evaluate the friction factor of a pipe flow

CO 4: Apply conservation principles to hydraulic machines

MACHINE DRAWING LAB R20ME22L1

CO 1: Explain about sectional views, limits, fits and tolerances, screw fasteners, keys, cotter Joints, bearings.

CO 2: Construct assembly drawings of engine parts, machine pars, and valves

---

MECHANICS OF SOLIDS AND METALLURGY LAB R20ME21L2

CO 1: Experiment with different materials for the evaluation of material properties through various destructive testing procedures.

CO 2: Examine the microstructures of different materials and also identify the hardness values.

APPLIED THERMODYNAMICS LAB R20ME22L2

CO 1: Examine the performance and emission parameters of SI and CI engines.

CO 2: Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine.

CO 3: Analyze Performance test on reciprocating air compressor unit.

METROLOGY AND INSTRUMENTATION LAB R20ME21L3

CO1: Examine different instruments that are available for linear, angular and roughness measurements and select and use the appropriate measuring instrument according to a specific requirement.

CO2: Analyze proper measuring instrument and know the requirement of calibration, errors in measurement.

MANUFACTURING TECHNOLOGY LAB R20ME22L3

CO 1: Prepare and Test different green sand mold and welding joints.

CO 2: Experiment on injection molding machines and different mechanical presses.

SOLID MODELLING R20ME21SC1

CO1: Create a model machine parts by using software packages

CO2: Create Simple Extruded Solid Models, understand the Basic Parametric modelling and Create and Edit Parametric Dimensions

COMPUTER AIDED ENGINEERING PRACTICE R20ME22SC2

CO1: Solve simple structural, heat and fluid flow problems using standard FEA software.

CO2: Analyzing of various components using analytical tools like ANSYS, Fusion 360 for engineering simulation.

ENVIRONMENTAL STUDIES R20CC21MC1

CO1: Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.

CO2: Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.

CO3: Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity.

CO4: Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices.

CO5: Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.

I Semester	II Semester
BUSINESS MANAGEMENT CONCEPTS FOR ENGINEERS 19BME5TH02 CO1: Summarize fundamentals of Managerial economics for decision making CO2: Apply concepts of Financial Accounting and BEP for business decisions CO3: Evaluate fundamental concepts and principles of management CO4: Discuss functional areas of management like HR, marketing and finance CO5: Apply project management techniques for project planning and evaluation	**DESIGN OF MACHINE ELEMENTS -II (Design Data Book is allowed) 19BME6TH02** CO1: Apply the design procedure to engineering problems, including the consideration of technical and manufacturing constrains of bearings. CO2: Identify the loads and stresses while designing the connecting rod and crank shaft. CO3: Analyze stresses on the piston and cylinder depending upon Design and proportions. CO4: Identify the loads and machine members subjected and calculate static and dynamic stresses to ensure safe design. CO5: Compare capacities of power transmission of Belt, Rope and Chain Drives.
METAL CUTTING & MACHINE TOOLS 19BME5TH03 CO1 Identify different cutting tool materials, tool nomenclature and calculate cutting parameters to enhance tool life. CO2 Explain the construction & specification of various machine tools and apply machining economics. CO3 Explain the working of Shaping, slotting, planning, drilling, boring machines and apply machining economics. CO4 Distinguish the working of grinding, lapping, honing and broaching processes. CO5 Illustrate the working of milling machines and apply machining economics.	**HEAT TRANSFER 19BME6TH03** CO1: Illustrate various modes of heat transfer CO2: Analyze various methods of heat transfer using extended surfaces and fins O3: Estimate heat loss from the system to the surroundings using convection. CO4: Determine various methods of design of heat exchangers. CO5: Estimation of radiation heat transfer between bodies.
HEAT POWER ENGINEERING 19BME5TH04 CO1: Illustrate the various types of efficiency improvements of Rankine cycle CO2: Describe the various boilers, mountings and accessories. CO3: Identify different types of nozzles used in steam turbines. CO4: Classify different turbines based on utility and applications. CO5: Discuss gas turbines, jet propulsion and rocket propulsion.	**DYNAMICS OF MACHINERY 19BME6TH04** CO1 Analyze the effect of precession motion on the stability of aero plane and naval ship, automobile vehicles under gyroscope. CO2 Illustrate friction in clutches, brakes and dynamometers for engineering applications. CO3 Analyze the stability of different types of governors under dynamic analysis. CO4 Analyze balancing of rotating masses by analytical and graphical methods CO5 Analyze balancing of reciprocating masses for primary and secondary forces.
DESIGN OF MACHINE ELEMENTS-I 19BME5TH05 CO1: Define and understand the design considerations and stresses in machine members. CO2: Explain and solve the problems related to strength of machine elements. CO3: Apply the engineering principles for the design of simple engineering machine members such as riveted joints, welded joints. CO4: Apply the engineering principles for the design of keys, cotters, knuckle joints and power transmission of joints. CO5: Understand and solve the problems related to shaft coupling.	**COMPLEX VARIABLES, PROBABILITY AND STATISTICS 19BME6TH01** CO1 Apply the probability concepts in their respective engineering data. CO2 Apply discrete and continuous probability distributions to solve various engineering problems. CO3 Analyze the multivariate problems in engineering. CO4 Apply the method of least squares to estimate the parameters of a regression model. CO5 Determine the confidence interval for a population parameter for single sample and two sample cases.
ENTREPRENEURSHIP & INNOVATION 19BCC5TH01 CO1 : Outline the concepts of Entrepreneurship. CO2 : Create the awareness on creativity and innovation. CO3 : Adopt the Entrepreneurship Development programs CO4 : Evaluate the project planning and feasibility studies CO5 : Analyze the concept of small and micro enterprises.	**AUTOMOBILE ENGINEERING 19BME6PE05** CO1: Acquisition of sufficient knowledge to classify Engines, Chassis, Fuel Supply Systems. CO2: Categorize and explain engine auxiliaries. CO3: Contrast steering, braking and suspension systems CO4: Estimate suitable conventional and automatic transmission system. CO5: Repair and maintain some of the engine components.

ENGINEERING SKILLS LAB 19BME5LB01	REFRIGERATION AND AIR CONDITIONING 19BME6PE06
After successful completion of this course, the students will be able to: CO1: Model and manufacture mechanical components using 3D printer. CO2: Operate a robot efficiently.	CO1: Illustrate of concepts of refrigeration and their applications. CO2: Evaluate the performance parameters of different types of refrigeration systems. CO3: Identify the desirable properties of refrigerant and its use in various refrigeration systems. CO4: Examine the special types of refrigeration systems CO5: Design of Air Conditioning systems for human comfort conditions.
METAL CUTTING & MACHINE TOOLS LAB 19BME5LB02 CO 1 Illustrate the working of lathe, shaper, planner, drilling, milling and grinding machines. CO 2 Analyze the forces acting on cutting tools for different machines.	**OPERATIONS RESEARCH 19BME6PE07** CO 1 Illustrate and solve linear programming problems. CO 2 Solve transportation and assignment problems. CO 3 Select a suitable sequencing and networking models. CO 4 Solve waiting line theory problems. CO 5 Analyze game theory & replacement problems.
HEAT POWER ENGINEERING LAB 19BME5LB03 CO1: Demonstrate the various horse powers, Calorific values, emissions of IC engines. CO2: Determine the various efficiencies and energy balance for several types of Internal Combustions Engines and compressors.	**UNCONVENTIONAL MACHINING PROCESSES 19BME6PE08** CO1 Summarize the needs and classification of unconventional machining process. CO2 Illustrate the concept of machining the hard material using chemical energy and electrochemical energy. CO3 Apply the knowledge on machining electrically conductive material through electrical energy in non-traditional machining processes. CO4 Identify the process parameters, their effect and applications of different processes. CO5 Compare various thermal energy based non-traditional machining processes.
	HEAT TRANSFER LAB. 19BME6LB01 CO1: Evaluate the amount of heat exchange for plane, cylindrical & spherical geometries CO2: Compare the performance of extended surfaces and heat exchangers.
	ADVANCED COMMUNICATION SKILLS 19BCC6MC01 CO 1 Use English language fluently, accurately and appropriately CO 2 Know how body language is used in communication and interpret non-verbal symbols. CO 3 Understand the nuances of the written language and write technical reports effectively. CO 4 Participate in Group discussions and successfully face interviews.
(R 16) IV B.TECH (ME)

I Semester	II Semester
FINITE ELEMENT METHODS **CO1:** Derive displacement, stress, strain relations and apply vibrational and weighted residual methods to solve differential equations. **CO2:** Determine the elongation, stresses and strains in one dimensional bar problems. **CO3:** Determine the displacement in Truss and deflections in beams **CO4:** compute stress and strains in two dimensional problems using constant strain triangle and also parametric elements. **CO5:** Evaluate the rate of heat transfer and temperature distribution in thin plates and fin. **CO6:** Determine natural frequencies of free vibration problems.	**MECHATRONICS** **CO1:** Demonstrate knowledge of various mechatronic systemcomponents. **CO2:** Describe various sensors and its applications in mechatronics **CO3:** Demonstrate knowledge of process controllers used in mechatronics. **CO4:** Demonstrate knowledge of mechatronic system design **CO5:** Describe the application of mechatronics.

CAD/CAM	REFRIGERATION & AIR CONDITIONING
CO1: Illustrate the fundamental concepts of the Product cycle and Design process. **CO2:** Build the mathematical basis in the technique of representation of geometric entities and the technique of transformation of geometric entities using transformation matrix. **CO3:** Develop the 2D and 3D geometries using Modeling packages. **CO4:** Understand the NC, CNC and DNC machines and part programming methods. **CO5:** Describe the use of GT for the product development and also the use of CAPP for the product development. **CO6:** Identify the various elements and their activities in the Computer Integrated Manufacturing Systems.	**CO1:** Understand the difference between refrigeration and airconditioning. **CO2:** Summarize the VCR system on T-S and P-h charts **CO3:** Identify the function of each component of VCR system **CO4:** Observe the function of the refrigerant in a refrigerationsystem and trace its path. **CO5:** Report different air conditioning methods and its applications **CO6:** Classify different components of air conditioning plant.
ADVANCED MANUFACTURING PROCESS	**ALTERNATE SOURCES OF ENERGY**
CO1: Illustrate advanced casting methods. **CO2:** Understand principles and applications of electron beam, ionbeam and laser hybrid welding processes. **CO3:** Explain forming process for thin sections. **CO4:** Understand abrasive and water jet machining. **CO5:** Explain electrical discharge and electro chemical machiningprocesses. **CO6:** Illustrate Plasma, Electron beam and Laser beam machining process.	**CO1:** Identity different sources of renewable energy **CO2:** Demonstrate different solar collecting/storage devices and itsworking **CO3:** Discuss different wind energy systems and wind data measurements. **CO4:** Understand the biomass to energy conversion methods **CO5:** Discuss the sources of biofuels that can be used in IC engines **CO6:** Classify different geothermal energy sources and harvesting of these sources.
ROBOTICS	
CO1: Distinguish between fixed automation and programmable automation. **CO2:** Identify various components of robot. **CO3:** Select appropriate type of actuator for a joint.**CO4:** Illustrate robot applications in manufacturing.**CO5:** Analyse kinematics of a robot. **CO6:** Develop a programme to control a robot for execution of a work cycle.	
PRODUCTION PLANNING AND CONTROL	
CO1: Apply the systems concept for the design of production and service systems. **CO2:** Make use of forecasts in the manufacturing and service sectors using selected quantitative and qualitative techniques. **CO3:** Understand the principles and techniques of inventory management. **CO4:** Choose routing procedure and able to prepare bill of material. **CO5:** Understand the importance and function of scheduling and make use of Gantt chart to solve scheduling problems. **CO6:** Identify dispatching procedure and make use of computer in production planning and control.	
CAD/ CAM LAB	
CO1: To impart the fundamental knowledge on using various analytical tools like ANSYS, FLUENT, etc., for engineering simulation. **CO2:** To know various fields of engineering where these tools can beeffectively used to improve the output of a product. **CO3:** To impart knowledge on how these tools are used in Industries by solving some real time problems using these tools.	

R20-B.TECH (ECE)-COURSE OUTCOMES	
I- B Tech	
I Semester	**II Semester**
MATRIX ALGEBRA AND CALCULUS **CO1 :** Solve the system of linear equations. **CO2 :** Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors. **CO3 :** Relate the results of mean value theorems in calculus to Engineering problems. **CO4 :** Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. **CO5 :** Compute the area and volume by interlinking them to appropriate double and triple integrals.	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS** **CO1 :** Apply first order ordinary differential equations to real life situations. **CO2 :** Identify and apply suitable methods in solving the higher order differential equations. **CO3 :** Solve the partial differentiation equations. **CO4 :** Interpret the physical meaning of different operators as gradient, curl and divergence. **CO5 :** Estimate the work done against a field, circulation and flux using vector calculus.
ENGINEERING CHEMISTRY **CO1 :** Analyze the suitable method of water treatment depending on the quality treatment.-Analyzing **CO2 :** Compare different types of polymers, fuels and their importance-Analyzing **CO3 :** Utilize the advanced materials as engineering materials and apply them in domestic and industrial life-Applying **CO4 :** Distinguish electrical energy sources and importance of corrosion science-Analyzing **CO5 :** Identify different types of engineering materials and applications in engineering.-Applying	**APPLIED PHYSICS** **CO1 :** Interpret the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polaraisation in various fields. (K2) **CO2 :** Analyse and understand various types of lasers & optical fibers. (K4) **CO3 :** Identify the crystal structures and XRD techniques. (K3) **CO4 :** Apply the magnetic materials in engineering field. (K3) **CO5 :** Identify the various applications of semiconductors in engineering field. (K3)
TECHNICAL AND COMMUNICATIVE ENGLISH - I **CO1 :** Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it (Apply-3). **CO2 :** Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. (Creating-5). **CO3 :** Build grammatically correct sentences using a variety of sentence structures (Apply3). **CO4 :** Enhance word power and usage of lexicons (Apply3).	**PROBLEM SOLVING USING PYTHON** **CO1:** Outline the computer system concepts and the flowcharts using raptor to solve the given problems. **CO2:** Summarize the fundamental concepts of python programming. **CO3:** Interpret object oriented and event driven programming in python. **CO4:** Apply the suitable data structures to solve the real time situational problems.
ENGINEERING GRAPHICS **CO1:** construct the geometrical shapes of regular polygons, Engineering Curves, and scales. **CO2:** illustrate the orthographic projections, projections of points, and lines. **CO3:** construct the projection of planes inclined to both the planes. **CO4:** construct the projection of solids for engineering applications. **CO5:** analyse the conversion of isometric views to orthographic views vice versa.	**NETWORK ANALYSIS** **CO1:** Analyze the basics of electrical circuits with nodal, mesh analysis and network theorems. **CO2:** Apply Laplace Transform for steady state and transient analysis **CO3:** Analyze the phasor representation for ac circuits and magnetic coupled circuits. **CO4:** Describe resonance circuits, two port network parameters and their interconnections.
PROBLEM SOLVING USING C **CO 1:** Develop algorithms and flow charts for simple problems. [K3] **CO 2:** Utilize suitable control structures for developing code in C.[K3] **CO 3:** Make use of functions and arrays in developing modular programs. [K3] **CO 4:** Make use of structures and pointers to write well-structured programs. [K3] **CO 5:** Make use of file Operations in C programming for a given application. [K3]	**DATA STRUCTURES** **CO1 :** Analyze sorting and searching algorithms. [K4] **CO2 :** Analyze elementary data structures such as stacks, queues and linked lists. [K4] **CO3 :** Compare and contrast various forms of trees. [K4] **CO4 :** Build graph data structures and various graph traversal techniques. [K3]

SOFT SKILLS AND COMMUNICATION SKILLS LAB **CO1 :** Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment. **CO2 :** Listen and comprehend several accents of English Language **CO3 :** Take part in various conversations/discourses using formal and informal expressions. **CO4 :** Adapt soft skills successfully in personal and professional life.	**DATA STRUCTURES LAB** **CO1 :** Develop various algorithms using recursive and non-recursivefunctions. [K3] **CO2 :** Experiment with linear data structures. [K3] **CO3:** Apply Tree traversal techniques in various applications. [K3]
ENGINEERING CHEMISTRY LAB **CO1 :** Develop and perform analytical chemistry techniques to address the water related problems (hardness, alkalinity, Chlorine, DO)-Creating **CO2 :** Explain the functioning of different analytical instruments- Applying **CO3 :** Compare viscosity and surface tension of different oils-Analyzing **CO4 :** Measure molecular/system properties such as strength ofsolutions, conductance of Solutions and acid number of lubricating oils, etc-Evaluating	**APPLIED PHYSICS LAB** **CO1 :** Apply the principles of physics in engineering field. (K3) **CO2 :** Utilize the modern engineering physics techniques and toolsin real time applications. (K3) **CO3 :** Analyze the characteristics, usage and the behaviour of materials. (K4)
PROBLEM SOLVING USING C LAB **CO 1:** Study, analyze and understand logical structure of computer programming and different constructs to develop programs inC Language. [K4] **CO 2:** Compare and contrast various data types and operatorprecedence. [K2] **CO 3:** Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions.[K4] **CO 4:** Analyze simple data structures, use of pointers and dynamic memory allocation techniques. [K4] **CO 5:** Make use of functions and file I/O operations in developing C Programs. [K3]	**PROBLEM SOLVING USING PYTHON LAB** **CO1 :** Create interactive visual programs using Scratch. [K6] **CO2 :** Develop flowcharts using raptor to solve the given problems.[K6] **CO3 :** Develop Python programs for numerical and text basedproblems. [K6] **CO4 :** Develop graphics and event based programming usingPython. [K6]
	CONSTITUTION OF INDIA **CO1:** Examine salient features of Indian Constitution and live accordingly in society& interpret the meaning of Fundamental Rights of State Policy **CO2:** Discover various aspects of Union Government legislation and live up to the expectations of the rules. **CO3:** Critically examine State Government legislation and improve your living standards by following the rules strictly **CO4:** Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living **CO5:** Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.

R20-B.TECH (ECE)-COURSE OUTCOMES	
II- B Tech	
I Semester	**II Semester**

NUMERICAL METHODS AND TRANSFORMATIONS

CO1 : Evaluate approximating roots of polynomials and transcendental equations by different algorithms.

CO2 : Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals.

CO3 : Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations.

CO4 : Select appropriate technique of Laplace transforms in solving differential equations.

CO5 : Relate Fourier series, integral, transforms techniques in their core.

INTERNET OF THINGS

CO1 : Outline the concept of internet of things.

