

## BACHELOR OF BUSINESS ADMINISTRATION (BBA)

### COURSE OUTCOMES (COs):

S. no	Subject	Subject Code	Course Outcomes
1	Indian Economy	BBA 102	<ol style="list-style-type: none"><li>1. Possess knowledge about Indian economic problems in the light of relevant economic theories and in a comparative perspective.</li><li>2. Appreciate the evolution of Indian economy, its institutional framework, planning policy.</li><li>3. Possess a deeper understanding of the relevance of international trade in view of protection and foreign competition</li></ol>
2	Fundamentals of Accounting	BBA 103	<ol style="list-style-type: none"><li>1. To describe, explain, and integrate fundamental concepts underlying accounting, finance, management, marketing, and economics.</li><li>2. To use information to support business processes and practices, such as problem analysis and decision making.</li></ol>
3	Business Communication	BBA 104	<ol style="list-style-type: none"><li>1. Use their learning to overcome oral or written language problems or hesitancy if any.</li><li>2. To face confidently corporate event including meetings and dealing effectively with colleague, client, or stakeholders.</li><li>3. Use learning on how to prepare Business reports, draft business letters or write Emails, for successful business dealings.</li><li>4. Exhibit the leaning on cross culture communication to work effectively in environment of diversified workforce.</li></ol>
4	Principles of Management	BBA 105	<ol style="list-style-type: none"><li>1. Gain practical skills and personal attributes and competencies that is required for managerial position.</li><li>2. Demonstrate the roles, skills, and functions of management.</li><li>3. Understand analytical, developmental, managerial, and technical skills relate to Managing organizations.</li><li>4. Specify how the managerial skills can be executed in a variety of circumstances in the organization.</li></ol>
5	Business Statistics	BBA 106	<ol style="list-style-type: none"><li>1. To provide managers the skills they need to make effective decisions in uncertain circumstances.</li><li>2. It provides entrepreneurs the statistical tools to business professionals, including statistical research in business, in order to help their organizations, succeed.</li></ol>

			3. Helps to recognize the opportunities of statistics in creating accurate predictions.
6	Business Economics	BBA 107	<ol style="list-style-type: none"> <li>1. To understand the concepts of cost, nature of production and its relationship to Business operations.</li> <li>2. To apply marginal analysis to the “firm” under different market conditions.</li> <li>3. To analyse the causes and consequences of different market conditions.</li> <li>4. To integrate the concept of price and output decisions of firms under various market structure.</li> </ol>
7	Business Environment	BBA 108	<ol style="list-style-type: none"> <li>1. Evaluate the economic &amp; political environmental dynamics to cope with the changing regulations affecting business and its profitability.</li> <li>2. Analyse the competitive forces in environment and accordingly devise business policies and strategies to stay in competitive position.</li> <li>3. Understand the international influences on domestic business and measures to be taken for successful global business operations.</li> </ol>
8	Developing soft skills and Personality Development	BBA 109	<ol style="list-style-type: none"> <li>1. Use the learnt soft skills to grow as successful professional.</li> <li>2. Demonstrate vital skills like leadership, motivation and spirit of team work to achieve the organizational Goal effectively.</li> </ol>
9	Industrial Psychology	BBA 110	<ol style="list-style-type: none"> <li>1. Use of various facets of psychology, its problems and understanding.</li> <li>2. To identify, formulate and solve the real-life problems with positive attitude.</li> <li>3. To inculcate the habit of learning and developing the industrial problems from business perspective.</li> </ol>
10	Human Resource Management	BBA 111	<ol style="list-style-type: none"> <li>1. To develop the understanding of the concept of human resource management and to understand its relevance in organizations.</li> <li>2. To develop necessary skill set for application of various HR issues.</li> <li>3. To analyse the strategic issues and strategies required to select and develop manpower resources.</li> <li>4. To integrate the knowledge of HR concepts to take correct business decisions.</li> </ol>
11	Seminar	BBA 100	<ol style="list-style-type: none"> <li>1. Demonstrate use of appropriate methodologies and test the strength of their thesis statement.</li> <li>2. Shall be able to show insight on topic, appropriate signposting, and clarity of purpose.</li> <li>3. Demonstrate problem-solving skills and apply theoretical knowledge.</li> </ol>