CO2 : Analyze the requirements, specifications to design IoT applications.

CO3 : Analyze domain specific applications using Arduino and Raspberry pi.

CO4 : Make use of python programming to implement Internet of Things

CO5: Design IoT applications using Raspberry Pi

ELECTRONIC DEVICES AND CIRCUITS

CO1 : Use P-N diodes in electronic circuits.

CO2 : Use special diodes and rectifiers in electronic circuits.

CO3 : Explore the operation of BJT and its applications.

CO4 : Analyse the thermal stability of BJT.

CO5 : Explore the operation of FET, other transistors and their applications.

ANALOG AND DIGITAL COMMUNICATIONS

CO1 : Elaborate the basic concepts of Analog Communication Systems.

CO2 : Analyze the Analog modulated and demodulated systems.

CO3 : Construct different digital modulation techniques.

CO4 : Analyze the fundamental concepts of information theorems and capacity.

CO5 : Assess the right method of error detection and error correction for data transmission

SIGNALS AND SYSTEMS

CO1 : Define basic signals and its operations.

CO2 : Identify Trigonometric and Exponential Fourier Series of signals.

CO3 : Develop Fourier Transforms for various signals.

CO4 : Solve Laplace Transform and z-Transform for various signals.

CO5 : Compare LTI system responses for different inputs and illustrate sampling concepts.

ELECTRONIC CIRCUITS AND PULSE CIRCUITS

CO1 : Develop single stage and multistage amplifiers.

CO2 : Summarize the importance of feedback in amplifiers and oscillators.

CO3 : Make use of Power Amplifiers in communication systems.

CO4 : Understand different linear and non-linear wave shaping circuits.

CO5 : Construct different multivibrators.

SWITCHING THEORY AND LOGIC DESIGN

CO1 : Classify and work on different types of number systems and codes that are used in the design of digital systems.

CO2 : Make use of theorems and postulates of Boolean algebra to minimize various Boolean expressions.

CO3 : Construct basic logic circuits and combinational circuits.

CO4 : Apply different models of Finite State Machines for design of sequential circuits.

CO5 : Utilize the concept of PLDs to realize switching functions and code converters.

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

CO1 : Apply the concepts of Electric and Magnetic Fields in different applications.

CO2 : Apply Maxwell's equations in electromagnetics.

CO3 : Understand wave propagation and derive the Wave Equations in Perfect Dielectric and Conducting Media.

CO4 : Understand wave characteristics - reflection and refraction of Electromagnetic Waves in different media and analyze different transmission lines and applications.

LINEAR CONTROL SYSTEMS

CO 1: Develop the mathematical model of a system and find its transfer function

CO 2: Understand the time response analysis and the frequency response analysis

CO 3: Determine the stability of a system in time domain and frequency domain

CO 4: Understand the classical control design techniques

TECHNICAL AND COMMUNICATIVE ENGLISH - II

CO1 : Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it (Apply-3).

CO2 : Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. (Creating-5).

CO3 : Build grammatically correct sentences using a variety of sentence structures (Apply3).

CO4 : Enhance word power and usage of lexicons (Apply3).

ELECTRONIC DEVICES AND CIRCUITS LAB

CO1 : Understand and analyze the behavior of PN junction diode, Zener diode.

CO2 : Understand the operational difference between half wave and Full wave Rectifiers.

CO3 : Identify the switching characteristics of transistor.

CO4 : Analyze the characteristics of transistor.

CO5 : Identify and analyze the UJT characteristics and its applications.

INTERNET OF THINGS LAB

CO1 : Explain the application areas of IOT ·

CO2 : Influence the revolution of Internet in Mobile Devices,

CO3 : Discuss about the importance of Cloud in IOT.

CO4 : Justify about the importance of Sensor Networks.

CO5: Explain building blocks of Internet of Things and characteristics.

SIGNALS AND SYSTEMS LAB

CO1 : Build elementary signals and implement Trigonometric Fourier series and Exponential Fourier series.

CO2 : Construct Fourier, Hilbert and Laplace Transform of a continuous time signal of various signals.

CO3 : Identify different properties of Fourier & Laplace Transforms.

CO4 : Develop z-transform of continuous time signal and experiment with different properties of it.

CO5 : Construct various filters and to draw their magnitude and phase responses.

ANALOG AND DIGITAL COMMUNICATIONS LAB

CO1 : Design and measure performance of AM and FM communication systems.

CO2 : Choose the different pulse modulation techniques

CO3 : Compare pre-emphasis and de-emphasis.

CO4 : Experiment with different digital modulation techniques and observe their results.

CO5 : Classify various channel encoding schemes for a given data stream.

DIGITAL LOGIC DESIGN LAB

CO1 : Identify the operation of various logic gates.

CO2 : Examine basic logical and arithmetic circuit operations.

CO3 : Illustrate and compare the operation of different flip-flops.

CO4 : Develop the complex digital logic circuits including both combinational and sequential logics by using computer-aided design tools.

ELECTRONIC CIRCUITS AND PULSE CIRCUITS LAB

CO1: Understand the effect of Frequency response of single stage amplifier.

CO2: Understand how frequency response varies by applying negative feedback on amplifiers.

CO3: Determine the efficiency of power amplifiers.

CO4: Construct high input impedance circuits.

CO5: Understand different responses for linear and nonlinear waveshaping circuits.

CO6: Design and working of different multivibrators.

DESIGN OF SYSTEMS USING ARDUINO AND RASPBERRY PI

CO1: Analyze the requirements, specifications to design home automation applications.

CO2: Build smart city applications using Arduino.

CO3: Develop agricultural applications using Raspberry pi.

CO4: Influence the revolution of Internet in Mobile Devices.

DESIGN AND SIMULATION OF ELECTRONIC CIRCUITS

CO1: To solve problems using Simulation Software

CO2: To develop, debug and test various electronic circuits

CO3: To use File I/O techniques.

CO4: To transfer data among parallel processes.

CO5: To use Simulation Software to create various applications

ENVIRONMENTAL STUDIES

CO1 : Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.

CO2 : Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.

CO3 : Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity.

CO4 : Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices.

CO5 : Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.

R19- B.Tech (ECE)- COURSE OUTCOMES	
III B.Tech	
I Semester	**II Semester**
LINEAR AND DIGITAL IC APPLICATIONS **CO1 :** Recall the basics of FET, MOSFET, amplifiers, standardmemories and their characteristics. **CO2 :** Extend the logic gate concept to realize basic combinational and sequential circuits for various Boolean expressions. **CO3 :** Illustrate the operation of IC 555 timer, utilization of filters, VCO, data converters and PLL in the development of various circuits. **CO4 :** Demonstrate the applications of Operational amplifier and IC 555 timer such as Adder, Subtractor, V-I, I-V converter, Differentiator, Integrator, and Triangular, Square wave generators, PWM, PPM generation respectively. **CO5 :** Make use of the computer-aided design tools for development of complex digital logic circuits.	**ANTENNAS AND WAVE PROPAGATION** **CO1 :** Explain radiation mechanism and basic antenna parameters. **CO2 :** Interpret different types of antennas and antenna arrays. **CO3 :** Demonstrate antenna measurements to know antenna'sperformance. **CO4 :** Identify the characteristics of radio wave propagation. **CO5 :** Illustrate the concepts of wave propagation and its characteristics in atmospheric conditions.
ENTREPRENEURSHIP & INNOVATION **CO1 :** Outline the concepts of Entrepreneurship.[K2] **CO2 :** Create the awareness on creativity and innovation.[K6] **CO3 :** Adopt the Entrepreneurship Development programs[K6] **CO4 :** Evaluate the project planning and feasibility studies.[K5] **CO5 :** Analyze the concept of small and micro enterprises.[K4]	**DIGITAL SIGNAL PROCESSING** **CO1 :** Analyze the signals and system in Time and Frequencydomain through transformations **CO2 :** Find DFT and IDFT coefficients of a given discrete timesequence using Fast Fourier Transform algorithm. **CO3 :** Illustrate the significance of various filter structures andresponses. **CO4 :** Construct the digital filter circuits for generating desiredsignal wave shapes (non- sinusoidal) **CO5 :** verify the performance of a variety of filters
PULSE AND DIGITAL CIRCUITS **CO1 :** Apply different linear wave shaping circuits. **CO2 :** Analyze different non-linear wave shaping circuits. **CO3 :** Make use of different diode and transistor switchingtimes to design various Logic families. **CO4 :** Construct different multi-vibrators. **CO5 :** Explain time base generators and sampling gates.	**MICROCONTROLLERS AND EMBEDDED SYSTEMS** **CO1 :** Explain 8051 architecture and the function of on-chiphardware units in 8051. **CO2 :** Develop 8051 embedded C programs for interfacing MatrixKeyboard, LCD, DAC, ADC and 7segment LED Display. **CO3 :** Demonstrate the architecture and function of on-chipperipherals in ARM **CO4 :** Summarize embedded system architecture and its buildingblocks. **CO5 :** Outline embedded system components, and Embedded Firmware designs
CONTROL SYSTEMS **CO1 :** Develop the mathematical model of a system and find itstransfer function **CO2 :** Apply the time response analysis and the frequency responseanalysis **CO3 :** Determine the stability of a system in time domain **CO4 :** Determine the stability of a system in frequency domain **CO5 :** Analyze the classical control design techniques	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA** **CO1 :** Utilize the basic Object Oriented concepts in writing JAVAprograms. **CO2 :** Experiment with programming constructs of Object OrientedProgramming. **CO3 :** Make use of inheritance, interfaces, packages and Exceptionhandling concepts. **CO4 :** Apply multi-threading concepts. **CO5 :** Apply applets, AWT and Event Handling concepts in various UI Applications.

COMPUTER ORGANISATION & MICROPROCESSORS **CO 1:** Apply the concepts of computer system and CPU design. **CO 2:** Demonstrate memory organization and I/O processing. **CO 3:** Make use of Instruction set in developing the assembly language programming **CO 4:** Demonstrate the hardware features of 8086 and Pentium processors. **CO 5:** Model an 8086 based microcomputer system by interfacing memory and I/O devices.	**PROFESSIONAL ELECTIVE-I** **ELECTRONIC MEASUREMENTS AND INSTRUMENTATION** **CO1 :** List out Electronic Instruments, their Characteristics and use, Peculiar Errors Associated with the Instruments and how to minimize such Errors. **CO2 :** Experiment with transducers, electrical and electronic instruments. **CO3 :** Review the Principle of Operation of Electronic Measuring Instruments. **CO4 :** Illustrate various concepts of electronic instruments. Computer controlled test systems. **CO5 :** Storage and display instruments for experimenting
OPEN ELECTIVE **FUNDAMENTALS OF IMAGE PROCESSING(OE)** **CO1:** Interpret the limitations of the computational methods on digital images. **CO2:** Develop Fourier transform for image processing in frequency domain. **CO3:** Illustrate the spatial and frequency domain image transforms on enhancement and restoration of images. **CO4:** Utilize the understanding of image enhancement techniques. **CO5:** Define the need for compression and evaluate the basic compression algorithms.	**DATA COMMUNICATIONS AND COMPUTER NETWORKS** **CO1 :** Describe different types of services, layers and switching techniques in computer networks. **CO2 :** Identify design issues of various layers in the reference model of computer networks. **CO3 :** Explain various network topology, transmission media and ISDN techniques. **CO4 :** Classify protocols used in different layers of the computer network. **CO5 :** Explain concepts of network security, domain name service, network management protocol.
CONSUMER ELECTRONICS(OE) **CO1:** List technical specification of electronics Audio system (microphone and Loud speaker). **CO2:** Demonstrate audio and video recording systems. **CO3:** Contrast working principles of Monochrome TV and Colour TV. **CO4:** Outline Broadcasting techniques of CATV and DTH TV. **CO5:** Illustrate the basic functions of various consumer electronic domestic Appliances.	**EMBEDDED SYSTEM DESIGN WITH ADVANCED PROCESSORS** **CO1:** Illustrate 3 and 5 stage pipelines of ARM core. **CO2:** Able to apply instructions for programming of ARM 7 processor. **CO3:** Build the AMBA bus architecture & Debugging **CO4:** Analyze different advanced ARM cores. **CO5:** Demonstrate the use of ARM core for different SOC applications.
LINEAR & DIGITAL IC APPLICATIONS LAB **CO1 :** Demonstrate the applications of Op-amp such as Adder, Subtractor, Comparator, Integrator and Differentiator Circuits. **CO2 :** Classify the active filters such as LPF, HPF, BPF and Band Reject Filters. **CO3 :** Interpret the operation of Oscillator circuits. **CO4 :** Illustrate the operation of Multivibrator circuits and compare various types of voltage regulators. **CO5 :** Develop the complex digital logic circuits including both combinational and Sequential logics by using computer- aided design tools.	**STATISTICAL METHODS IN AI** **CO1 :** Apply the basics of Artificial Intelligence, Intelligent Agents and its structure for problem solving by various searching techniques **CO2 :** Apply the concept of informed search and Exploration of constraint satisfaction problems and Adversarial Search **CO3 :** Analyze what is reasoning and Knowledge Representation **CO4 :** Analyze the concept of Reasoning with Uncertainty & Probabilistic Reasoning **CO5 :** Apply the basic forms of Machine Learning, decision trees and statistical Learning setting.
ELECTRONIC CIRCUITS & PULSE AND DIGITAL CIRCUITS LAB **CO1 :** Apply the effect of capacitors on frequency response of amplifier. **CO2 :** Compare the efficiency of power amplifiers. **CO3 :** Construct high input impedance circuits. **CO4 :** Experiment with different Sinusoidal and Non sinusoidal circuits. **CO5 :** Construct different digital circuits using Active & Passive Electronic Components.	**MICROPROCESSORS & MICROCONTROLLERS LAB** **CO1:** Build Up the assembly language programs on arithmetic, logical and string operations. **CO2:** Construct an 8086 system by interfacing I/O and other devices. **CO3:** Make Use of Instruction set of 8086 for modular programming and Dos/Bios programming. **CO4:** Distinguish processor based systems and controller system. **CO5:** Model the 8051 based embedded systems for

SKILL LAB	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB
	variousapplications
SKILL LAB **CO1 :** Analyze the requirements, specifications to design homeautomation applications. **CO2 :** Build smart city applications using Arduino. **CO3 :** Develop agricultural applications using Raspberry pi. **CO4 :** Construct the IOT Devices. **CO5 :** Influence the revolution of Internet in Mobile Devices.	**OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB** **CO1:** Develop java programs by using OOP concepts [K3]. **CO2:** Make use of interfaces, packages, threads in developing JAVAprogrammes [K3]. **CO3:** Make use of exception handling in java programming [K3]. **CO4:** Develop Graphical User Interfaces and applets with event handling [K3].
	ADVANCED COMMUNICATION SKILLS LAB **CO1:** Apply the nuances of the written language and write letters, emails and Resume effectively. **CO2:** Know how body language is used in communication andinterpret non-verbal symbols **CO3:** Participate in Group Discussions using analytical and problem solving skills. **CO4:** Face job interviews confidently and enhance employability.
	OPEN ELECTIVE-III **INTRODUCTION TO EMBEDDED SYSTEMS** **CO1:** Illustrate the classification and applications of embedded systems. **CO2:** Recall the basic memory devices, passive components andcore of embedded systems. **CO3:** Summarize various Communication interface in EmbeddedSystems. **CO4:** Demonstrate characteristics of embedded systems. **CO5:** Explain the RTOS basics and various Communication &Synchronization techniques.
	GLOBAL POSITIONING SYSTEM **CO1:** Identify the importance of Space segment, Control segmentand User segment in GPS. **CO2:** Analyze the GPS observables like code, phase pseudo ranges,Doppler data and Biases. **CO3:** Estimate surveying with GPS. **CO4:** Categorize the different application areas of GPS. **CO5:** Recommend the Hardware and Software improvements forfuture GPS.

R16-B.TECH (ECE)-COURSE OUTCOMES IV- B Tech	
IV B. TECH. - I SEMESTER	**IV B. TECH. -I I SEMESTER**
Object Oriented Programming through JavaCO1: Summarize the basic Object Oriented concepts. **CO2:** Illustrate various programming constructs of Object OrientedProgramming. **CO3:** Analyze inheritance, packages and Exception handlingconcepts. **CO4:** Apply multi-threading concepts. **CO5:** Apply applets, Event Handling and AWT concepts in various UIApplications.	**Cellular and Mobile Communications** **CO1:** Illustrate fundamental concept of Cellular Radio System Operation and Design: Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor (Q), Desired C/I From a Normal Case in a Omni Directional and directional Antenna System, Cell Splitting, and Cell Sectoring. **CO2:** Compare Measurement of C/I value in Omnidirectional & Directional Antenna System, Co-channel, Non Co-channel interference, and Adjacent Channel Interference. **CO3:** Interpret cell coverage for signal and traffic, diversity techniques and mobile antennas. **CO4:** Demonstrate Frequency management and Channel assignment. **CO5:** Classify different types of handoffs.

	CO6: Summarize GSM architecture-channels, TDMA architecture-channels and CDMA architecture-channels.
Microcontrollers and Embedded Systems **CO1:** Explain 8051 architecture and the function of on-chiphardware units in 8051. **CO2:** Develop 8051 embedded C programs for interfacing MatrixKeyboard, LCD, DAC, ADC and 7segment LED Display. **CO3:** Demonstrate the architecture and function of on-chipperipherals in ARM **CO4:** Summarize embedded system architecture and its building blocks. **CO5:** Outline embedded system components, and EmbeddedFirmware designs **CO6:** Illustrate RTOS Concepts	**Professional Elective - IV:** **Low power IC design** **CO1**: Illustrate the concepts of Low-Power Design Approaches. **CO2**: Apply Power reduction techniques possible at circuit level andlogic level. **CO3**: Interpret the low voltage technologies and circuits. **CO4**: Model the gate level logic circuits in PSPICE tool. **CO5**: Extend the Low Power and Design to Different Applications. **CO6**: List the Low-Voltage Low-Power Memories and Basics ofDRAM.
Computer Networks **CO1:** Describe different types of services, layers and switchingtechniques in computer networks. protocol, www, e-mail and multimedia. **CO2:** Identify design issues of various layers in the reference modelof computer networks. **CO3:** Explain various network topology, transmission media andISDN techniques. **CO4:** Interpret routing and congestion algorithms. **CO5:** Classify protocols used in different layers of the computernetwork. **CO6:** Explain concepts of network security, domain name service,network management	**Wireless Sensor Networks** **CO1:** Interpret wireless sensor networks and the key components. **CO2:** Illustrate various physical and wireless MAC layers. **CO3:** Analyze different Ad hoc routing protocols. **CO4:** Recall about transport layer protocols and challenges forproviding QOS. **CO5:** Demonstrate the security issues in wireless sensor networksand WSN applications. **CO6:** Model real time applications based on concepts of wirelesssensor networks
Professional Elective - II:Digital IC design **CO1:** Explain the concepts of MOS Design. **CO2:** Outline the concepts of Combinational MOS Circuits. **CO3:** Construct Sequential MOS Circuits **CO4:** Classify the Digital IC Design to Different Applications. **CO5:** Illustrate the impact of interconnect parasitics on circuitperformance. **CO6:** List the Concepts of Semiconductor Memories, Flash Memory,RAM array organization	**System-On-Chip** **CO1:** Infer basics of System Architecture and Processor Architecture. **CO2:** List different Types of Processors like VLIW Processors, Superscalar Processors etc., and Basic concepts in Processor Micro Architecture. **CO3:** Interpret Cache memory, Multilevel Caches, SOC external memory and data encryption algorithm for the security needs. **CO4:** Outline the Concept of Inter Connect Architectures, SOC Standard Buses and Reconfiguration Technologies. **CO5:** Classify bus architectures use in SOC design and approach. **CO6:** Recognize several SOC application studies in various areas like image compression with an example.
Satellite Communications **CO1:** Illustrate the orbital and functional principles of satellitecommunication systems **CO2:** Architect, interpret, and select appropriate technologies forimplementation of specified satellite communication systems **CO3:** Analyse and evaluate a satellite link and suggest enhancements to improve the link performance. **CO4:** Select an appropriate modulation, multiplexing, coding andmultiple access schemes for a given satellite communication link. **CO5:** Specify, design, prototype and test analog and digital satellitecommunication systems as per given specifications.	**PC based Instrumentation** **CO1:** Recall the main functional units in a PC and be able to explainhow they interact. **CO2:** Interpret the standard serial and parallel interfacing buses andable to distinguish account for different generations of PCs. **CO3:** Infer the basics of PLC and its programming. **CO4:** Demonstarte different PLC functions to applications. **CO5:** Illustrate the basics of SCADA. **CO6:** Develop DAQ using I/O systems.

CO6: Apply the concepts of satellite navigation and global positioning system.	
Network Security and Cryptography CO1: Summarize the fundamentals of Cryptography. **CO2:** Analyze how security is achieved and attacks can be countered by using symmetric/asymmetric algorithms. **CO3:** Apply Number Theoretic concepts in developing cryptographic algorithms to counter attacks. **CO4:** Interpret the role of hash functions and Digital Signatures in Information Security. **CO5:** Compare different network security designs using available secure solutions **CO6:** Illustrate the use of encryption techniques to secure data in transit across data networks.	**Speech Processing (PE-IV) CO1:** Describe human speech generation system **CO2:** Apply standard digital signal processing tools to analyze speech signals **CO3:** Employ signal processing techniques to analyze speech in time and frequency domains **CO4:** Experiment on different type of speech samples to extract some features and illustrate the results in MATLAB **CO5:** Design speech and speaker recognition systems for computer applications **CO6:** Develop software to implement text to speech and speech to text applications
Bio Medical Instrumentation **CO1:** Compare the different bio potential characteristics and recording methods so as to enable to record various bio signals. **CO2:** Create an understanding of the nonelectrical parameters measurements so as to enable to record various non-electrical parameters **CO3:** Identify the patient safety issues related to biomedical instrumentation. **CO4:** Build and operate bio potential amplifiers **CO5:** Illustrate the role of bio potential electrodes and the different medical imaging systems. **CO6:** Apply the knowledge for the research, design and development of new medical devices.	**Professional Elective - V:** **FPGA Design** **CO1:** Recall combinational and sequential digital circuits, Logic Families, LSI and VLSI Components. **CO2:** Classify the various memory architectures. **CO3:** Explain the Programmable Logic Devices on FPGA logic blocks. **CO4:** Build the architecture of digital IC logic families for given specifications. **CO5:** Develop test benches to simulate combinational and sequential circuits. **CO6:** Apply the knowledge of FPGA architectures for different applications.
Advanced DSP **CO1:** Classify the system in Time and Frequency domain through its respective tools. **CO2:** Summarize the basics of multi rate digital signal processing. **CO3:** Interpret various digital signal processing systems with interfacing sub systems of different sampling rates. **CO4:** Illustrate the Analysis of the power spectrum by using different non parametric methods. **CO5:** Compare the power spectrum by using different parametric methods like AR, MA, ARMA methods. **CO6:** Define the digital filter circuits for generating desired signal wave shapes (Non-sinusoidal) for different applications like computers, control systems and counting and timing systems.	**Software Defined Radio** **CO1**: Describe the basics of the software defined radios. **CO2**: Design the wireless networks based on the cognitive radios **CO3**: Explain the concepts behind the wireless networks. **CO4**: Compare SDR with traditional Hardware Radio HDR. **CO5**: Illustarte the concept of Cognitive Radio. **CO6**: Develop open projects and explore their capability to build their own communication system.
Professional Elective - III: Mixed Signal Design **CO1:** Define the concepts of Switched Capacitor circuits. **CO2:** Interpret the concepts of PLL. **CO3:** Summarize the fundamentals of data converter. .**CO4:** Construct Nyquist Rate A/D Converters. **CO5:** Build the concepts of Oversampling Converters **CO6:** Develop the concept of Continuous-Time Filters	**Distributed Computing** **CO1:** Outline the potential benefits of distributed systems **CO2:** Interpret synchronization techniques in distributed systems. **CO3:** Analyze various distributed deadlock detection and prevention techniques. **CO4:** Summarize process scheduling techniques, threads and fault tolerance in distributed environments. **CO5:** Interpret distributed file system implementations and shared memory**.** **CO6:** Relate distributed system functions in MACH and DCE.

Radar Systems **CO1:** Demonstrate the basic principles of RADAR System. **CO2:** Solve the RADAR Equation and to calculate Transmitter power. **CO3:** Description of CW and Frequency Modulated Radar & FM-CW Radar. **CO4:** Illustrate the principle of each and every block of MTI and Pulse Doppler Radar. **CO5:** Contrast the different methods used for tracking targets. **CO6:** Relate the Noise Figure and Noise Temperature in Radar Receivers and describe antennas used for Radars.	**Data Acquisition and Transmission** **CO1:** Define a data acquisition system. **CO2:** Compare analog and digital data acquisition system. **CO3:** Infer different data transmission systems. **CO4:** Explain different display systems. **CO5:** Infer different types of digital instruments. **CO6:** List different recorders used in data acquisition and transmission.
Cloud Computing **CO1:** Summarize the Virtualization and applications for the state-of- the-art cloud computing **CO2:** Carry out the Cloud Scale and value of Cloud Computing **CO3:** Analyze the infrastructure of cloud computing including public, private and hybrid clouds and various services like PaaS, SaaS, IaaS etc **CO4:** Monitor the Security and Disaster Management **CO5:** Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization **CO6:** Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas	**Embedded System Design** **CO1:** Recall the fundamentals of Core of the Embedded system. **CO2:** Define process models and technologies to design an Embedded system. **CO3**: Demonstrate the customization of Hardware or software. **CO4**: Delineate the unique characteristics of Embedded systems. **CO5**: Make use of system design techniques to develop Hardware/Software for embedded systems. **CO6**: Develop an embedded system with real time constraints.
Analytical Instrumentation **CO1:** Distinguish Different Analyzers in Analytical Instrumentation. **CO2:** State the Knowledge of Different Spectrophotometer's. **CO3:** Select the basic Principles of Spectroscopy and Chromatography Techniques. **CO4:** Relate Different Analytical Techniques to solve Analytical and Bio-analytical Problems. **CO5:** Choose Instrumentation Associated with (NMR) Spectrophotometer and Electron Spin Resonance (ESR). **CO6:** Extend the use of spectro photo meters in various aspects. **CO7:** Write principles of NMR and their use.	
Digital Signal Processors and Architectures **CO1:** Recognize the fundamentals of fixed and floating point architectures of various DSPs. **CO2:** Learn the architecture details and instruction sets of fixed and floating point DSPs **CO3:** Infer about the control instructions, interrupts, and pipeline operations. **CO4:** Illustrate the features of on-chip peripheral devices and its interfacing **CO5:** Analyze and learn to implement the signal processing algorithms in DSPs **CO6:** Learn the DSP programming tools and use them for applications **CO7:** Design and implement signal processing modules in DSPs	

VLSI and Embedded Systems Lab **CO1:** Construct and test gates using CMOS using EDA Tool. **CO2:** Construct and test D-Flip flop using CMOS NAND gate using EDA Tools. Timers using 8051. **CO3:** Construct and test Decade Counter using D-Flip Flop using EDA Tool. **CO4:** Construct and test static RAM cell and Differential Amplifier using CMOS using EDA Tool. **CO5:** Develop basic programs in Serial and Parallel Blinking of LEDs, Serial communication implementation and Delay generation using **CO6:** Develop Interrupt handling, Share resource using MUTEX and Allocate resource using semaphores with ARM.	
Object Oriented Programming through Java Lab **CO1:** Develop JAVA programs using Object Oriented Programing concepts. **CO2:** Make use of interfaces, threads, exception handling concepts to develop java programs **CO3:** Construct GUI for developing java	

R20 - B. TECH.(CSE) - COURSE OUTCOMES	
I B. TECH	
I Semester	**II Semester**
TECHNICAL AND COMMUNICATIVE ENGLISH - I **CO1**: Interpret explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. [K3]**.** **CO2**: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **[K6].** **CO3**: Build grammatically correct sentences using a variety of sentence structures**. [K3]** **CO4**: Enhance word power and usage of lexicons [**K3].**	**COMMUNICATIVE ENGLISH - II** **CO1:** Read and comprehend complex texts and summarize. **CO2:** Compose paragraphs, essays as creative writing. **CO3:** Learn grammatical structures and write grammatically correct sentences **CO4:** Enhance word power and usage of lexicons.**CO5:** Compile emails, letters, reports, resume and information transfer.
MATRIX ALGEBRA AND CALCULUS **CO1:** Solve the system of linear equations.[K3] **CO2:**Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.[K4] **CO3:**Apply the mean value theorems in calculus to Engineering problems.[K3] **CO4:**Apply the functions of several variables to evaluate the rates of change with respect to Time and space variables in engineering. [K3] **CO5:** Determine the area and volume by interlinking them to appropriate double and triple integrals. [K5]	**ENGINEERING CHEMISTRY** **CO 1:** Analyze the suitable method of water treatment depending on the quality treatment. [K4] **CO 2:** Compare different types of polymers, fuels and their importance.[K4] **CO 3:**Utilize the advanced materials as engineering materials and apply them in domestic and industrial life.[K3] **CO 4:**Distinguish electrical energy sources and importance of corrosion science.[K4] **CO5:**Identify different types of engineering materials and applications in engineering **[K3]**
APPLIED PHYSICS **CO1 :** Interpret the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polarization in various fields. **[K2]** **CO2 :** Analyze and understand various types of lasers & optical fibers.[**K4]** **CO3 :** Identify the crystal structures and XRD techniques. **[K3]**. **CO4 :** Apply the magnetic materials in engineering field. [**K3]** **CO5 :** Identify the various applications of semiconductors in engineering field. **[K3]**	**PROBLEM SLOVING USING PYTHON** **CO 1:** Summarize the fundamental concepts of python programming. [K2] **CO 2:** Interpret object oriented and event driven programming in python. [K2] **CO 3:** Apply the suitable data structures to solve the real time problems. [K3] **CO 4:** Apply regular expressions for many different situations. [K3]

PROBLEM SOLVING USING C **CO1**: Develop algorithms and flow charts for simple problems.[K3] **CO2**:Utilize suitable control structures for developing code in C.[K3] **CO3**: Make use of functions and arrays in developing modularprograms. [K3] **CO4**: Make use of structures and pointers to write well-structured programs. [K3] **CO5**: Make use of file Operations in C programming for a givenapplication. [K3]	**ELECTRONIC DEVICES AND LOGIC DESIGN** **CO1:**Apply P-N diodes and Special diodes in electronic circuits.[K3] **CO2:**Compare different types of transistors (BJT, FET and MOSFET) with their working principles.[K2] **CO3:**Make use of Boolean algebra and K-map and to minimize combinational functions.[K3] **CO4:** Develop combinational circuits and sequential circuits.[K3] **CO5:** Construct different types of registers and counters.[K3]
LINUX PROGRAMMING LAB **CO 1:** Apply the fundamental UNIX utilities. [K3] **CO 2:** Utilize the Unix file system[K3] **CO 3:** Experiment with shell and UNIX filters. [K3] **CO 4:** Analyze the Shell Programming constructs to developshell scripts. [K4]	**NUMERICAL METHODS AND STATISTICS** **CO1**:Evaluate approximating roots of polynomials and transcendental equations by different algorithms. [**K5**] **CO2**:Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. [**K3**] **CO3**:Apply different algorithms for approximating solutionsof ordinary differential equation to its analytical computations.[**K3**] **CO4**: Decide whether to accept or reject a statement about parameter in decision making problems. [**K5**]
SOFT SKILLS & COMMUNICATION SKILLS LAB **CO1:**Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment.[K3] **CO2**:Listen and comprehend several accents of English Language.[K4] **CO3**:Take part in various conversations/discourses using formaland informal expressions.[K4] **CO4**:Adapt soft skills successfully in personal and professionallife.[K5]	**PROBLEM SOLVING USING PYTHON LAB** **CO1:** Develop interactive visual programs using Scratch.[K3]. **CO2:** Develop Python programs for numerical and text basedproblems. [K3]. **CO3:** Develop graphics and event based programming usingPython. [K3]. **CO4:** Develop Python programs on object oriented programming and regular expressions. [K3].
APPLIED PHYSICS LAB **CO1:** Apply the principle of physics in engineering field **(K3)** **CO2:** Utilize the modern engineering physics techniques and tools in real time applications. **(K3)** **CO3:** Analyse characteristics, usage and the behaviour of materials**. (K4)**	**ENGINEERING CHEMISTRY LAB** **CO1:** Develop and perform analytical chemistry techniques to address the water related problems (hardness,alkalinity, Chlorine, DO). [K6] **CO2:** Explain the functioning of different analytical instruments.[K5] **CO3:**Compare viscosity and surface tension of different oils.[K4] **CO4:**Measure molecular/system properties such as strengthof solutions, conductance of solutions and acid number of lubricating oils, etc.[K5]

PROBLEM SOLVING USING C LAB	CSE WORKSHOP
CO1: Study, analyze and understand logical structure of computer programming and different constructsto develop programs in C Language. [K4] **CO2:** Compare and contrast various data types and operator precedence. [K2] **CO3:** Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. [K4] **CO4:** Analyze simple data structures, use of pointers and dynamic memory allocation techniques.[K4] **CO5:** Make use of functions and file I/O operations in developing C Programs. [K3]	**CO1:**Demonstrate the need of PC hardware components,applications and softwares.[K2] **CO2:**Explain the knowledge of networks, internetand World Wide Web, Search engines, Netiquette. [K2] **CO3:**Install and use different software like Windows XP,Linux. **CO4:**Identify and fix the defective PC and software relatedissues.[K3] **CO5:**Formalise with parts of windows word, Excel and Power point.
	R PROGRAMMING LAB **CO1 :** Apply the all basic operators on various data types.[K3] **CO2 :** Develop programs using Conditional Statements andvarious types of loops.[K3] **CO3 :** Develop programs using Matrices, Lists and Frames.[K3] **CO4 :** Develop programs using Functions, Math functions and Statistical functions in R.[K3] **CO5 :** Analyze the real word datasets presented in different formats using R libraries to perform exploratory data analysis and visualization.[K3]
	ENVIRONMENTAL STUDIES **CO1:** Explain the concepts of the ecosystem and its function in the environment. The need for protectingthe producers and consumers in various ecosystems and their role in the food web. **CO2:** Analyse the natural resources and their importance for the sustenance of the life and recognize the need toconserve the natural resources. **CO3:** Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity. **CO4:** Distinguish various attributes of the pollution, theirimpacts and measures to reduce or control the pollution along with waste management practices. **CO5:** Define Environmental policy, legislation, environmental assessment and the stages involved inEIA Environmental audit.

R20 - B. TECH.(CSE) - COURSE OUTCOMES	
II B. TECH.	

I Semester	II Semester
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE R20CC2102 CO 1: Apply the logical statements, connectivity among the statements and forms different types of normal forms. [K3] CO 2: Analyze the theory of Inference for statement calculus. [K4] CO 3: Classify the types of graphs and trees to formulate computational problems.[K4] CO 4: Apply DNF and CNF on Boolean algebraic functions to simplify the digital (logic) circuits. [K3] CO 5: Solve mathematical problems with recurrence relations using different methods. [K3]	TECHNICAL AND COMMUNICATIVE ENGLISH – II R20CC2201 CO 1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it (Apply-3). CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. (Creating-5). CO3:Build grammatically correct sentences using a variety of sentence structures (Apply3). CO4: Enhance word power and usage of lexicons (Apply3).