12	Business Law	BBA 201	<ol style="list-style-type: none"> <li>1. It provides business owners, managers, and other professionals to have a basic understanding of business law to help them make better decisions.</li> <li>2. It helps in protecting liberties and rights, maintaining orders, resolving disputes, and establishing standards for the business concerns and their dealings with different sectors.</li> <li>3. It helps business concerns to know the existing rules and regulations applicable to them and to their concern fields.</li> </ol>
13	Organizational Behaviour	BBA 202	<ol style="list-style-type: none"> <li>1. To apply the relevant concepts of OB in understanding the complexities of individual behaviour in organization and its management.</li> <li>2. To apply the relevant concepts of OB in understanding the complexities of group behaviour in organization and its management.</li> <li>3. To synthesize relevant information and evaluate options for the most logical and optimal solution for predicting and controlling human behaviour in organizations to improve outcomes.</li> </ol>
14	Introduction to Business Research	BBA 203	<ol style="list-style-type: none"> <li>1. To differentiate among various type and approaches of research and apply them in different business.</li> <li>2. To formulate the actual problem and analyse the factors behind these problems related to the business or product or service of the organisation.</li> <li>3. To collect the data and information for the continuous research and development process of the organisation for competitive purpose.</li> </ol>
15	Financial Management	BBA 204	<ol style="list-style-type: none"> <li>1. Financial management enables to accomplish important big picture and daily financial objectives to finance managers.</li> <li>2. Developing skills for financial planning information to investors.</li> <li>3. Provides skills for great decision-making with respect to financial considerations.</li> </ol>
16	Fundamentals of Marketing	BBA 205	<ol style="list-style-type: none"> <li>1. Students will be able to understand Practical and theoretical implementation of Services marketing with knowledge of 7p's (Extended 3p).</li> <li>2. Shall get familiar with the scope of Services marketing in real world.</li> <li>3. Shall be able to identify critical issues in the service delivery process with an effective Service marketing system and issues related to services marketing triangle. Students also understand the integration of technology with services marketing for better</li> </ol>

			performance.
17	Company Law	BBA 206	<ol style="list-style-type: none"> <li>1. Use their learning on incorporation, functioning and legal obligations of Private and Public companies under the law laid down by Government.</li> <li>2. Based on their learning about roles and duties of personnel, they are expected discharge their duties properly in professional life.</li> </ol>
18	Strategic Management	BBA 207	<ol style="list-style-type: none"> <li>1. Helps student a life-long process of improving critical thinking that can lead to sound judgement.</li> <li>2. To gain a competitive edge.</li> <li>3. Provides the proper ground for defining the roadmap of any educational complex to develop success.</li> </ol>
19	Enterprise resource planning	BBA 208	<ol style="list-style-type: none"> <li>1. To know about the advancement in the business technology</li> <li>2. It provides comprehensive solution for education function integration and end to end process management</li> <li>3. To learn the skills of the software</li> </ol>
20	Business Auditing	BBA 209	<ol style="list-style-type: none"> <li>1. It enables students to understand importance of systematic records keeping and management of all activities like financial, accounting, production etc. in the business.</li> <li>2. It helps students in Developing concept of establishing transparency of the entity to its stakeholders.</li> <li>3. To understand its Important roles in serving the public interest to strengthen accountability and reinforce trust and confidence in financial reporting.</li> </ol>
21	Supply Chain Management	BBA 210	<ol style="list-style-type: none"> <li>1. Use their learning on importance of supply chain in Business's survival and growth, to speed up supply from manufacturer to end consumer.</li> <li>2. Having learnt the demand of 3PL and 4PL Logistics, the student may even choose the same as carrier option.</li> <li>3. Use learning to Manage inventory and cooperate with Logistic Partners to replenish stocks just in time or reduced lead time.</li> </ol>
22	Summer Internship	BBA 300	<ol style="list-style-type: none"> <li>1. To apply their knowledge and skills acquired in the classroom to a professional context.</li> <li>2. To understand what skills are transferable to new contexts; identify and understand the practices and protocols of the company and industry in which they are working.</li> <li>3. To successfully reflect on the quality of the contribution they have made to the organization.</li> </ol>

			4. To refine and reassess their own career goals because of the experience.
23	Fundamentals of Quality Management	BBA 301	<ol style="list-style-type: none"> <li>1. Know quality management is a continuing revolution and be familiar with basic methods and tools to achieve quality goals by effective quality planning, controlling, and improving.</li> <li>2. Identify the key aspects of the quality improvement cycle and to select and use appropriate tools and techniques for controlling, improving, and measuring quality.</li> <li>3. Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems.</li> </ol>
24	Management and Cost accounting	BBA 302	<ol style="list-style-type: none"> <li>1. Students should be able to identify, use and interpret the results of costing techniques appropriate to different activities and decisions.</li> <li>2. Formulate and use standards and budgets for planning and control purposes.</li> <li>3. Understand the role of responsibility accounting and performance measurement; understand the behavioural implications of performance measurement and transfer pricing systems in divisionalised businesses.</li> <li>4. Appreciate the need to relate management accounting systems to contemporary thinking about organisational planning and control.</li> </ol>
25	Introduction to Operations Research	BBA 303	<ol style="list-style-type: none"> <li>1. To identify and develop operational research models from the verbal description of the real system.</li> <li>2. To Understand the mathematical tools that are needed to solve.</li> <li>3. To use mathematical software to solve the proposed model's optimisation problems.</li> <li>4. To Develop a report that describes the model and the solving technique, analyse the results, and propose recommendations in language understandable to the decision-making processes in Management Engineering</li> </ol>
26	Entrepreneurship Development	BBA 304	<ol style="list-style-type: none"> <li>1. Student will be able to develop and cultivate skills required for entrepreneurship.</li> <li>2. Students will be able to identify ideas, evaluate the opportunities, develop plans, manage resources and company for starting new ventures.</li> <li>3. Students can map the parameters to assess opportunities and constraints for new business ideas</li> </ol>
27	Corporate	BBA 305	<ol style="list-style-type: none"> <li>1. Familiar with the nature, scope, and purpose of</li> </ol>

	Governance and Business Ethics		<p>Business Ethics.</p> <p>2. Know the Importance of Ethics &amp; Moral standards like; Ethics &amp; Moral Decision Making, Ethical Principles in Business.</p> <p>3. Demonstrate an enhanced appreciation for the relevance and practical application of ethics in the role of management.</p> <p>4. Demonstrate detailed knowledge of the development of corporate social responsibilities of business corporations beyond profit maximisation.</p>
28	Production & Operation Management	BBA 306	<p>1. Apply the concept of production &amp; operation management in manufacturing and service sector and will be able to, plan, forecast and implement production and service-related decisions.</p> <p>2. Plan production schedules and plan resources (material and machine) required for production.</p> <p>3. To apply the concepts of purchase, stores and inventory management and analyse and evaluate material requirement decisions.</p>
29	Project	BBA 400	<p>1. Carry out a substantial research-based project.</p> <p>2. Analyse data and synthesize research findings.</p> <p>3. Report research findings in written and verbal forms.</p> <p>4. Use research findings to advance education theory and practice.</p> <p>5. Demonstrate an understanding of the ethical issues associated with practitioner research</p>
30	Project Management	BBA 401	<p>1. Understand project characteristics and various stages of a project.</p> <p>2. Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic.</p> <p>3. Analyse the learning and understand techniques for project planning, scheduling, execution control, project procurement etc</p>
31	Investment Banking and Financial Services	BBA 402	<p>1. Developing skills to entrepreneurs in risk management area, like identifying and avoiding the risk or making plans to overcome it in economic, securities terms of a company.</p> <p>2. Job opportunities skills to manage accounts and/or funds for a company or individual or to advise them regarding the management of investments.</p> <p>3. Helps entrepreneurs looking for funding and investors for their business.</p>
32	Working Capital Management	BBA 403	<p>1. Students will get enough knowledge about the working capital as well as how it is determined and</p>