OOPS THROUGH JAVA R20CC2103 CO1: Interpret the syntax and semantics of java programming language and OOPs concepts. [K2] CO2: Make use of different predefined classes and packages and interfaces to develop programmes using OOPs concepts. [K3] CO3: Apply exception handling and multithreading mechanisms on java programs.[K3] CO4: Develop java programmes using collection framework & I/O. [K3] CO5: Make use of AWT, Applets and Event-Handling to develop GUI. [K3]	**DATABASE MANAGEMENT SYSTEMS R20CC2203** CO1 : Interpret the fundamentals of DBMS. [K2] CO2 : Analyze DB design methodology and normalization process. [K4] CO3 : Develop Queries in RDBMS. [K3] CO4 : Compare and Contrast various transaction and concurrency management techniques. [K2] CO5 : Analyze various file organizations and indexing techniques. [K4]
DATA STRUCTURES R20CC2104 CO1 : Apply Searching, Sorting and Hashing techniques to solve problems.[K3] CO2 : Analyze basic data structures such as Stacks, Queues and Linked List. [K4] CO3 : Solve problems involving Advanced concepts of Trees. [K3] CO4 : Analyze variety of Graph data structures that are used in various applications. [K4]	**FORMAL LANGUAGES AND AUTOMATA THEORY R20CC2204** CO1: Interpret the core concepts relating to the theory of computation, formal languages, Regular Expressions[K2]. CO2: Analyze the functioning of Finite-State Machines, Pushdown Automata and Turing Machines to solve problems [K4]. CO3: Build grammars and Normal forms for given grammars for different language classes and able to prove and disprove theorems establishing key properties of formal languages and Automata [K3]. CO4: Identify formal language classes and their membership properties[K3].
COMPUTER ORGANIZATION R20CI2101 CO 1: Interpret the computer system from user's perspective and can explain how Arithmetic Logic Unit works. [K2] CO 2: Explain of basic components of the system and illustrate data paths and control flow for sequencing in CPUs. [K2] CO 3: Interpret the Micro operations and Microprogramming for design of control unit of CPU. [K2] CO 4: Develop Main Memory Interfacing Circuit and can apply various cache memory mapping techniques. [K3] CO 5: Apply algorithms to perform arithmetic operations on binary representation of fixed point data. [K3] CO 6: Interpret various I/O interface devices. [K2]	**SOFTWARE ENGINEERING R20CS2205** CO 1: Analyse basic software engineering models. [K4]. CO 2: Demonstrate the various Object Oriented Design models [K2]. CO 3: Outline the software prototyping, analysis and design [K2]. CO 4: Outline the importance of software testing and project management [K4].
FRONT END WEB TECHNOLOGIES R20CC2105 CO1: Interpret a webpage and identify its elements and attributes.[K2]. CO2: Build webpages using HTML5 [K3]. CO3: Make use of Cascading Style Sheets on webpages [K3]. CO4: Make use of Java Script to write nteractive webpages [K3]. CO5: Build dynamic webpages with JQuery [K3]. CO6: Make use of JQuery UI to develop dynamic webpages [K3].	**DATABASE MANAGEMENT SYSTEMS LAB R20CC22L1** CO1 : Apply SQL commands like DDL, DML and DCL to perform different Database operations [K3]. CO2 : Develop PL/SQL block statements, control statements and cursors. [K3] CO3 : Develop PL/SQL programs using functions and procedures. [K3] CO4 : Develop PL/SQL programs using packages and Triggers. [K3]
DATA STRUCTURES LAB R20CC21L1 CO 1: Analyze algorithms, Searching, Sorting and hashing Techniques.[K4] CO 2: Make use of elementary data structures such as stacks, Queues and linked list to develop their applications.[K3] CO 3: Examine different tree traversal techniques. [K4] CO 4: Experiment with different graph traversal	**SOFTWARE ENGINEERING AND UML LAB R20CS22L2** CO 1: Compare the process of requirements development and requirements management and Examine the importance of requirements classification. [K4] O 2: Build use case diagrams that specify requirements for a software system.[K3] CO 3: Develop class diagrams that demonstrate design

techniques.[K4]	model of a software system. .[K3] CO 4: Make use of interaction diagrams to model the dynamic aspects of a software system [K3] CO 5: Develop various applications using unified modeling language. .[K3]
OOPS THROUGH JAVA LAB R20CC21L2 CO1: Develop java programs by using OOP concepts. [K3] CO2: Make use of interfaces, exception handling and threads to develop JAVA programs. [K3] CO3: Make use of exception handling and collections in Java Programming. [K3] CO4: Develop GUIs with AWT, Applets and Event Handling. [K3]	MOBILE APPLICATION DEVELOPMET LAB 19BCS4LB03 CO1 : Demonstrate various components of Android Framework.[K2]. CO2 : Develop user Interfaces for the Android Application.[K3]. CO3 : Develop Android Applications using Android API and Services.[K3]. CO4 : Develop Android Applications which access data from Internet.[K3].
FRONT END WEB TECHNOLOGIES LAB R20CC21L3 CO 1:Develop static html pages [K3]. CO 2: Develop Interactive Web Pages with different styles and client side validations[K3]. CO 3: Make use of JQuery programming to develop Web pages [K3]. CO 4: Apply JQuery UI to HTML pages [K3].	ARTIFICIAL INTELLIGENCE (FOR CSE) R20CC22L4 CO 1: Summarize the characteristics of AI that make it useful to real-world problems. [K2] CO 2: Analyse different search techniques and predicate logic in artificial Intelligence. [K4] CO 3: Interpret knowledge representation and symbolic reasoning using different rules. [K2] CO 4: Apply the basic knowledge on learning and reinforcement learning. [K3] CO 5: Make use of the power of AI in Natural language processing as an advanced Application of AI. [K3]
DATA SCIENCE R20CC21SC1 CO 1: Demonstrate the basic arithmetic programming in python[K3] CO 2: Analyze different data structures and choose suitable one for a given problem[K4] CO 3: Demonstrate Data cleaning, processing for the given dataset using respective packages.[K3] CO 4: Perform Data visualization[K3] CO 5: Solve the problems related to Descriptive and Inferential Statistics for a given scenario.[K4]	
CONSTITUTION OF INDIA (MC) R20CC21MC2 CO1: Examine salient features of Indian Constitution and live accordingly in society & interpret the meaning of Fundamental Rights of State Policy. CO2: Discover various aspects of Union Government legislation and live up to the expectations of the rules. CO3: Critically examine State Government legislation and improve your living standards by following the rules strictly CO4: Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living CO5: Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.	

I Semester	II Semester
OPERATING SYSTEMS 19BCI5TH01 CO 1: Classify various operating system functionalities and generations. [K2] CO 2: Interpret process management and exemplify the process synchronization techniques. [K2] CO 3: Apply various process scheduling algorithms. [K3] CO 4: Distinguish various memory management techniques and apply various deadlock techniques. [K4] CO 5: Compare and contrast various disk scheduling algorithms and can interpret the file system implementations. [K2]	ARTIFICIAL INTELLIGENCE 19BCS6TH02 CO1 : Summarize the characteristics of AI that make it useful to real-world problems. [K2] CO2 : Analyse different search techniques and predicate logic in artificial Intelligence. [K4] CO3 : Interpret knowledge representation and symbolic reasoning using different rules. [K2] CO4 : Apply the basic knowledge on learning and reinforcement learning. [K3] CO5 : Make use of the power of AI in Natural language processing as an advanced application of AI. [K3]
COMPUTER NETWORKS 19BCS5TH03 CO 1: Summarize basic concepts of Data Communication and Networking. [K2] CO 2: Compare and Contrast OSI and TCP/IP reference models. [K2] CO 3: Interpret data link layer services and multiple access protocols. [K2] CO 4: Analyse different routing protocols. [K4] CO 5: Illustrate the essential principles of different transport layer protocols. [K2] CO 6: Summarize various application layer protocols. [K2]	CRYPTOGRAPHY & NETWORK SECURITY 19BCS6TH03 CO1 : Summarize the fundamentals of Cryptography. [K2] CO2 : Analyze how security is achieved, and attacks can be countered by using symmetric/asymmetric algorithms. [K4] CO3 : Apply Number Theoretic concepts in developing cryptographic algorithms to counter attacks. [K3] CO4 : Interpret the role of hash functions and Digital Signatures in Information Security.[K2] CO5 : Compare different network security designs using available secure solutions. [k2] CO6 : Illustrate the use of encryption techniques to secure data in transit across data networks. [K2]
COMPILER DESIGN 19BCI5TH02 CO 1: Summarize different phases and passes of a compiler. [K2] CO 2: Compare and Contrast various Top-Down and Bottom-Up Parsing techniques. [K2] CO 3: Interpret different types of Intermediate Code representations. .[K2] CO 4: Illustrate the effective usage of register allocation and various Code-generation techniques. .[K2] CO 5: Apply different code-optimization techniques to optimize the target code. .[K3]	ENTREPRENEURSHIP & INNOVATION 19BCC6TH01 CO1 : : Outline the concepts of Entrepreneurship.[K2] CO2 : : Create the awareness on creativity and innovation.[K6] CO3 : : Adopt the Entrepreneurship Development programs[K6] CO4 : : Evaluate the project planning and feasibility studies.[K5] CO5 : : Analyze the concept of small and micro enterprises.[K4]
OOAD THROUGH UML 19BCS5TH04 CO 1: Illustrate the conceptual model of UML in software development life cycle. [K2] CO 2: Apply Common Modeling Techniques of Structural Modeling. [K3] CO 3: Analyze and model the behavioral concepts of a system and Apply Unified Modeling Language (UML) towards analysis and design. [K4] CO 4: Apply advance behavioural modelling concepts for analysing and designing of Object oriented Systems. [K3] CO 5: Apply the concepts of architectural design for deploying the code for software. [K3]	BIG DATA ANALYTICS 19BCS6PE04 CO 1: Interpret the architectural elements of big data and Hadoop framework. [K2] CO 2: Analyse various big data applications using map reduce programming module. [K4] CO 3: Analyse Spark capabilities such as distributed datasets, in-memory caching, and the interactive shell. [K4] CO 4: Summarize Spark's powerful built-in libraries, including Spark SQL, Spark Streaming. [K2] CO 5: Analyze Hadoop data with PIG and Hive. Interpret the applications and architecture of Mobile Computing and multiplexing techniques. [K4]
ADVANCED JAVA AND WEB TECHNOLOGIES 19BCS5TH05 CO 1: Interpret Servlet Life Cycle and web servers. [K2] CO 2: Illustrate JSP Life cycle. [K2] CO 3: Apply Session Management for JSP applications. [K3] CO 4: Illustrate the usage of JDBC in JSP applications. [K2]	NETWORK PROGRAMMING 19BCS6PE05 CO 1: Summarize the characteristics of Networking and OSI Reference model. [K2] CO 2: Illustrate TCP and UDP sockets. [K2] CO 3: Develop knowledge of client server programing. [K3]

CO 5: Make use of PHP for the development of web-based applications. [K3] CO 6: Utilize JDBC in PHP web-based applications. [K3	CO 4: Apply the basic knowledge socket programming. [K3] CO 5: Interpret power of UDP sockets in network programming. [K2]
DATA WAREHOUSING AND DATA MINING 19BCI5TH06 CO 1: Interpret the data mining terminology and types of data to be mined. [K2] CO 2: Outline the need and importance of pre-processing techniques and apply them.[K2] CO 3: Interpret data warehousing concepts and operations. [K2] CO 4: Compare and contrast different dominant Data Mining Algorithms for Classification and Clustering and apply them. [K4] CO 5: Analyze the performance of Association Rules. [K4]	**AGILE WITH SCRUM 19BCS6PE06** CO 1: Outline the concepts of Agile. [K2] CO 2: Analyze the requirements, specifications to design Agile Scrum Framework. [K4] CO 3: Summarize the benefits of different tools of Agile Testing. [K2] CO 4: Illustrate the Agile practices with respective principles to design and development. [K2] CO 5: Apply the Agile scenarios in terms of industry trends. [K3]
COMPUTER GRAPHICS 19BCS5TH08 CO 1: Summarize graphics applications, architectures, and open GL program structure. [k2] CO 2: Apply basic transformations on objects. [k3] CO 3: Apply line and polygon clipping algorithms. [k3] CO 4: Identify different projections. [k3] CO 5: Design interactive programs using openGL. [k6]	**MOBILE COMPUTING 19BCS6PE07** CO 1: Interpret the applications and architecture of Mobile Computing and multiplexing Techniques. [K2] CO 2: Analyze the Mobile IP issues. [K4] CO 3: Analyze the various Mobile TCP Variants. [K4] CO 4: Analyze the various routing protocols in MANET. [K4]
SOFTWARE TESTING METHODOLOGY 19BCS5TH09 CO 1: Outline the software testing terminology. [K2] CO 2: Compare and contrast various behavioural testing methodologies. [K2] CO 3: Summarize various dynamic testing techniques. [K2] CO 4: Summarize the importance of validation activities. [K2] CO 5: Interpret software testing and quality management. [K2]	**CRYPTOGRAPHY AND NETWORK SECURITY LAB 19BCS6LB01** CO1: Analyse security concepts and type of attacks and network security algorithms. [K4] CO2: Apply symmetric and asymmetric key cryptography technique to encrypt and decrypt text. [K4] CO3: Apply Cryptography Hash Function for message authentication and to solve other applications. [K3]
MICROPROCESSORS AND MULTICORE SYSTEMS 19BCI5TH07 CO 1: Interpret various building blocks of 8086 microprocessor. [K2] CO 2: Make use of various instructions and assembler directives to develop programs on the target microprocessor. [K3] CO 3: Make use of String instruction, various types of procedures and macros to develop programs on the target microprocessor. [K3] CO 4: Analyze various types of interrupts and interrupt applications of 8086. [K4] CO 5: Analyze the various basic building blocks of 8086, 80286, 80486 and Pentium Microprocessors. [K4]	**BIG DATA ANALYTICS LAB 19BCS6LB02** CO 1: Experiment with installation of Hadoop and develop applications using MapReduce framework. [K3] CO 2: Experiment with installation of Spark and develop applications. [K3] CO 3: Analyze Hadoop data with PIG. [K4] CO 4: Develop NoSQL structures like Hive for processing and aggregating logs in the database. [K3]
OS & UML LAB 19BCS5LB01 CO 1: Apply various scheduling, page replacement and Deadlock avoidance algorithms for effective utilization of the CPU. [K3] CO 2: Demonstrate various Memory Management Techniques. [K2] CO 3: Build use case diagrams that specify requirements for a software system. [K3] CO 4: Develop class diagrams that demonstrate design model of a software system. [K3] CO 5: Make use of interaction diagrams to model the dynamic aspects of a software System. [K3]	**R PROGRAMMING LAB 19BCS6LB03** CO 1: Apply the all basic operators on various data types.[K3] CO 2: Develop programs using Conditional Statements and various types of loops.[K3] CO 3: Develop programs using Matrices, Lists and Frames.[K3] CO 4: Develop programs using Functions, Math functions and Statistical functions in R.[K3] CO 5: Analyze the real word datasets presented in different formats using R libraries to perform exploratory data analysis and visualization.[K3]

CO 6: Develop various applications using unified modelling language. [K3]	
ADVANCED JAVA AND WEB TECHNOLOGIES LAB 19BCS5LB02 CO 1: Experiment with the installation of Web Servers. [K3] CO 2: Make use of servlets in dynamic web pages. [K3] CO 3: Develop web applications using JSP for effective data management. [K3] CO 4: Construct the web based applications in PHP using effective data base access with rich client interaction. [K3]	**ARTIFICIAL INTELLIGENCE LAB 19BCS6LB04** CO 1: Apply various preprocessing Techniques on the given data.[K3] CO 2: Construct regression models for a given data.[K3] CO 3: Build classification models for a given data.[K3]
DATA MINING LAB 19BCS5LB03 CO 1: Apply data preprocessing techniques on the given data.[K3] CO 2: Construct classification model for the given data.[k3] CO 3: Identify Association Rules for the given data.[K3] CO 4: Apply the clustering techniques on the given data.[K3]	
MINI PROJECT 19BCS5MP01 CO 1: Apply practical knowledge gained within the chosen area of technology for project Development. [K3] CO 2: Evaluate, analyze, formulate and handle programming projects with a comprehensive and systematic approach. [K5] CO 3: Take part in as an individual or in a team in development of technical projects. [K4] CO 4: Develop effective communication skills for presentation of project related activities.[K3]	
ADVANCED COMMUNICATION SKILLS 19BCC5MC01 CO 1: Compile emails, letters, reports and resume. (Create-6) CO 2: Develop presentation Skills and make formal presentations using strategies. (Apply 3) CO 3: Analyse problem solving skills effectively to participate in Group Discussions (Analyze-4) CO 4: Build interview skills for employability. (Apply -3)	

R16 IV B.TECH

I Semester	II Semester
INTERNET OF THINGS **CO1 :** Outline the concepts of Internet of Things. **CO2 :** Analyze the requirements, specifications to design IoTapplications. **CO3 :** Analyze domain specific applications using Arduino andRaspberry pi. **CO4 :** Interpret cloud storage models and communication APIs forIoT.	**SOFTWARE QUALITY ASSURANCE AND TESTING** **CO1 :** Outline different aspects of software quality assurance andstandards. **CO2 :** Apply various software testing strategies. **CO3 :** Develop test plans, schedules and testing techniques forsoftware project. **CO4 :** Apply features of software testing automation tools. **CO5 :** Summarize different steps in software testing process. **CO6 :** Identify the status of testing results and testing methodologies.
BIG DATA ANALYTICS **CO1:** Interpret the architectural elements of big data and Hadoopframework. **CO2:** Analyse various big data applications using map reduceprogramming module. **CO3:** Analyse Spark capabilities such as distributed datasets, in-memory caching, and the interactive shell.	**NON CONVENTIONAL ENERGY RESOURCES** **CO1:** Analyse the significance of renewable energy. **CO2:** Understand the principles of solar radiation. **CO3 :** Know the functioning of basic components of wind energy **CO4:** Understand the utilization of biomass in power generation.

CO4: Summarize Spark's powerful built-in libraries, including SparkSQL, Spark Streaming. **CO5:** Analyze Hadoop data with PIG and Hive.	**CO5:** Understand the working principles of geothermal, ocean, tidal and wave energy techniques. **CO6:** Know the functioning of direct energy conversion techniques.
SOFTWARE TESTING METHODOLOGY **CO1 :** Outline the software testing terminology. **CO2 :** Compare and contrast various behavioral testing methodologies. **CO3 :** Summarize various dynamic testing techniques and validation activities. **CO4 :** Interpret software testing and quality management. **CO5 :** Analyze debugging techniques and testing tools.	**PRACTICAL TRAINING / INTERNSHIP** **CO1:** Gain practical experience within the business environment. **CO2:** Acquire knowledge of the industry in which the internship is done. **CO3:** Apply knowledge and skills learned in the classroom in a work setting. **CO4:** Develop and refine oral and written communication skills. **CO5:** Identify areas for future knowledge and skill development
MOBILE AD HOC AND SENSOR NETWORKS **CO1 :** Analyse the routing protocols in MANET. **CO2 :** Outline the data transmission in MANET. **CO3 :** Interpret the TCP over Ad-hoc Networks. **CO4 :** Interpret the data transmission and data acquisition in WSN. **CO5 :** Outline the tools and network platforms of WSN.	**MAJOR PROJECT** **CO1:** Acquire practical knowledge within the chosen area of technology for project development. **CO2:** Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach. **CO3:** Contribute as an individual or in a team in development of technical projects. **CO4:** Develop effective communication skills for presentation of project related activities.
CLOUD COMPUTING **CO1 :** Interpret various types of Virtualization. **CO2 :** Outline the Cloud Application Architectures and Infrastructure Models. **CO3 :** Analyze the Data center to cloud. **CO4 :** Analyze various services of Cloud Computing. **CO5 :** Analyze the Security and Disaster Management in Cloud.	
MOBLILE APPLICATION DEVELOPMET LAB **CO1 :** Demonstrate various components of Android Framework. **CO2 :** Develop user Interfaces for the Android Application. **CO3 :** Develop Android Applications using Android API and Services.	
ORACLE DATABASE ADMINISTRATION **CO1 :** Create oracle database instance **CO2 :** Manage and configure oracle network environment. **CO3 :** Implement security features in database. **CO4 :** Take and restore backup and recovery **CO5 :** Perform database recovery.	
IOT LAB **CO1:** Analyse the requirements, specifications to design home automation applications. **CO2:** Build smart city applications using Arduino. **CO3:** Develop agricultural applications using Raspberry pi. **CO4:** Utilize AutoBahn, Xively Cloud communication API's to exchange data.	
BIG DATA ANALYTICS LAB **CO1:** Experiment with installation of Hadoop and develop applications using Map Reduce framework. **CO2:** Experiment with installation of Spark and develop applications.**CO3:** Analyse Hadoop data with PIG.	