			managed in any organization.
33	International Financial Management	BBA 404	<ol style="list-style-type: none"> <li>1. Students shall gain theoretical and practical knowledge required for the management of financial and investment functions of multinational corporations.</li> <li>2. Students will discover how the international capital markets, foreign exchange markets, and the derivatives market can be used to manage transaction and operating risks facing the multinational firm.</li> <li>3. Students will learn, through hands-on case studies and empirical evidence how to manage multinational companies' investment and financing activities. The relevance of country risk and international corporate governance in cross-border investments will also be examined.</li> </ol>
34	Income Tax	BBA 405	<ol style="list-style-type: none"> <li>1. Students shall be familiarized with different terms of used in taxation i.e. Tax Management, Tax Evasion and Tax Avoidance.</li> <li>2. To compute the overall tax liability of an individual as well as the company.</li> <li>3. To gain the knowledge for reducing the tax liability by using different exemptions give by the income tax department of India.</li> </ol>
35	Personal Selling & Sales Force Management	BBA 406	<ol style="list-style-type: none"> <li>1. The purpose of this course is to prepare students to be future sales managers.</li> <li>2. Managing and Developing the Sales Force, Measurement of Sales Goals and Evaluation of Salesperson Performance.</li> <li>3. To understand how the sales effort should be organized, and the strategic role of information in sales management</li> </ol>
36	Brand Management	BBA 407	<ol style="list-style-type: none"> <li>1. Demonstrate knowledge of the nature and processes of branding and brand management.</li> <li>2. Evaluate the scope of brand management activity across the overall organisational context and analyse how it relates to other business areas.</li> <li>3. Appraise the key issues in managing a brand portfolio and making strategic brand decisions.</li> <li>4. Formulate and justify brand development decisions</li> <li>5. Analyse and discuss contemporary brand related problems and develop appropriate strategies and initiatives</li> </ol>
37	Retail Management	BBA 408	<ol style="list-style-type: none"> <li>1. To familiarize students with the decisions involved in running a retail firm and the concepts and principles for making those decisions.</li> </ol>

			<p>2. To know the responsibilities of retail personnel in the numerous career positions available in the retail field.</p> <p>3. To recognize and understand the operations-oriented policies, methods, and procedures used by successful retailers in today's global economy.</p>
38	International Marketing	BBA 409	<p>1. To familiarize student with the impact of global and regional influences on products and services for consumers and businesses.</p> <p>2. To Apply knowledge gained in other courses to the understanding of marketing management in an international setting.</p> <p>3. Students will be encouraged to look at marketing practices in other countries and compare them with what they are familiar with.</p>
39	Rural Marketing	BBA 410	<p>1. With the help of Rural Marketing students will utilize the understanding on peculiarities of rural markets, channels and competition in marketing decision making.</p> <p>2. Students will understand the Rural Market Segmentation, targeting and positioning and Rural Products.</p> <p>3. Students can understand Buying behaviour of Rural Consumer and Purchase decision making process.</p>
40	Strategic Human Resource Management	BBA 411	<p>1. To provide basic knowledge about the concepts of Strategic Human Resource Management.</p> <p>2. The course will explain the importance of Strategic Human Resource Management and their effective management in organisations.</p> <p>3. Demonstrate a basic understanding of different tools used in forecasting and planning Strategic Human Resource needs.</p>
41	Leadership Dynamics In Management	BBA 412	<p>1. Develop the Skills of cooperation and coordination within the organization.</p> <p>2. Determine and provide needful directions to entrepreneurs for making team spirit among people.</p> <p>3. To develop skills in entrepreneurs for attainment of common organizational goals.</p>
42	Team Building and Group Dynamics	BBA 413	<p>1. Develops the skills to stay focused on the task at hand and do not engage in distracting behaviours in organization.</p> <p>2. Provides skills to entrepreneurs to determine the action items that any decision requires or think through how to carry out decisions.</p> <p>3. Develops entrepreneurial skills to ensure self-</p>