CO4: Develop NoSQL structures like Hive for processing and aggregating logs in the database.	
MASSIVE OPEN ONLINE COURSES (MOOCs) **CO1:** Identify suitable course required for their carrier **CO2:** Adapt effectively for changing conditions. **CO3:** Develop and refine oral communication skills. **CO4:** Take part in lifelong learning	

R20 - B. TECH.(IT) - COURSE OUTCOMES I B. TECH.	
I Semester	**II Semester**
TECHNICAL AND COMMUNICATIVE ENGLISH – I R20CC1101 CO1: Interpret explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. [K3]. CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. [K6]. CO3: Build grammatically correct sentences using a variety of sentence structures. [K3] CO4: Enhance word power and usage of lexicons [K3].	NUMERICAL METHODS AND STATISTICS R20CC1202 CO1: Evaluate approximating roots of polynomials and transcendental equations by different algorithms. [K5] CO2: Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. [K3] CO3: Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations.[K3] CO4: Decide whether to accept or reject a statement about parameter in decision making problems. [K5]
LINEAR ALGEBRA AND CALCULUS R20CC1102 CO 1: Solve the system of linear equations.[K3] CO 2: Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.[K4] CO 3: Apply the mean value theorems in calculus to Engineering problems.[K3] CO 4: Apply the functions of several variables to evaluate the rates of change with respect to Time and space variables in engineering. [K3] CO 5: Determine the area and volume by interlinking them to appropriate double and triple integrals. [K5]	ENGINEERING CHEMISTRY R20CC1204 CO 1: Analyze the suitable method of water treatment depending on the quality treatment. [K4] CO 2: Compare different types of polymers, fuels and their importance.[K4] CO 3: Utilize the advanced materials as engineering materials and apply them in domestic and industrial life.[K3] CO 4: Distinguish electrical energy sources and importance of corrosion science.[K4] CO 5: Identify different types of engineering materials and applications in engineering. [K3]
APPLIED PHYSICS R20CC1104 CO 1: Interpret the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polarization in various fields. [K2] CO 2: Analyze and understand various types of lasers & optical fibers.[K4] CO 3: Identify the crystal structures and XRD techniques. [K3]. CO 4: Apply the magnetic materials in engineering field. [K3] CO 5: Identify the various applications of semiconductors in engineering field. [K3]	PROBLEM SLOVING USING PYTHON R20CC1206 CO 1: Summarize the fundamental concepts of python programming. [K2] CO 2: Interpret object oriented and event driven programming in python. [K2] CO 3: Apply the suitable data structures to solve the real time problems. [K3] CO 4: Apply regular expressions for many different situations. [K3]
PROBLEM SOLVING USING C R20CC1105 CO1: Develop algorithms and flow charts for simple problems. [K3] CO2: Utilize suitable control structures for developing code in C. [K3] CO3: Make use of functions and arrays in developing modular programs. [K3] CO4: Make use of structures and pointers to write well-structured programs. [K3] CO5: Make use of file Operations in C programming for a given application. [K3]	ELECTRONIC DEVICES AND LOGIC DESIGN R20CC1208 CO1: Apply P-N diodes and Special diodes in electronic circuits.[K3] CO2: Compare different types of transistors (BJT, FET and MOSFET) with their working principles.[K2] CO3: Make use of Boolean algebra and K-map and to minimize combinational functions.[K3] CO4: Develop combinational circuits and sequential circuits.[K3] CO5: Construct different types of registers and counters.[K3]

SOFT SKILLS & COMMUNICATION SKILLS LAB R20CC11L1 CO1: Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment.[K3] CO 2: Listen and comprehend several accents of English Language.[K4] CO 3: Take part in various conversations/discourses using formal and informal expressions.[K4] CO 4: Adapt soft skills successfully in personal and professional life.[K5]	**ENGINEERING CHEMISTRY LAB R20CC12L2** CO 1: Develop and perform analytical chemistry techniques to address the water related problems (hardness, alkalinity, Chlorine, DO). [K6] CO 2: Explain the functioning of different analytical instruments.[K5] CO 3: Compare viscosity and surface tension of different oils.[K4] CO 4: Measure molecular/system properties such as strength of solutions, conductance of solutions and acid number of lubricating oils, etc.[K5]
PROBLEM SOLVING USING C LAB R20CC11L2 CO 1: Study, analyze and understand logical structure of computer programming and different constructs to develop programs in C Language. [K4] CO 2: Compare and contrast various data types and operator precedence. [K2] CO 3: Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. [K4] CO 4: Analyze simple data structures, use of pointers and dynamic memory allocation techniques. [K4] CO5: Make use of functions and file I/O operations in developing C Programs. [K3]	**R PROGRAMMING LAB R20CC12L3** CO 1: Apply the all basic operators on various data types.[K3] CO 2: Develop programs using Conditional Statements and various types of loops.[K3] CO 3: Develop programs using Matrices, Lists and Frames.[K3] CO 4: Develop programs using Functions, Math functions and Statistical functions in R.[K3] CO 5: Analyze the real word datasets presented in different formats using R libraries to perform exploratory data analysis and visualization.[K3]
APPLIED PHYSICS LAB R20CC11L4 CO1: Apply the principle of physics in engineering field (K3) CO2: Utilize the modern engineering physics techniques and tools in real time applications. (K3) CO3: Analyse characteristics, usage and the behaviour of materials. (K4)	**LINUX PROGRAMMING LAB R20CS11L8** CO 1: Apply the fundamental UNIX utilities. [K3] CO 2: Utilize the Unix file system[K3] CO 3: Experiment with shell and UNIX filters. [K3] CO 4: Analyze the Shell Programming constructs to develop shell scripts. [K4]
CSE WORKSHOP R20CC12L7 CO1: Demonstrate the need of PC hardware components, applications and softwares.[K2] CO2: Explain the knowledge of networks, internet and World Wide Web, Search engines, Netiquette. [K2] CO3: Install and use different software like Windows XP, Linux. CO4: Identify and fix the defective PC and software related issues.[K3] CO5: Formalise with parts of windows word, Excel and Power point.	**PROBLEM SOLVING USING PYTHON LAB R20CC12L12** CO1: Develop interactive visual programs using Scratch.[K3]. CO2: Develop Python programs for numerical and text based problems. [K3]. CO3: Develop graphics and event based programming using Python. [K3]. CO4: Develop Python programs on object oriented programming and regular expressions. [K3].
	ENVIRONMENTAL STUDIES R20CCMC1 CO 1: Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.[K2] CO 2: Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.[K4] CO 3: Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity.[K2] CO 4: Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices.[K4] CO 5: Interpret Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.[K2]

R20 - B. TECH.(IT) - COURSE OUTCOMES
II B. TECH.

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE R20CC2102 CO 1: Apply the logical statements, connectivity among the statements and forms different types of normal forms. [K3] CO 2: Analyze the theory of Inference for statement calculus [K4] CO 3: Classify the types of graphs and trees to formulate computational problems.[K4] CO 4: Apply DNF and CNF on Boolean algebraic functions to simplify the digital (logic) circuits. [K3] CO 5: Solve mathematical problems with recurrence relations using different methods. [K3]	**TECHNICAL AND COMMUNICATIVE ENGLISH – II R20CC2201** CO 1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it (Apply-3). CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. (Creating-5). CO3:Build grammatically correct sentences using a variety of sentence structures (Apply3). CO4: Enhance word power and usage of lexicons (Apply3).
OOPS THROUGH JAVA R20CC2103 CO1: Interpret the syntax and semantics of java programming language and OOPs concepts. [K2] CO2: Make use of different predefined classes and packages and interfaces to develop programmes using OOPs concepts. [K3] CO3: Apply exception handling and multithreading mechanisms on java programs.[K3] CO4: Develop java programmes using collection framework & I/O. [K3] CO5: Make use of AWT, Applets and Event-Handling to develop GUI. [K3]	**DATABASE MANAGEMENT SYSTEMS R20CC2203** CO1 : Interpret the fundamentals of DBMS. [K2] CO2 : Analyze DB design methodology and normalization process. [K4] CO3 : Develop Queries in RDBMS. [K3] CO4 : Compare and Contrast various transaction and concurrency management techniques. [K2] CO5 : Analyze various file organizations and indexing techniques. [K4
DATA STRUCTURES R20CC2104 CO1 : Apply Searching, Sorting and Hashing techniques to solve problems.[K3] CO2 : Analyze basic data structures such as Stacks, Queues and Linked List. [K4] CO3 : Solve problems involving Advanced concepts of Trees. [K3] CO4 : Analyze variety of Graph data structures that are used in various applications. [K4]	**DESIGN AND ANALYSIS OF ALGORITHMS R20IT2202** CO 1: Apply asymptotic notations to measure the performance of algorithms. [K3] CO 2: Apply divide-and-conquer paradigm when an algorithmic design situation calls for it. [K3] CO 3: Identify all feasible solutions to get optimal solutions using greedy method. [K3] CO 4: Apply dynamic-programming approach, to solve real world problems. [K3] CO 5: Apply fundamental graph traversal techniques to solve various applications using Backtracking. [K3] CO 6: Analyse least cost and FIFO branch and bound paradigms. [K4]
COMPUTER ORGANIZATION R20CI2101 CO 1: Interpret the computer system from user's perspective and can explain how Arithmetic Logic Unit works. [K2] CO 2: Explain of basic components of the system and illustrate data paths and control flow for sequencing in CPUs. [K2] CO 3: Interpret the Micro operations and Microprogramming for design of control unit of CPU. [K2] CO 4: Develop Main Memory Interfacing Circuit and can apply various cache memory mapping techniques. [K3] CO 5: Apply algorithms to perform arithmetic operations on binary representation of fixed point data. [K3] CO 6: Interpret various I/O interface devices. [K2]	**COMPUTER NETWORKS R20IT2205** CO 1: Summarize basic concepts of Data Communication and Networking. [K2] CO 2: Compare and Contrast OSI and TCP/IP reference models. [K2] CO 3: Interpret data link layer services and multiple access protocols. [K2] CO 4: Analyse different routing protocols. [K4] CO 5: Illustrate the essential principles of different transport layer protocols. [K2] CO 6: Summarize various application layer protocols. [K2]
FRONT END WEB TECHNOLOGIES R20CC2105 CO1: Interpret a webpage and identify its elements and attributes.[K2]. CO2: Build webpages using HTML5 [K3]. CO3: Make use of Cascading Style Sheets on webpages [K3]. CO4: Make use of Java Script to write nteractive webpages [K3].	**SOFTWARE ENGINEERING R20CC2204** CO 1: Analyse basic software engineering models. [K4]. CO 2: Demonstrate the various Object Oriented Design models [K2]. CO 3: Outline the software prototyping, analysis and design [K2]. CO 4: Outline the importance of software testing and

CO5: Build dynamic webpages with JQuery [K3]. CO6: Make use of JQuery UI to develop dynamic webpages [K3].	project management [K4].
DATA STRUCTURES LAB R20CC21L1 CO 1: Analyze algorithms, Searching, Sorting and hashing Techniques.[K4] CO 2: Make use of elementary data structures such as stacks, Queues and linked list to develop their applications.[K3] CO 3: Examine different tree traversal techniques. [K4] CO 4: Experiment with different graph traversal techniques.[K4]	DATABASE MANAGEMENT SYSTEMS LAB R20CC22L1 CO1 : Apply SQL commands like DDL, DML and DCL to perform different Database operations [K3]. CO2 : Develop PL/SQL block statements, control statements and cursors. [K3] CO3 : Develop PL/SQL programs using functions and procedures. [K3] CO4 : Develop PL/SQL programs using packages and Triggers. [K3]
OOPS THROUGH JAVA LAB R20CC21L2 CO1: Develop java programs by using OOP concepts. [K3] CO2: Make use of interfaces, exception handling and threads to develop JAVA programs. [K3] CO3: Make use of exception handling and collections in Java Programming. [K3] CO4: Develop GUIs with AWT, Applets and Event Handling. [K3]	SOFTWARE ENGINEERING AND UML LAB R20CS22L2 CO 1: Compare the process of requirements development and requirements management and Examine the importance of requirements classification. [K4] CO 2: Build use case diagrams that specify requirements for a software system.[K3] CO 3: Develop class diagrams that demonstrate design model of a software system. .[K3] O 4: Make use of interaction diagrams to model the dynamic aspects of a software system [K3] CO 5: Develop various applications using unified modeling language. .[K3]
FRONT END WEB TECHNOLOGIES LAB R20CC21L3 CO 1:Develop static html pages [K3]. CO 2: Develop Interactive Web Pages with different styles and client side validations[K3]. CO 3: Make use of JQuery programming to develop Web pages [K3]. CO 4: Apply JQuery UI to HTML pages [K3]	MOBILE APPLICATION DEVELOPMET LAB 20CC22L2 CO1 : Demonstrate various components of Android Framework.[K2]. CO2 : Develop user Interfaces for the Android Application.[K3]. CO3 : Develop Android Applications using Android API and Services.[K3]. CO4 : Develop Android Applications which access data from Internet.[K3].
CONSTITUTION OF INDIA (MC) R20CC21MC2 CO1: Examine salient features of Indian Constitution and live accordingly in society & interpret the meaning of Fundamental Rights of State Policy. CO2: Discover various aspects of Union Government legislation and live up to the expectations of the rules. CO3: Critically examine State Government legislation and improve your living standards by following the rules strictly CO4: Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living CO5: Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life	ARTIFICIAL INTELLIGENCE R20CC22L4 CO 1: Summarize the characteristics of AI that make it useful to real-world problems. [K2] CO 2: Analyse different search techniques and predicate logic in artificial Intelligence. [K4] CO 3: Interpret knowledge representation and symbolic reasoning using different rules. [K2] CO 4: Apply the basic knowledge on learning and reinforcement learning. [K3] CO 5: Make use of the power of AI in Natural language processing as an advanced Application of AI. [K3]

R19 - B. TECH.(IT) - COURSE OUTCOMES **III B. TECH.**	
OPERATING SYSTEMS 19BCI5TH01 CO 1: Classify various operating system functionalities and generations. [K2] CO 2: Interpret process management and exemplify the process synchronization techniques. [K2] CO 3: Apply various process scheduling algorithms. [K3] CO 4: Distinguish various memory management techniques and apply various deadlock techniques. [K4] CO 5: Compare and contrast various disk scheduling	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING 19BIT6TH02 CO1: Develop a fundamentals of artificial intelligence and Machine Learning. [K3] CO2: Analyze different search techniques and predicate logic in artificial Intelligence. [K4] CO3: Make use of knowledge representation and symbolic reasoning using different rules. [K3] CO4: Compare and contrast different dominant Machine

algorithms and can interpret the file system implementations. [K2]	Learning Algorithms for classification. [K4]
DESIGN AND ANALYSIS OF ALGORITHMS 19BIT5TH03 CO 1: Apply asymptotic notations to measure the performance of algorithms [K3] CO 2: Apply divide-and-conquer paradigm when an algorithmic design situation calls for it [K3]. CO 3: Identify all feasible solutions to get optimal solutions using greedy method [K3]. CO 4: Apply dynamic-programming approach, to solve real world problems [K3]. CO 5: Apply fundamental graph traversal techniques to solve various applications using Backtracking [K3]. CO 6: Analyse least cost and FIFO branch and bound paradigms [K4].	**BLOCKCHAIN TECHNOLOGIES 19BIT6TH03** CO 1: Summarize the fundamentals of Blockchain. [K2] CO 2: Analyze the working of Blockchain. [K4] CO 3: Interpret how business can be easily made with Blockchain. [K2] CO 4: Illustrate how Block Chain can be integrated with various current technologies. [K2] CO 5: Get familiarity about the Blockchain strength in providing solutions. [K3] CO 6: Investigate the Problems with Blockchain. [K4]
SOFTWARE ENGINEERING 19BIT5TH04 CO1 : Compare and contrast basic software engineering methods and practices. [K2]. CO2 : Analyze the project management essentials [K4]. CO3 : Analyze the software process models. [K4]. CO4 : Outline the importance of software testing and quality control approaches [K2].	**ENTREPRENEURSHIP & INNOVATION 19BCC6TH01** CO 1: : Outline the concepts of Entrepreneurship.[K2] CO 2: : Create the awareness on creativity and innovation.[K6] CO 3: : Adopt the Entrepreneurship Development programs[K6] CO 4: : Evaluate the project planning and feasibility studies.[K5] CO 5: : Analyze the concept of small and micro enterprises.[K4]
CRYPTOGRAPHY & NETWORK SECURITY 19BIT5TH05 CO 1: Summarize the fundamentals of Cryptography. [K2] CO 2: Analyze how security is achieved, and attacks can be countered by using symmetric/asymmetric algorithms. [K4] CO 3: Apply Number Theoretic concepts in developing cryptographic algorithms to counter attacks. [K3] CO 4: Interpret the role of hash functions and Digital Signatures in Information Security.[K2] CO 5: Compare different network security designs using available secure solutions. [k2] CO 6: Illustrate the use of encryption techniques to secure data in transit across data networks. [K2]	**BIG DATA ANALYTICS 19BIT6PE04** CO 1: Interpret the architectural elements of big data and Hadoop framework. [K2] CO 2: Analyse various big data applications using map reduce programming module. [K4] CO 3: Analyse Spark capabilities such as distributed datasets, in-memory caching, and the interactive shell. [K4] CO 4: Summarize Spark's powerful built-in libraries, including Spark SQL, Spark Streaming. [K2] CO 5: Analyze Hadoop data with PIG and Hive. Interpret the applications and architecture of Mobile Computing and multiplexing techniques. [K4]
WEB DEVELOPMENT USING MEAN STACK 19BIT5TH08 CO1: Apply Angular8 to develop web applications. [K3] CO2: Make use of Forms and Services. [K3] CO3: Utilize Node.js to create Server-Side Applications. [K3] CO4: Make use of Express to deploy web applications. [K3] CO5: Experiment with NoSQL using MongoDB. [K3]	**COMPUTER GRAPHICS 19BIT6PE05** CO 1: Summarize graphics applications, architectures, and open GL program structure. [k2] CO 2: Apply basic transformations on objects. [k3] CO 3: Apply line and polygon clipping algorithms. [k3] CO 4: Identify different projections. [k3] CO 5: Design interactive programs using openGL. [k6]
DATA WAREHOUSING AND DATA MINING 19BCI5TH06 CO 1: Interpret the data mining terminology and types of data to be mined. [K2] CO 2: Outline the need and importance of pre-processing techniques and apply them.[K2] CO 3: Interpret data warehousing concepts and operations. [K2] CO 4: Compare and contrast different dominant Data Mining Algorithms for Classification and Clustering and apply them. [K4] CO 5: Analyze the performance of Association Rules. [K4]	**SOFTWARE PROJECT MANAGEMENT 19BIT6PE06** CO 1: Illustrate the conventional software Management and economics [K2]. CO 2: Outline the software life cycle phases and artifacts [K2]. CO 3: Illustrate the various workflows, check points and iterative process planning [K2]. CO 4: Analyze the project organizations, responsibilities and control [K4]

COMPILER DESIGN 19BCI5TH02 CO 1: Summarize different phases and passes of a compiler. [K2] CO 2: Compare and Contrast various Top-Down and Bottom-Up Parsing techniques. [K2] CO 3: Interpret different types of Intermediate Code representations. .[K2] CO 4: Illustrate the effective usage of register allocation and various Code-generation techniques. .[K2] CO 5: Apply different code-optimization techniques to optimize the target code. .[K3]	**ADVANCED COMPUTER ARCHITECTURE 19BIT6PE07** CO 1: Analyze the architectures of MIMD, SIMD and super computers. [K4] CO 2: Compare the RISC and CISC architectures. [K4] CO 3: Interpret various models of Linear and Non-Linear pipeline Processors. [K5] CO 4: Compare the Cache coherence issues. [K4] CO 5: Analyze message passing mechanisms. [K4] CO 6: Compare different forms of parallelism in parallel systems. [K4]
SOFTWARE REQUIREMENTS AND ESTIMATION 19BIT5TH09 CO 1: Outline knowledge about software requirements. [K2] CO 2: Apply principles of software requirements management and modelling. [K3] CO 3: Apply various methods to estimate size of software. [K3] CO 4: Evaluate software estimation with respect to estimation factors. [K5] CO 5: Summarize the benefits of different software requirement management tools. [K2]	**AI & ML LA 19BIT6LB01** CO 1: Apply various pre-processing Techniques on the given data. [K3] CO 2: Construct regression models for a given data. [K3] CO 3: Build classification models for a given data. [K3]
MICROPROCESSORS AND MULTICORE SYSTEMS 19BCI5TH07 CO 1: Interpret various building blocks of 8086 microprocessor. [K2] CO 2: Make use of various instructions and assembler directives to develop programs on the target microprocessor. [K3] CO 3: Make use of String instruction, various types of procedures and macros to develop programs on the target microprocessor. [K3] CO 4: Analyze various types of interrupts and interrupt applications of 8086. [K4] CO 5: Analyze the various basic building blocks of 8086, 80286, 80486 and Pentium Microprocessors. [K4]	**BIG DATA ANALYTICS LAB 19BIT6LB02** CO 1: Experiment with installation of Hadoop and develop applications using MapReduce framework. [K3] CO 2: Experiment with installation of Spark and develop applications. [K3] CO 3: Analyze Hadoop data with PIG. [K4] CO 4: Develop NoSQL structures like Hive for processing and aggregating logs in the database. [K3]
MOBILE APPLICATION DEVELOPMET LAB 19BIT5LB01 CO1 : Demonstrate various components of Android Framework.[K2]. CO2 : Develop user Interfaces for the Android Application.[K3]. CO3 : Develop Android Applications using Android API and Services.[K3]. CO4 : Develop Android Applications which access data from Internet.[K3].	**R PROGRAMMING LAB 19BIT6LB03** CO 1: Apply the all basic operators on various data types.[K3] CO 2: Develop programs using Conditional Statements and various types of loops.[K3] CO 3: Develop programs using Matrices, Lists and Frames.[K3] CO 4: Develop programs using Functions, Math functions and Statistical functions in R.[K3] CO 5: Analyze the real word datasets presented in different formats using R libraries to perform exploratory data analysis and visualization.[K3]
WEB DEVELOPMENT USING MEAN STACK LAB 19BIT5LB02 CO1: Develop SPAs with Angular. [K3] CO2: Develop a web server with Node.js. [K3] CO3: Develop a web server with Express.js [K3] CO4: Make use of MongoDB to perform database operations. [K3]	**MINI PROJECT 19BCS5MP01** CO 1: Apply practical knowledge gained within the chosen area of technology for project Development. [K3] CO 2: Evaluate, analyze, formulate and handle programming projects with a comprehensive and systematic approach. [K5] CO 3: Take part in as an individual or in a team in development of technical projects. [K4] CO 4: Develop effective communication skills for presentation of project related activities.[K3]

DATA MINING LAB 19BIT5LB03 CO 1: Apply data preprocessing techniques on the given data.[K3] CO 2: Construct classification model for the given data.[k3] CO 3: Identify Association Rules for the given data.[K3] CO 4: Apply the clustering techniques on the given data.[K3]	
UML LAB 19BIT5LB04 CO 1: Build use case diagrams that specify requirements for a software system. [K3] CO 2: Develop class diagrams that demonstrate design model of a software system. [K3] CO 3: Make use of interaction diagrams to model the dynamic aspects of a software system. [K3] CO 4: Develop various applications using unified modelling language. [K3	
DATA MINING LAB 19BCS5LB03 CO 1: Apply data preprocessing techniques on the given data.[K3] CO 2: Construct classification model for the given data.[k3] CO 3: Identify Association Rules for the given data.[K3] CO 4: Apply the clustering techniques on the given data.[K3]	
ADVANCED COMMUNICATION SKILLS 19BCC5MC01 CO 1: Compile emails, letters, reports and resume. [K6] CO 2: Develop presentation Skills and make formal presentations using strategies. [K3] CO 3: Analyse problem solving skills effectively to participate in Group Discussions [K4] CO 4: Build interview skills for employability. [K3]	

R20 - B. TECH.CSE(AI) - COURSE OUTCOMES
I B. TECH.

TECHNICAL AND COMMUNICATIVE ENGLISH - I	COMMUNICATIVE ENGLISH - II
CO1: Interpret explicit and implicit meaning of a text, recognize key passages; raise questions and summarizeit. [K3]**.** **CO2**: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. **[K6].** **CO3**: Build grammatically correct sentences using a variety ofsentence structures**. [K3]** **CO4**: Enhance word power and usage of lexicons [**K3].**	**CO1:** Read and comprehend complex texts and summarize. **CO2:** Compose paragraphs, essays as creative writing. **CO3:** Learn grammatical structures and write grammaticallycorrect sentences **CO4:** Enhance word power and usage of lexicons.**CO5:** Compile emails, letters, reports, resume andinformation transfer.
MATRIX ALGEBRA AND CALCULUS **CO1:** Solve the system of linear equations.[K3] **CO2:**Analyze the applications of matrices in various fields andobtain Eigen values and Eigenvectors.[K4] **CO3:**Apply the mean value theorems in calculus to Engineeringproblems.[K3] **CO4:**Apply the functions of several variables to evaluate therates of change with respect to Time and space variables in engineering. [K3] **CO5:** Determine the area and volume by interlinking them toappropriate double and triple integrals. [K5]	**ENGINEERING CHEMISTRY** **CO 1:** Analyze the suitable method of water treatment depending on the quality treatment. [K4] **CO 2:** Compare different types of polymers, fuels and theirimportance.[K4] **CO 3:**Utilize the advanced materials as engineering materials and apply them in domestic and industrial life.[K3] **CO 4:**Distinguish electrical energy sources and importanceof corrosion science.[K4] **CO5:**Identify different types of engineering materials andapplications in engineering **[K3]**

APPLIED PHYSICS	PROBLEM SLOVING USING PYTHON
CO1 : Interpret the experimental evidence of wave nature of light and interference in thin films, Diffraction gratingand Polarization in various fields. **[K2]** **CO2 :** Analyze and understand various types of lasers & opticalfibers.[**K4]** **CO3 :** Identify the crystal structures and XRD techniques. **[K3]**. **CO4 :** Apply the magnetic materials in engineering field. [**K3]** **CO5 :** Identify the various applications of semiconductors in engineering field. **[K3]**	**CO 1:** Summarize the fundamental concepts of python programming. [K2] **CO 2:** Interpret object oriented and event driven programming in python. [K2] **CO 3:** Apply the suitable data structures to solve the real timeproblems. [K3] **CO 4:** Apply regular expressions for many different situations. [K3]
PROBLEM SOLVING USING C **CO1**: Develop algorithms and flow charts for simple problems.[K3] **CO2**:Utilize suitable control structures for developing code in C.[K3] **CO3**: Make use of functions and arrays in developing modularprograms. [K3] **CO4**: Make use of structures and pointers to write well-structured programs. [K3] **CO5**: Make use of file Operations in C programming for a givenapplication. [K3]	**ELECTRONIC DEVICES AND LOGIC DESIGN** **CO1:**Apply P-N diodes and Special diodes in electronic circuits.[K3] **CO2:**Compare different types of transistors (BJT, FET andMOSFET) with their working principles.[K2] **CO3:**Make use of Boolean algebra and K-map and to minimize combinational functions.[K3] **CO4:** Develop combinational circuits and sequential circuits.[K3] **CO5:** Construct different types of registers and counters.[K3]
LINUX PROGRAMMING LAB **CO 1:** Apply the fundamental UNIX utilities. [K3] **CO 2:** Utilize the Unix file system[K3] **CO 3:** Experiment with shell and UNIX filters. [K3] **CO 4:** Analyze the Shell Programming constructs to developshell scripts. [K4]	**NUMERICAL METHODS AND STATISTICS** **CO1**:Evaluate approximating roots of polynomials and transcendental equations by different algorithms. [K5] **CO2**:Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals. **[K3]** **CO3**:Apply different algorithms for approximating solutionsof ordinary differential equation to its analytical computations.[**K3]** **CO4**: Decide whether to accept or reject a statement about parameter in decision making problems. [**K5]**
SOFT SKILLS & COMMUNICATION SKILLS LAB **CO1:**Communicate effectively with good pronunciation, overcoming mother tongue influence in academic and professional environment.[K3] **CO2**:Listen and comprehend several accents of English Language.[K4] **CO3**:Take part in various conversations/discourses using formaland informal expressions.[K4] **CO4**:Adapt soft skills successfully in personal and professionallife.[K5]	**PROBLEM SOLVING USING PYTHON LAB** **CO1:** Develop interactive visual programs using Scratch.[K3]. **CO2:** Develop Python programs for numerical and text basedproblems. [K3]. **CO3:** Develop graphics and event based programming usingPython. [K3]. **CO4:** Develop Python programs on object oriented programming and regular expressions. [K3].
APPLIED PHYSICS LAB **CO1:** Apply the principle of physics in engineering field **(K3)** **CO2:** Utilize the modern engineering physics techniques and tools in real time applications. **(K3)** **CO3:** Analyse characteristics, usage and the behaviour of materials**. (K4)**	**ENGINEERING CHEMISTRY LAB** **CO1:** Develop and perform analytical chemistry techniques to address the water related problems (hardness,alkalinity, Chlorine, DO). [K6] **CO2:** Explain the functioning of different analytical instruments.[K5] **CO3:**Compare viscosity and surface tension of different oils.[K4] **CO4:**Measure molecular/system properties such as strengthof solutions, conductance of solutions and acid number of lubricating oils, etc.[K5]

PROBLEM SOLVING USING C LAB	CSE WORKSHOP
CO1: Study, analyze and understand logical structure of computer programming and different constructsto develop programs in C Language. [K4] **CO2:** Compare and contrast various data types and operator precedence. [K2] **CO3:** Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions. [K4] **CO4:** Analyze simple data structures, use of pointers and dynamic memory allocation techniques.[K4] **CO5:** Make use of functions and file I/O operations in developing C Programs. [K3]	**CO1:**Demonstrate the need of PC hardware components,applications and softwares.[K2] **CO2:**Explain the knowledge of networks, internetand World Wide Web, Search engines, Netiquette. [K2] **CO3:**Install and use different software like Windows XP,Linux. **CO4:**Identify and fix the defective PC and software relatedissues.[K3] **CO5:**Formalise with parts of windows word, Excel and Power point.
	R PROGRAMMING LAB **CO1 :** Apply the all basic operators on various data types.[K3] **CO2 :** Develop programs using Conditional Statements andvarious types of loops.[K3] **CO3 :** Develop programs using Matrices, Lists and Frames.[K3] **CO4 :** Develop programs using Functions, Math functionsand Statistical functions in R.[K3] **CO5 :** Analyze the real word datasets presented in differentformats using R libraries to perform exploratory data analysis and visualization.[K3]
	ENVIRONMENTAL STUDIES **CO1:** Explain the concepts of the ecosystem and its function in the environment. The need for protectingthe producers and consumers in various ecosystems and their role in the food web. **CO2:** Analyse the natural resources and their importance for the sustenance of the life and recognize the need toconserve the natural resources. **CO3:** Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity. **CO4:** Distinguish various attributes of the pollution, theirimpacts and measures to reduce or control the pollution along with waste management practices. **CO5:** Define Environmental policy, legislation, environmental assessment and the stages involved inEIA Environmental audit.

R20 - B. TECH.CSE(AI) - COURSE OUTCOMES	
II B. TECH.	
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE R20CC2102 CO 1: Apply the logical statements, connectivity among the statements and forms different types of normal forms. [K3] CO 2: Analyze the theory of Inference for statement calculus. [K4] CO 3: Classify the types of graphs and trees to formulate computational problems.[K4] CO 4: Apply DNF and CNF on Boolean algebraic functions to simplify the digital (logic) circuits. [K3] CO 5: Solve mathematical problems with recurrence relations using different methods. [K3]	TECHNICAL AND COMMUNICATIVE ENGLISH – II R20CC2201 CO 1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it (Apply-3). CO2: Compose paragraphs, essays, emails, letters, reports, resume and transfer information into tables, Pie and bar diagrams. (Creating-5). CO3:Build grammatically correct sentences using a variety of sentence structures (Apply3). CO4: Enhance word power and usage of lexicons (Apply3).

OOPS THROUGH JAVA R20CC2103 CO1: Interpret the syntax and semantics of java programming language and OOPs concepts. [K2] CO2: Make use of different predefined classes and packages and interfaces to develop programmes using OOPs concepts. [K3] CO3: Apply exception handling and multithreading mechanisms on java programs.[K3] CO4: Develop java programmes using collection framework & I/O. [K3] CO5: Make use of AWT, Applets and Event-Handling to develop GUI. [K3]	**DATABASE MANAGEMENT SYSTEMS R20CC2203** CO1 : Interpret the fundamentals of DBMS. [K2] CO2 : Analyze DB design methodology and normalization process. [K4] CO3 : Develop Queries in RDBMS. [K3] CO4 : Compare and Contrast various transaction and concurrency management techniques. [K2] CO5 : Analyze various file organizations and indexing techniques. [K4
DATA STRUCTURES R20CC2104 CO1 : Apply Searching, Sorting and Hashing techniques to solve problems.[K3] CO2 : Analyze basic data structures such as Stacks, Queues and Linked List. [K4] CO3 : Solve problems involving Advanced concepts of Trees. [K3] CO4 : Analyze variety of Graph data structures that are used in various applications. [K4]	**AUTOMATA AND COMPILER DESIGN R20AI2202** CO1: Summarize the concept of Automata and Construct Finite Automata Machines to recognize the languages. [K3] CO2: Ability to implement practical aspects of automata theory. [K4] CO3: Analyze Different parsing techniques and should be position to solve the problems. [K3] CO4: Ability to design of a compiler given features of the languages. [K3] CO5: Analyze the program and minimize the code by using optimizing techniques which helps in reducing the no. of instructions in a program. [K3]
DATA SCIENCE R20AI2101 CO 1: Apply principles of NumPy and Pandas to the analysis of data. [K3] CO 2: Make use of various file formats in loading and storage of data. [K3] CO 3: Identify and apply the need and importance of pre-processing techniques [K3]. CO 4: Analyze the results and present them in a pictorial format [K2]. CO 5: Apply Data aggregation commands and filling missing value methods [K3]	**SOFTWARE ENGINEERING R20CS2205** CO 1: Analyse basic software engineering models. [K4]. CO 2: Demonstrate the various Object Oriented Design models [K2]. CO 3: Outline the software prototyping, analysis and design [K2]. CO 4: Outline the importance of software testing and project management [K4].
FRONT END WEB TECHNOLOGIES R20CC2105 CO1: Interpret a webpage and identify its elements and attributes.[K2]. CO2: Build webpages using HTML5 [K3]. CO3: Make use of Cascading Style Sheets on webpages [K3]. CO4: Make use of Java Script to write nteractive webpages [K3]. CO5: Build dynamic webpages with JQuery [K3]. CO6: Make use of JQuery UI to develop dynamic webpages [K3].	**INTRODUCTION TO ARTIFICIAL INTELLIGENCE R20AI2205** CO1: Summarize the characteristics of AI that make it useful to real-world problems. [K2] CO2: Analyse different search techniques and predicate logic in artificial Intelligence. [K4] CO3: Interpret knowledge representation and symbolic reasoning using different rules. [K2] CO4: Apply the basic knowledge on learning and reinforcement learning. [K3] CO5: Make use of the power of AI in Natural language processing as an advanced Application of AI. [K3]
DATA STRUCTURES LAB R20CC21L1 CO 1: Analyze algorithms, Searching, Sorting and hashing Techniques.[K4] CO 2: Make use of elementary data structures such as stacks, Queues and linked list to develop their applications.[K3] CO 3: Examine different tree traversal techniques. [K4] CO 4: Experiment with different graph traversal techniques.[K4]	**DATABASE MANAGEMENT SYSTEMS LAB R20CC22L1** CO1 : Apply SQL commands like DDL, DML and DCL to perform different Database operations [K3]. CO2 : Develop PL/SQL block statements, control statements and cursors. [K3] CO3 : Develop PL/SQL programs using functions and procedures. [K3] CO4 : Develop PL/SQL programs using packages and Triggers. [K3]

OOPS THROUGH JAVA LAB R20CC21L2	AI LAB R20AI22L3
CO1: Develop java programs by using OOP concepts. [K3] CO2: Make use of interfaces, exception handling and threads to develop JAVA programs. [K3] CO3: Make use of exception handling and collections in Java Programming. [K3] CO4: Develop GUIs with AWT, Applets and Event Handling. [K3]	CO1: Implement basic AI algorithms.[K3] CO2: Identify problems that are amenable to solution by AI methods.[K3] CO3: Identify appropriate AI methods to solve a given problem.[K3]
FRONT END WEB TECHNOLOGIES LAB R20CC21L3	MOBILE APPLICATION DEVELOPMET LAB 19BCS4LB03
CO 1:Develop static html pages [K3]. CO 2: Develop Interactive Web Pages with different styles and client side validations[K3]. CO 3: Make use of JQuery programming to develop Web pages [K3]. CO 4: Apply JQuery UI to HTML pages [K3	CO1 : Demonstrate various components of Android Framework.[K2]. CO2 : Develop user Interfaces for the Android Application.[K3]. CO3 : Develop Android Applications using Android API and Services.[K3]. CO4 : Develop Android Applications which access data from Internet.[K3].
CONSTITUTION OF INDIA R20CC21MC2	IOT (SOC) R20AI22SC1
CO1: Examine salient features of Indian Constitution and live accordingly in society & interpret the meaning of Fundamental Rights of State Policy. CO2: Discover various aspects of Union Government legislation and live up to the expectations of the rules. CO3: Critically examine State Government legislation and improve your living standards by following the rules strictly CO4: Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living CO5: Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.	CO 1: Analyze the requirements, specifications to design home automation applications. CO 2: Build smart city applications using Arduino. CO 3: Analyze domain specific applications using Arduino and Raspberry pi. CO 4: Influence the revolution of Internet in Mobile Devices.