			development, positive communication, leadership skills and the ability to work closely together as a team to problem solve.
43	Knowledge Process Outsourcing	BBA 414	<ol style="list-style-type: none"> <li>1. Understand the outsourcing of core information-related business activities which can create an integral part of the company's value chain.</li> <li>2. Students can understand and cater the changing customer demands.</li> <li>3. Providing efficient reporting and performance measurement to achieve operational excellence and enhanced productivity.</li> </ol>
44	Management of Industrial Relations	BBA 415	<ol style="list-style-type: none"> <li>1.To familiarize with the role of management and unions in the promotions of industrial relations.</li> <li>2. Examine the labour relation issues and its management.</li> <li>3. To acquire skills in handling employer-employee relations.</li> </ol>
45	E-Business	BBA 416	<ol style="list-style-type: none"> <li>1. To develop essential knowledge, skills, and methods for using technical aspects of e-business.</li> <li>2. To understand paperless offices and processes thus contributing to savings in terms of resources.</li> <li>3. To develop entrepreneurial approach in current market scenario of e-commerce.</li> </ol>
46	Fundamental of Cyber Security	BBA 417	<ol style="list-style-type: none"> <li>1. Analyse and evaluate the cyber security needs of an organization.</li> <li>2. Have acquired knowledge of a representative sample of security threats, issues, technologies, and theories</li> <li>3. Determine and analyse software vulnerabilities and security solutions to reduce the risk of exploitation.</li> </ol>
47	Database Management System	BBA 418	<ol style="list-style-type: none"> <li>1. To design and build a simple database system.</li> <li>2. To demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.</li> </ol>
48	Introduction to Artificial Intelligence	BBA 419	<ol style="list-style-type: none"> <li>1. Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.</li> <li>2. Apply these techniques in applications which involve perception, reasoning, and learning.</li> <li>3. Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.</li> </ol>
49	Management Information System	BBA 420	<ol style="list-style-type: none"> <li>1. Understands the concept, its development and management support for the Management Information System</li> </ol>

			<p>2. Ability to define needs and dimensions of MIS, steps for short- and long-range plans and budget for MIS</p> <p>3. Analyses the elements and data sources, constraints and develops formats and documents of MIS</p> <p>4. Develops methods, planning for implementation and process of evaluation of MIS</p>
50	Business Decision Making	BBA 421	<p>1. To have greater insight into decision-making processes</p> <p>2. Possess a range of different perspectives on what counts as an 'effective' decision.</p> <p>3. Understand better how people perceive and decide about risk.</p>
51	Renewable and Alternate Energy Integration Management System	BBA 422	<p>1. The student will have knowledge in a specialized field such as solar energy, storage, smart grid.</p> <p>2. The student will have specialized knowledge in the field of renewable energy system.</p> <p>3. The student will have a good understanding of national and international regulation and framework condition for renewable energy system.</p>
52	Human Values & Ethics	BBA 01	<p>1. To create conducive environment for professionals to grow as good and responsible human beings imbibing values and ethics.</p> <p>2. Understanding the significance of environment.</p> <p>3. Developing humanitarian outlook.</p>
53	Industrial Safety Engineering	BBA 02	<p>1. To know about Industrial safety programs and toxicology, Industrial laws, regulations, and source models.</p> <p>2. To analyse industrial hazards and its risk assessment.</p> <p>3. Students can understand the safety audit, safety education and performance monitoring in industries</p>
54	Business Simulation Approaches	BBA 03	<p>1. Understand the purpose, techniques, need and modelling of Simulation in business.</p> <p>2. Students will learn to model the business and various Simulation approaches.</p> <p>3. Students can understand the application of Simulation in various sectors.</p>
55	Foreign Language (German)	BBA 04	<p>1. Students can listen to and understand the spoken German language which uses the elementary spoken structures.</p> <p>2. Students can speak and engage in simple dialogues in German.</p> <p>3. Students can read and write the sentences and short paragraphs in German.</p>

56	Financial Inclusion	BBA 05	<p>1.To help students understand concept of financial inclusion and understand its crucial relationship with development indicators.</p> <p>2. To let students learn about the emerging trends of micro finance and micro insurance and how the benefit of financial services can be extended to poor.</p> <p>3. To make them learn about vital concept such as Banks, Client, Business Correspondent and Facilitator involved in smooth functioning of Banking and Finance sector.</p>
57	Corporate Restructuring	BBA 06	<p>1. Understand about Mergers, Amalgamation and Takeovers</p> <p>2. Gain more knowledge on the revival of sick companies</p> <p>3. Understand all aspects and intricacies of law and practical issues affecting and arising out of corporate restructuring.</p>
58	Corporate Financial Decisions	BBA 07	<p>1. provide a range of definitions of corporate governance and identify issues usually addressed by corporate governance structures.</p> <p>2. Summarize recent scandals and abuses and the regulatory reaction.</p> <p>3. Helps students to understand financial prediction, monetary management, fund procurement, budgeting, credit administration and investment appraisal in the corporate sectors.</p>
59	Introduction to Professional Correspondence and Business Documentation	BBA 08	<p>1. How to improve organizational practices, eliminate silos, keep employees informed and reduce errors.</p> <p>2. It helps students to understand the power of visual communication, interpret business visuals, and make intelligent design choices in their own documents and presentations.</p>
60	Project Appraisal and Analysis	BBA 09	<p>1. How to extract relevant information for determining the success or failure of a project.</p> <p>2. This means that the project appraisal is done to know, how much the company has invested on the project and in return how much it is gaining from it.</p> <p>3. Make them capable to analyse, apply and appreciate contemporary project management tools and methodologies in contemporary world.</p>
61	Advance Spreadsheet Tools for Financial Analysis	BBA 10	<p>1. To organize and categorize data into a logical format and develop knowledge of business-related forecasts and plan.</p> <p>2. Make meaningful representations of data in the form of charts and pivot tables and solve complex</p>

			<p>problems using superpower functions.</p> <p>3. The role of this course is to teach participants the various formulas used in Excel, how to debug them, audit them and how to use which formula for which occasion.</p>
62	Financial Modelling and Derivatives	BBA 11	<p>1. To estimate the valuation of a business or to compare businesses to their peers in the industry.</p> <p>2. It provides to understand strategic planning to test various scenarios, calculate the cost of new projects, decide on budgets, and allocate corporate resources.</p> <p>3. Executives typically use financial models to make decisions regarding: Budgeting and forecasting</p>
63	Tourism and Hospitality Management	BBA 20	<p>1. Develops leadership and management skills through group co-operation.</p> <p>2. Describes the roles and function of a leader in hospitality industry.</p> <p>3. Understand the importance of goal setting and team building.</p>
64	Agricultural Marketing	BBA 21	<p>1. To widen the product range.</p> <p>2. To bring in good marketing practices which helps to cope up with environmental changes.</p> <p>3. To help in planning for successful operations leading to better quality of products and customer satisfaction.</p>
65	International Business	BBA 22	<p>1. To understand global issues.</p> <p>2. To prepare you for diverse business opportunities.</p> <p>3. Not limiting to finding a job in own country of study alone, but rather opening.</p>
66	Banking Law	BBA 23	<p>1. Exhibit and use their learning about Banking system, regulator, Customer-Bank relationship, and related Laws.</p> <p>2. Learning on Private sector banks functioning may result in opting the sector as carrier.</p>
67	Disaster Management	BBA 24	<p>1. To increase knowledge and understanding of disaster phenomenon, its different contextual aspects, impacts and public health consequences.</p> <p>2. To ensure skills and abilities to design implement and evaluate research on disaster.</p> <p>3. Understanding of international strategy for disaster reduction</p>
68	Social Media in Business	BBA 25	<p>1. Students shall be able to understand the difference between traditional marketing and social media marketing.</p> <p>2. Students shall be able to develop social media marketing goals and objectives.</p> <p>3. Students shall be able to develop an internal social</p>

			media policy, including management, timing, and frequency.
69	Digital Marketing	BBA 26	<ol style="list-style-type: none"> <li>1. Understand the Integrated digital marketing, opportunities and threats associated with it.</li> <li>2. Interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.</li> <li>3. Students can develop digital marketing strategies and segmentation the market for digital marketing.</li> </ol>
70	Gender, Justice and Workplace Securities	BBA 81	<ol style="list-style-type: none"> <li>1. To be able to understand and explain basic concepts related to gender inequality.</li> <li>2. To understand various provisions, laws and measures designed to promote gender equality.</li> <li>3. To be sensitive towards gender issues in workplace settings.</li> </ol>
71	Water Society and Sustainability	BBA 82	<ol style="list-style-type: none"> <li>1. To be able to understand major theoretical and methodological approaches to relations between water and human existence.</li> <li>2. To be able to understand global scenario and contemporary challenges related to water.</li> <li>3. To develop an environmentally sensitive outlook towards natural resources.</li> </ol>
72	Introduction to Cultural Studies	BBA 83	<ol style="list-style-type: none"> <li>1. To be able to understand the cultural complexity in all its forms and analyse the socio-political context in which culture manifests itself.</li> <li>2. To be able to understand the importance of socio cultural and political forces in construction of social realities and categories.</li> <li>3. To be culturally sensitive in their personal and professional lives.</li> </ol>
73	Economics of Health and Healthcare	BBA 84	<ol style="list-style-type: none"> <li>1. To help students understand economics of health and Health care system</li> <li>2. To give students deep insight and understanding of flourishing Hospital Industry and booming pharmaceutical market.</li> <li>3. To let students understand International Health Care system</li> </ol>