I MBA (R19)

I MBA - I SEMESTER	I MBA - II SEMESTER
MANAGEMENT THEORY AND ORGANIZATIONAL BEHAVIOUR CO1: Examine the Management concepts and functions. [K4]CO2: Apply the concepts of planning, decision making. [K3] CO3: Apply the concepts of delegation of authority, decentralisation and depart mentation in real life situations. [K3] CO4: Analyse the controlling principles and practices, Ethics and corporate social responsibility. [K4] CO5: Adapt the effective organisational behaviour and climate. [K6] CO6: Evaluate the basic concepts of organisational conflicts and climate. [K5]	**FINANCIAL MANAGEMENT** CO1: Outline the basic concepts of Financial Management. [K1] CO2: Comprehend the various methods of Investment Analysis and apply various techniques of capital budgeting. [K3] CO3: Adapt the concepts of leverage, capital structure and its effect on the long term survival of the firm. [K6] CO4: Appraise various methods of computation of cost of capital. [K5] CO5: Appraise the valuation methods of dividends and the dividend policies of Indian corporates. [K5] CO6: Assess the working capital requirement of a firm and comprehend the nitty-gritty of current assets management. [K5]

ECONOMICS FOR MANAGERS	HUMAN RESOURCE MANAGEMENT
CO1: Describe the importance of managerial economics and its contribution to decision making in different types of businessorganizations by the managerial economist. [K2] CO2: Apply the basic principles of managerial economics. [K3] CO3: Apply demand analysis concept in the real life business situations.[k3] CO4: Contrast on the usefulness of the production function and costfunction in analysing the firm's production activity. [K6] CO5: Classify different types of costs associated with cost functionwhich affect the profitability of the organisations. [K4] CO6: Determining the prices of products under different marketstructures. [K5]	CO1: Outline the functions and challenges of HRM. [K4] CO2: Apply different concepts of HR Planning, Recruitment, Selection, Training, Interviewing Techniques and Executive Development Programs. [K3] CO3: Apply the uses of job analysis, job description, job specification, ergonomics in industry and the methods of job evaluation. [K3] CO4: Utilize the various methods of performance appraisal. [K3] CO5: Develop a sound compensation mechanism at global level, determinants of payment of wages and incentive plans. [K6] CO6: Examine the role of trade unions, Grievance Handling Procedures, Industrial Disputes Resolution Mechanisms and stress management at work place. [K4]
ACCOUNTING FOR MANAGERS	MARKETING MANAGEMENT
CO1: Outline the basic knowledge of accounting, bookkeeping,accounting Principles, accounting cycle. [K2] CO2: Apply the concepts of journal, ledger and Trail balance. [K3] CO3: Identify the nature of expenditure and revenue for preparation offinancial statements of business. [K3] CO4: Examine the role of accounting policies like depreciation. [K4] CO5: Analyze the need for inventory valuation and accountingstandards. [K6] CO6: Apply financial analysis technique of ratio analysis for theassessment of financial performance of the company. [K3]	CO1: Interpret the concepts of marketing and its information system. [K2] CO2: Analyse the segmentation, targeting and positioning in marketing. [K4]CO3: Analyse various phases of product life cycle. [K4] CO4: Evaluate various methods of pricing and identify the best pricingstrategy. [K5] CO5: Examine marketing communication strategies. [K5] CO6: Formulate the controlling techniques of marketing. [K6]
MANAGERIAL COMMUNICATIONS & SOFT SKILLS	PRODUCTION AND OPERATIONS MANAGEMENT
CO1: Apply the basic concepts of communication for businesscorrespondence. [K3] CO2: Distinguish different forms of communication. [K4] CO3: Evaluate different types of communication. [K5] CO4: Adapt report writing skills of different types on need basis. [K6] CO5: Acquire presentation skills along with the interview techniques. [K2] CO6: Pursue the emerging issues in communication with respect to theimpact. [K2]	CO1: Apply the basic concepts of production and operations managementand identify types of manufacturing processes. [K3] CO2: Assess the need for production planning and control in themanufacturing units. [K5] CO3: Analysing the effectiveness of plant location and plant layout. [K3]CO4: Design strategies to improve productivity. [K6] CO5: Evaluate purchasing function and inventory management function.[K5] CO6: Develop the quality control system and quality control strategies. [K6]
BUSINESS ENVIRONMENT	BUSINESS RESEARCH METHODOLOGY
CO1: Outline the basic concepts of business environment and itscomponents. [K2] CO2: Analyse the structure of Indian economy. [K4] CO3: Appraise the effectiveness of components of fiscal policy andbalance of payments on the economy. [K6] CO4: Evaluate different trade related policies. [K5] CO5: Measure the impact of legal environment act like – MRTP, RTPand RTI. [K5] CO6: Assess the impact of concepts relating to Socio-culturalenvironment. [K6]	CO1: Adapt the fundamentals of Business research methodology. [K6] CO2: Identify research problem. [K3] CO3: Apply sample and census survey and measuring techniques. [K3] CO4: Design data collection techniques. [K6] CO5: Develop data processing procedures and apply tools. [K6] CO6: Draft thesis/report writing. [K2]

QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS	BUSINESS LAWS
CO1: Recall the fundamentals in Mathematics and Statistics. [K1] CO2: Demonstrate the methods to solve Linear Programming Problems. [K2] CO3: Choose decision making in a competitive situation. [K3] CO4: Solve transportation Problem with minimum cost of transport of commodities. [K3] CO5: Adapt substitution of new one for better usage. [K6] CO6: Develop a realistic schedule and monitor the progress of the project. [K6]	CO1: Analyze the Indian Contract Act. [K4] CO2: Evaluate Sales of Goods Act and the machinery for redressal of consumer grievances. [K5] CO3: Elaborate rights and duties of agent and principal, Principal's liability for the acts of agent and the procedure for termination of agency. [K6] CO4: Examine the rights and duties of partners, dissolution of partnership firm. [K4] CO5: Examine the formation of company, amendments act in 2013.[K4] CO6: Explain the kinds of Negotiable Instruments and Goods and Services Act. [K5]
IT FOR MANAGERS-I	IT FOR MANAGERS-II
CO1: Identify computer hardware components, assemble and dissemble computer components. [K3] CO2: Create Attractive Documents [K6] CO3: Apply Various Mathematical & Statistical Operations Using MS-Excel. [K3] CO4: Create various advanced MS-Excel functions & applications. [K6] CO5: Create Effective basic power point Presentations. [K6] CO6: Create effective professional presentations. [K6]	CO1: Outline the basic concepts of SQL. [K2] CO2: Apply different types of operators of SQL. [K3] CO3: Formulate the Constraints in SQL. [K6] CO4: Apply different types of functions on tables & Queries. CO5: Infer the basics of PL/SQL. [K2] CO6: Develop the real time applications on ERP. [K6]
II MBA – III SEMESTER	**II MBA. – IV SEMESTER**
STRATEGIC MANAGEMENT	LOGISTICS AND SUPPLY CHAIN MANAGEMENT
CO1: Develop vision, mission and objectives of the organization. [K3] CO2: Analyse industry and develop techniques of competitive analysis. [K4] CO3: Appraise strategic leadership styles and actions. [K5] CO4: Formulate effective strategies in business. [K6] CO5: Develop a frame work for the implementation strategies in business. [K3] CO6: Evaluate the strategy controls by measuring performance of organization. [K5]	CO1: Outline the basic concepts of Logistics and Supply Chain. (K1) CO2: Analyze different logistics strategies to get competitive advantage. (K4) CO3: Assess the profitability by measuring the logistics performance and maintaining supply chain relationships. (K5) CO4: Adapt new and global strategies to compete with the rivals by selecting effective source of suppliers and pricing of the products. (K6)
BUSINESS ETHICS AND CORPORATE GOVERNANCE	ENTREPRENEURSHIP DEVELOPMENT
CO1: Outline fundamentals of Values and ethics. [K2] CO2: Evaluate the global issues with respect to business ethics. [K6] CO3: Analyse manager's responsibilities in business ethics. [K4] CO4: Apply Corporate Governance Theories into Practice. [K6] CO5: Apply the Corporate Governance Scenario in India. [K6] CO6: Elaborate of Media in Indian Corporate Governance. [K6]	CO1: Identify the importance of entrepreneurship. [K2] CO2: Analyse entrepreneurship development programs in India and contents for training for entrepreneurial competencies. [K4] CO3: Develop creativity in entrepreneurship. [K6] CO4: Design the project reports & make project evaluation. [K6] CO5: Analyse the policies and procedures of small and micro enterprises.[K4] CO6: Appraise the institutional support to small and medium enterprises.[K5]

BUSINESS ANALYTICS CO1: Outline fundamentals of Business Analytics. [K2] CO2: Demonstrate different classifications of Business Analytics. [K2]CO3: Analyse and prepare reports on Business Analytics. [K4] CO4: Apply Business Analytics in different areas like Finance, HR andMarketing. [K3]	**FINANCIAL RISK MANAGEMENT & DERIVATIVES** CO1: Analyse the different types of risks and its impact on financialinstitutions. [K4] CO2: Measure different type's risks by applying various tools andtechniques. [K5] CO3: Appraise the role and importance of derivatives. [K5] CO4: Evaluate the forward and future contracts and its pricing. [K4] CO5: Minimise the risk of financial institutions by using Swaps.[K6] CO6: Build the option strategies in order to minimise the risk. [K6]
INVESTMENT AND PORTFOLIO MANAGEMENT CO1: Analyse various investment alternatives for effective investmentdecision [K4]. CO2: Discuss the importance of security analysis in investment decisionprocess [K6]. CO3: Design bond management strategies to realise good return onbond investment [K6]. CO4: Apply different equity valuation methods for the valuation ofsecurities [K3]. CO5: Construct optimal portfolio for higher return at lower risk [K6]. CO6: Analyse different schemes of mutual funds for better investmentdecision [K4].	**FINANCIAL INSTITUTIONS & SERVICES** CO1: Outline the overview of financial system. [K2] CO2: Assess the performance of various types of financial institutions. [K5]CO3: Analyse the commercial banks and its roles. [K4] CO4: Appraise the activities of various non-banking financial institutions.[K5] CO5: Analyse the impact of insurance regulations on the Insurance Industry.[K4] CO6: Create awareness on different financial services. [K6]
CORPORATE TAXATION CO1: Conclude the fundamentals of Taxation [K5].CO2: Discuss taxation methods of companies [K6]. CO3: Analyse income sources from business through taxation [K4]. CO4: Determine taxation techniques to reduce tax burden to thecompany [K5]. CO5: Evaluate Tax management strategies [K5]. CO6: Develop procedure for filing the tax for individuals and corporate [K6].	**INTERNATIONAL FINANCIAL MANAGEMENT** CO1: Evaluate the functioning of international financial system andmonetary system [K5]. CO2: Analyse the international financial markets and the variousinternational financial instruments [K4]. CO3: Analyse the advantages of foreign exchange market [K4].CO4: Evaluate foreign direct investments [K3]. CO5: Develop strategies to deal with different types of risks associated withMNC's [K6]. CO6: Deign strategies to deal with international tax environment [K6].
BANKING & INSURANCE CO1: Analyse the Indian financial system and role of commercial banks[K2] CO2: Develop better understanding on different types of deposits,their benefits as well as on advances [K6] CO3: Analyze the regulations in banking system. [K4]CO4: Make up on new banking innovations. [K6] CO5: Develop skills to facilitate the basic concepts of Risk andInsurance. [K6] CO6: Outline the principles of Insurance and classifications ofInsurance. [K2]	**STRATEGIC INVESTMENT AND FINANCIAL DECISIONS** CO1: Analyse the concept of investment decisions & its process. [K2] CO2: Applying the various investment decisions under different situations.[K3] CO3: Evaluating the different types of investment & decisions. [K5]CO4: Analyse different kinds of investment decisions. [K4] CO5: Evaluate strategic analysis of selected investment decisions. [K5] CO6: Distinguish on various theories of international capital structures. [K4]

PERSONAL FINANCIAL PLANNING	INTERNATIONAL HUMAN RESOURCE MANAGEMENT
CO1: List out steps in financial planning process [K4]. CO2: Design the process for preparation and filing of tax returns [K6].CO3: Evaluate investment decisions in capital goods [K5]. CO4: Analyse various insurance policies which are suitable for investorneeds [K4]. CO5: Develop effective investment strategies related to variousfinancial securities [K6]. CO6: Evaluate alternate investment options [K5].	CO1: Identify the challenges of global HRM& strategic role of Global HRM. [CO2: Adapt different methods of selection and process of Expatriate and Repatriate. [K6] CO3: Analyze the cross-cultural management problems and build skill builmethods in cross culture teams. [K4] CO4: Make use of factors affecting on compensation and methodcompensation. [K3] CO5: Measure the Global HRD climate and frame strategies to overcchallenges. [K5] CO6: Develop the global labour relations and international standardorganizations. [K6]
MANAGEMENT OF INDUSTRIAL RELATIONS	LEADERSHIP
CO1: Analyse the basic concepts and importance of industrial relationsmanagement. [K4] CO2: Identify the concept of Trade Unions. [K3] CO3: Appraise the collective bargaining power. [K5] CO4: Evaluate the benefits of quality of work life. [K5] CO5: Analyse the concepts of labour safety measures. [K4]CO6: Design the grievance management procedures. [K6]	CO1: Identify the leadership qualities to run an organization successfully.[K3] CO2: Appraise the various behavioural concepts. [K5] CO3: Develop the organizational structures in decision making. [K3] CO4: Analyse the interpersonal behaviour and barriers of communication inleadership styles. [K4] CO5: Assess the impact of group conflicts in the organisation. [K5] CO6: Adopt different kinds of inspirational leadership styles to lead teams ineffective way. [K6]
COMPENSATION AND REWARD MANAGEMENT	HUMAN RESOURCE DEVELOPMENT
CO1: Outline basic concepts, framework and theories of compensation.[K2] CO2: Develop a strategic plan for making compensation as a competitive advantage to the organization. [K6] CO3: Contrast different types of incentive plans and determine whichplan suit best to organization. [K2] CO4: List the different types of employee benefits. [K1] CO5: Design different methods of wage determination applicable todifferent cadres of employees. [K6] CO6: Evaluate the mechanism of wage boards and its role in fixation ofwage. [K5]	CO1: Analyze the fundamental concepts of HRM and functions of HRD. [K4]CO2: Elaborate various perspectives of HRD. [K6] CO3: Develop sub-systems of HRD. [K3] CO4: Apply training and development practices. [K3] CO5: Identify the issues in employee counseling and wellness. [K3]CO6: Evaluate recent trends of HRD. [K5]
PERFORMANCE MANAGEMENT	INDUSTRIAL JURISPRUDENCE & LABOUR LEGISLATIONS
CO1: Adapt the basics of performance management system. [K6] CO2: Identify the performance system best fit to organization. [K3] CO3: Develop a mechanism to meet the performance expectations sethe organization. [K6] CO4: Apply the monitoring principles. [K3] CO5: Design the audit system for all types of jobs existed in differentorganizations. [K6] CO6: Analyze performance appraisal system and determining the bestsystem of appraisal for the needs of the organization. [K4]	CO1: Examine the basic concepts and importance of employee legislationsin India. [K4] CO2: Apply the concept of industrial disputes Act. [K3] CO3: Illustrate the importance of payment of bonus Act. [K2] CO4: Evaluate the benefits provided by the payment of Gratuity Act to theemployees. [K5] CO5: Analyse the legal formalities under minimum wages Act. [K4]CO6: Determine the various provisions of the Factories Act. [K5]
EMPLOYEE ENGAGEMENT & RETENTION MANAGEMENT	SERVICES MARKETING
CO1: Analyse the fundamentals of Employee engagement practices.[K6] CO2: Develop the employee engagement strategies. [K6] CO3: Analyze the employee turnover rates in different sectors. [K4] CO4: Evaluate the employee retention and retention success mantras. [K5] CO5: Apply the retention strategies. [K3] CO6: Develop practices to retain talent/skilled employee. [K6]	CO1: Analyse the basic concepts of services marketing. [K4]CO2: Identify the customer needs and expectations. [K2] CO3: Develop market segmentation process in services marketing. [K6]CO4: Assess the pricing strategies of services marketing. [K5] CO5: Analysing the impact of marketing communication in servicepromotion. [K4] CO6: Evaluate the consumer grievance recovery strategies. [K5]

CUSTOMER RELATIONSHIP MANAGEMENT & CONSUMER BEHAVIOUR	DIGITAL MARKETING
CO1: Illustrate the basic concepts of Customer Relationship Management. [K2]	CO1: Outline the basic concepts of Digital Marketing. [K2]
CO2: Appraise the customer profile and perception of customer behaviour in relationship perspectives. [K4]	CO2: Analyze different channels of digital marketing according to the changing requirements of the markets. [K4]
CO3: Analyse strategies for customer acquisition models of CRM. [K4] CO4: Evaluate the consumer behaviour and business strategies. [K5] CO5: Apply the various consumer behaviour models. [K3]	CO3: Construct different digital marketing plans on situational basis.
CO6: Build the psychological process and develop the effective strategy in terms of impact on consumer behaviour. [K6]	CO4: Adapt changes through market research for attainment of news goals. [K6]
	CO5: Compare different avenues of social media for marketing and advertising products for effective sales. [K4]
EVENT MANAGEMENT	**BRAND MANAGEMENT**
CO1: Outline of the role and purpose of various events in the organizations. [K2]	CO1: Analyse the importance of brand image in marketing [K4].
CO2: Analyzing the techniques and strategies required to plan successful events. [K4]	CO2: Formulate brand vision which communicates better the organisations' policy on Branding [K6].
CO3: Develop competencies required to promote, implement and conduct distinct events. [K6]	CO3: Analyse brand promotion methods in brand communication [K4]. CO4: Analyse factors influencing brand extension decisions [K4].
CO4: Develop knowledge and competencies required to assess the quality and success of different events. [K6]	CO5: Design brand marketing programmes and for better brand performance [K6].
	CO6: Evaluate emerging trends in brand management [K5].
RETAIL MARKETING	**ADVERTISEMENT MANAGEMENT**
CO1: Outline fundamentals of Retailing. [K2]	CO1: Outline the basic concepts of advertising for better understanding the challenges and opportunities in advertising [K6].
CO2: Identify the general strategies of retailing. [K3] CO3: Formulate location strategies of retailing. [K6] CO4: Develop layout designs. [K6]	CO2: Analyse the relations of advertising with segmentation and budget decision [K4].
CO5: Analyse various pricing strategies and develop location strategies. [K4]	CO3: Design better advertising strategies for the company [K6].
CO6: Formulate different types of franchising and its impact on the business. [K6]	CO4: Identify media options which are suitable for the company for better promotion [K3].
	CO5: Develop an effective advertising campaign for the company [K6].
	CO6: Evaluate the role of AD agencies for the successful advertising management [k5].
RURAL MARKETING	**BUSINESS INTELLIGENCE**
CO1: Assess the problems in rural marketing. [K4]	CO1: Interpret the concepts and components of Business Intelligence (BI). CO2: Relate the business strategies applied over different areas of business.
CO2: Analyse the lifestyle, personality and rural marketing strategies. [K4]	CO3: Identify the requirements needed to design a Business Intelligence model.
CO3: Apply brand building strategies in rural areas. [K3]	CO4: Analyze a behavioral model to assess the behavior of the customer.
CO4: Categorize the various channels of distribution in rural marketing. [K4]	
CO5: Adapt marketing communication in rural marketing. [K6] CO6: Evaluate the recent trends in rural marketing. [K5]	
DECISION SUPPORT SYSTEMS	**ENTERPRISE RESOURCE PLANNING**
CO1: Define the role of information systems in DSSs. [K1]	**CO1:** Make basic use of Enterprise software, and its role in integrating business functions
CO2: Define the role of managers in making decisions within IT organizations. [K1]	**CO2:** Analyse the strategic options for ERP identification and adoption.
CO3: Design and formulate management problems using DSSs models. [K6]	**CO3:** Design the ERP implementation strategies.
CO4: Apply linear and integer programming techniques for scheduling and optimization problems that require decision making using MSEXCEL. [K3]	**CO4:** Create reengineered business processes for successful ERP implementation.

DATA WAREHOUSING & DATA MINING	INFORMATION SYSTEMS AUDIT
CO1: Organize raw data to make it suitable for various data miningalgorithms. [K2] CO2: Measure interesting patterns from different kinds of databases.[K5] CO3: Apply the techniques of clustering, classification, associationfinding, feature selection and visualization to real world data. [K3]	CO1: Outline audit standards. [K2] CO2: Determine Audit Process. [K5] CO3: Compile Computer assistance Audit tools, Managing Audit tools. [K6]CO4: Formulate Strategy and Standards for Auditing. [K6]
SOFTWARE PROJECT MANAGEMENT	**CYBER LAW & SECURITY**
CO1: Outline the issues and challenges faced while doing theSoftware project Management. [K1] CO2: Identify the software projects fails and that failure probabilitycan be reduced effectively. [K3] CO3: Student will be able to do the Project Scheduling, tracking, Riskanalysis and Quality management. [K] CO4: Cost estimation using different techniques. [K5]	CO1: Outline key terms and concepts in cyber law, intellectual property andcybercrimes, trademarks and domain theft. [K2] CO2: Determine computer technologies, digital evidence collection, andevidentiary reporting in forensic acquisition. [K5] CO3: Defend both clean and corrupted systems, protecting personal data,securing simple computer networks, and safe Internet usage. [K5] CO4: Create approaches for incident analysis and response. [K6]
E-BUSINESS	
CO1: Compare and evaluate alternative e-business strategies andtechnologies. [K4] **CO2:** Justify and promote strategic initiatives, such as adopting a newbusiness system. [K4] **CO3:** Demonstrate systems architecture and technologies for systemsintegration. [k2] **CO4:** Plan and deliver senior management reports and presentations.[K3]	

R20 - MCA - COURSE OUTCOMES	
I MCA	
I Semester	**II Semester**
C PROGRAMMING AND DATA STRUCTURES: **CO 1:** Demonstrate the basic knowledge of computer hardware andsoftware [K3]. **CO 2:** Ability to problem solving and logical skills in programming[K3] **CO 3:** Implement modular programming using functions [K3] **CO 4:** Interpret dynamic memory allocation using pointers and Organize data into files [K3]	COMPUTER NETWORKS: **CO 1:** Interpret the basic computer network technology [K3] **CO 2:** Identify the different types of network topologies andprotocols[K2] **CO 3:** Explain the layers of the OSI and TCP/IP model and thefunctions of each layer [K2] **CO 4:** Design and implement data link or network layer protocolswithin a simulated networking environment [K6]
COMPUTER ORGANIZATION: After completion of this course student will be able to **CO 1:** The basic components of a computer, including CPU, memories,and input/output, and their organization representation of data, addressing modes, instructions sets [K2] **CO 2:** Discriminate different register transfer micro operations, Principles of hardwired and micro programmed control [K4] **CO 3:** Demonstrate various fixed and floating point arithmetic operations, performing the Arithmetic operations of binary number systems and formulating the arithmetic functions and solve scientific problems by means of a numerical analysis method [K3] **CO 4:** Extrapolate memory organization and input, output organizations [K4] **CO 5:** Generalize pipe line and vector processing, multi processors andits applications [K6]	Object Oriented Programming Using java: **CO 1:** To be able to analyses the real world problems in an ObjectOriented way [K4] **CO2:** Apply Encapsulation, Inheritance and Polymorphism features of Java appropriately to solve problems [K3] **CO 3:** To be able to create Java console, GUI and Web applications in Java [K6] **CO 4:** To be able to create lightweight multithreaded applicationswith synchronization [K6]

Database management systems: **CO 1:** Able to master the basic concepts and understand the applications of database systems [K2] **CO 2:** Able to construct an Entity-Relationship (E-R) model fromspecifications and to transform to relational model [K6] **CO 3:** Able to construct unary/binary/set/aggregate queries in Relational Algebra [K6] **CO 4:** Understand and apply database normalization principles [K3]	**Software Engineering:** After completion of this course the students should be able to **CO 1:** Identify generic models of software development process [K2] **CO 2:** Understand fundamental concepts of Requirements Engineering and Analysis Modeling [K2] **CO 3:** Compare different design techniques and their implementation [K4] **CO 4:** List out various testing and maintenance measures [K1]
Operating Systems: At the end of the course the student will be able to **CO 1:** Classify different types of systems like distributed system, special purpose system and the working principle of system calls[K4] **CO 2:** Compute the waiting time and turnaround time of different CPUscheduling algorithms and comparison among all the CPU scheduling algorithms [K2] **CO 3:** Examine the page faults for different Page Replacement algorithms and comparison among all the Page Replacement algorithms, and methods to handle deadlocks [K4] **CO 4:** Differentiate among different File System implementation anddirectory implementation [K4] **CO 5:** Assess different types of disk scheduling algorithms, distinguishdifferent protection and security mechanisms [K5]	**Design analysis and algorithms:** After completion this course, the student should be able to: **CO 1:** Analyze worst-case running times of algorithms usingasymptotic analysis [K4] **CO 2:** Describe the divide-and-conquer paradigm and explainwhen an algorithmic design situation calls for it [K2] **CO 3:** Describe the greedy, dynamic-programming paradigm andexplain when an algorithmic design situation calls for it [K2] **CO 4:** Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate[K4]
CO1: Demonstrate skills in solving mathematicalproblems [K3] **CO2:** Comprehend mathematical principles and logic[K4] **CO3:** Formulate null, alternative hypothesis and test itsvalidity based on random sample [K4] **CO4:** Apply queuing models to find the optimum servicerate [K3]	**Artificial intelligence:** After successful completion of this course, the students willbe able to: **C01:** Outline the fundamentals of artificial intelligence and characteristics of problems [K2]
Database management systems Lab: After Completion of this course student must be able to **CO1:** Understand, analyse and apply SQL commands like DDL, DML,DCL to perform different Database operations [K2] **CO2:** Understand and practice PL/SQL block, control statements andcursors [K2] **CO3:** Develop PL/SQL programs using functions & procedures [K6] **CO4:** Develop PL/SQL programs using packages and Triggers [K6]	**C02**: Analyse different search techniques and predicate logic in artificial Intelligence [K4] **CO3:** Interpret knowledge representation and symbolic reasoning using different rules [K3] **CO4:** Interpret Statistical reasoning and filler structures [K3] **CO5:** Apply various problem planning systems anddifferent learning methodologies [K3] **CO6:** Apply different language processing schemes while solving the real world problems [K3]
C PROGRAMMING AND DATA STRUCTURES Lab: **CO1:** Study, analyse and understand logical structure of computerprogramming and different constructs to develop programs in C Language [K2] **CO2:** Know how to write, compile and debug programs in C Language[K2] **CO3:** Understand and analyse data types, typecasting and operatorprecedence [K2] **CO4:** Analyse the use of conditional and looping statements to solveproblems associated with conditions and repetitions [K4]	**Advance Unix Programming:** At the end of this course student will be able to **CO 1:** Utilize various utilities in Unix operating system [K3] **CO 2:** Implement various OS functionalities using system calls[K3] **CO 3:** Implement Inter Process Communication [K3] **CO 4:** Implement network programming using sockets [K3] **CO 5:** Implement Remote Procedure Call [K3]

Operating Systems and Linux Lab:	Data Warehousing and mining:
At the end of the course, student will be able to • Implement various CPU scheduling algorithms and compare results [K3] • Implement various disk scheduling algorithms and compare results [K3] • Implement page replace algorithms [K3] • Implement various memory management techniques[K3] Execute basic Linux commands List of Experiments[K3]	**CO 1:** Examine the types of data to be mined and extract knowledge using Data Mining Techniques [K1] **CO 2:** Analyze the different operations and techniques involved in Data Warehouse [K4] **CO 3:** Identify components in typical Data Warehouse architectures [K1] **CO 4:** Compare and contrast different dominant Data Mining Algorithms for classification, Association Analysis and Clustering [K4]
•	**Object Oriented Programming Using java Lab:** **CO1:** Demonstrate his or her ability to write, compile & execute basic java program and also the use of OOP concept i.e. data abstraction & data hiding, encapsulation, inheritance, polymorphism [K3] **CO2:** Create and use interfaces, threads [K6] **CO3:** Handle exceptions and write applets [K6] **CO4:** Knowledge of GUI for developing java components [K1]
	EMPLOYABILITY SKILLS LAB: After successful completion of this course, the students will be ableto: **CO 1:** Write effective Resume for employment [K6] **CO 2**: Make formal presentations using relevant technical style ofcommunication and appropriate strategies for both academic and professional purpose [K6] **CO 3**: Participate in Group Discussions using analytical and problem solving skills [K5] **CO 4**: Face job interviews confidently and enhance employability[K4]
III Semester	**IV Semester**
MACHINE LEARNING WITH PYTHON: **CO1:** Identify machine learning techniques suitable for a given problem [K1] **CO2:** Solve the problems using various machine learning techniques[K3] **CO3:** Apply dimensionality reduction techniques [K3] **CO4:** Design application using machine learning techniques [K6]	**BLOCKCHAIN TECHNOLOGY:** **CO 1:** Interpret the working procedure of Bitcoins [K2] **CO 2:** Analyze the Transactions in Bitcoin Network [K4] **CO 3:** Analyze the Block Chain and Bitcoin Network [K4] **CO 4:** Analyze the Mining and Consensus in Block Chain [K4]
WEB TECHNOLOGIES: After completion of this course, the students should be able to **CO 1:** Acquaint with necessary fundamental skills for creating webapplications [K6] **CO 2:** Install and manage web server software and study server sidescripting languages like servlets and JSP [K3] **CO 3:** Acquire the concepts of java beans [K5] **CO 4:** Understand database access and use it in JSP and servlets [K2]	**DESIGN PATTERNS:** **CO1:** Identify the appropriate design patterns to solve objectoriented design problems [K1] **CO2:** Develop design solutions using creational patterns [K6] **CO3:** Apply structural patterns to solve design problems [K3] **CO4:** Construct design solutions by using behavioural patterns[K6] **CO5:** Demonstrate about Advanced Patterns like Pattern Catalogs[K3]

NETWORK SECURITY & CRYPTOGRAPHY: At the end of this course, the student should be able to **CO1:** Analyze the vulnerabilities in any computing system and hence be able to design a Security solution [K4] **CO2:** Identify the security issues in the network and resolve it [K1] **CO3:** Evaluate security mechanisms using rigorous approaches, including theoretical [K5] **CO4:** Compare and Contrast different IEEE standards and Electronic mail security [K4] **CO5:** Understand and use Security & Privacy mechanisms in EDI like E-mail [K2]	**E-COMMERCE:** After completion of this course, the students should be able to **CO 1:** Demonstrate an understanding of the foundations and importance of E-commerce [K3] **CO 2:** Demonstrate an understanding of retailing in E-commerce [K3] **CO 3:** Analyse the impact of E-commerce on business models and strategy [K4] **CO 4:** Describe Internet trading relationships including Business to Consumer, Business- to-Business & Intra-organizational [K1]
CLOUD COMPUTING: **CO 1:** Understand the Virtualization and applications for the state-of-the-art cloud computing [K2] **CO 2:** Carry out the Cloud Scale and value of Cloud Computing [K1] **CO 3:** Analyze the infrastructure of cloud computing including public,private and hybrid clouds and various services like PaaS, SaaS, IaaS etc.[K4] **CO 4:** Monitor the Security in cloud [K2]	**BIG DATA ANALYTICS:** **CO 1:** Preparing for data summarization, query, and analysis [K6] **CO 2:** Applying data modelling techniques to large data sets [K3] **CO 3:** Creating applications for Big Data analytics [K6] **CO 4:** Building a complete business data analytic solution [K6]
DIGITAL IMAGE PROCESSING: By the end of the course the students will be able to **CO1:** Process, quantize and to perform sampling on given images [K4]**CO2:** Transform and filter the digital image for improving the image quality [K3] **CO3:** Generate Color images by applying different image characteristics using different color models [K5] **CO4:** Compress the digital images by applying different lossless and lossy compression techniques [K3] **CO5:** Identify different representations and restoration of digital images [K1]	**CYBER SECURITY:** At the end of this course, student should be able to **CO 1:** Possess a fundamental knowledge of Cyber Security [K2] **CO 2:** Understand what vulnerability is and how to address most common vulnerabilities [K2] **CO 3:** Know basic and fundamental Computer Forensics principles as it relates to Cyber Security [K1] **CO 4:** Have the knowledge needed to practice safer computing and safeguard your information [K1] **CO 5:** Understand basic technical controls in use today, such as firewalls and Intrusion Detection systems [K2]
INTERNET OF THINGS: **CO 1:** Demonstrate knowledge and understanding of the security and ethical issues of the Internet of Things [K4] **CO 2:** Conceptually identify vulnerabilities involving the Internet of Things [K1] **CO 3:** Develop critical thinking skills [K6] **CO 4:** Conceptually identify recent security attacks [K1]	
UNIFIED MODELING LANGUAGE: After completion this course, the student should be able to **CO1:** Analyze software requirements and document those using UseCases [K4] **CO2:** Utilize the notation of the UML diagrams such as Use Case, Class, Sequence, Activity, State chart, Deployment and Package Diagrams [K3] **CO3:** Acquire the knowledge of Library Files, executable files, Processors and Devices for a system [K1] **CO4:** Build the Forward and Reverse Engineering using UML notations [K6]	

HUMAN MANAGEMENT: The student is able to **CO1:** Outline the functions and challenges of HRM. [K4] **CO2:** Apply different concepts of HR Planning, Recruitment, Selection, Training, Interviewing Techniques and Executive Development Programs. [K3] **CO3:** Apply the uses of job analysis, job description, job specification, ergonomics in industry and the methods of job evaluation. [K3] **CO4:** Utilize the various methods of performance appraisal. [K3] **CO5:** Develop a sound compensation mechanism at global level, determinants of payment of wages and incentive plans. [K6] **CO6:** Examine the role of trade unions, Grievance Handling Procedures, Industrial Disputes Resolution Mechanisms and stress management at work place. [K4]	
WEB TECHNOLOGY LAB: After Completion of this course, the student should be able to: **CO 1:** Get practical exposure on HTML, XHTML, CSS,JavaScript, XML and other web technologies [K3] **CO 2:** Get practical exposure to develop XML Technologies such as XML Schemas,XSLT [K3] **CO 3:** Get practical exposure to develop Server-Side Programming using ServletsandJSP's. [K3] **CO 4:** Develop a web page & web site using AJAX andPHP.[K6]	
NSC&UML LAB: After completion this course, the student should be able to **CO 1:** Understand how to model requirements with Use Cases [K2] **CO 2:** Utilize the principles to design packages for large scale softwareprojects [K3] **CO 3:** Design the Dynamic Behaviour and Structure of the design [K6] **CO 4:** Apply the pragmatic approach to Software Design and Development [K3]	
EMPLOYABILITY SKILLL-2: After completion this course, the student should be able to **CO1:** Effectively use UML for Analysis of a given problem[K3] **CO2:** Effectively use UML for Design of a given problem[K3] **CO3:** Effectively use Android Studio for the development of Android application [K3] **CO4:** Automate testing using Selenium or any other tool [K3	