## MASTER OF BUSINESS ADMINISTRATION (MBA)

### COURSE OUTCOMES

S.no	Subject	Subject Code	Course Outcomes
1	Industrial Management	MBA 01	<ol style="list-style-type: none"><li>1. Student will become efficient and acquire acumen of more profitable business practices.</li><li>2. Students will understand importance of better customer service and product quality.</li><li>3. Able to make work safer, faster, easier, and more rewarding.</li><li>4. Able to help industry in production of more products which possess all utility factors.</li><li>5. Making the world safer through better designed products and processes.</li><li>6. Reducing costs associated with new technologies.</li></ol>
2	Engineering & Managerial Economics	MBA 02	<ol style="list-style-type: none"><li>1. Students will acquire basic knowledge in Engineering &amp; managerial economics, which allows students to gain theoretical and empirical skill of economics.</li><li>2. To make Engineering students prepared for economic empowerment so that they could manage their wealth, help them in starting their own business or during managerial period.</li><li>3. Students will develop Interdisciplinary skills which can help them to thrive in the lifelong changing environment in various fields of Industry of Economics.</li><li>4. Students will acquire practical knowledge of economics, the kind of markets, cost theory, various issues of demand and other major economic concepts.</li><li>5. Able to explain succinctly the meaning and definition of managerial economics; elucidate on the characteristics and scope of managerial economics.</li><li>6. Able to describe the techniques of managerial economics.</li><li>7. Able to explain the applications of managerial economics in various aspects.</li><li>8. To learn about the management and economics of the industrial environment</li></ol>
3	Public Administration	MBA 03	<ol style="list-style-type: none"><li>1. The students will be able to know the scope, significance, and methodology of public administration.</li><li>2. Able to understand public corporation, board, administrative set up in India, administrative decentralization, and coordination.</li><li>3. Understands the objectives, recruitment, training, terms of employment of personnel administration, financial organization and its administration, and parliamentary control over the financial management.</li><li>4. Understands the accountability and judicial control over public administration, administrative aspects for rural and urban administration in India.</li></ol>

4	Fundamentals of Management	MBA 101	<p>1. Fundamentals management provides an insight to managers to manage an organization. The principles empower managers to decide, what should be done to accomplish given tasks and to handle situations, which may arise in management. It makes managers more efficient. 2. It is helpful in identifying the areas of management in which existing &amp; future managers should be trained. 3. Management principles makes the role of managers' concrete. Therefore, these principles act as ready reference to the managers to check whether their decisions are appropriate.</p>
5	Accounting and Financial Analysis	MBA 102	<p>1. To prepare the account of concern business using these accounting skills like trading account, Profit and Loss account and Balance sheet. 2. Prepare and analyse the Fund Flow Statement and Cash Flow Statement. 3. Analyse the financial statement using various ratios and financial statements analysis tools and techniques. 4. Provide the current position of the concern business to the stakeholders like proprietors Public and Government etc.</p>
6	Managerial Economics	MBA 103	<p>1. Economics students in general will be able to pinpoint and understand the past, present economic conditions of the country. 2. They will also be able to forecast the future course of changes and development through their knowledge of policies and programmes set by the governments and other development agencies. 3. They will be equipped with the techniques to find solution of the problems like mobilization of manpower and materials available in the country.</p>
7	Marketing Management	MBA 104	<p>1. Marketing Management provides knowledge and capabilities to develop marketing strategies (Segmentation, Targeting and Positioning) for organizations. These strategies outline clearly how an organization will promote its products and services to its target market with an aim of increasing its sales volumes and maintaining a competitive edge over its competitors.</p> <p>2. It also provides and insight for analyse market trends with an aim of identifying unexploited or new markets for the organization's products and services. Also, through market analysis and forecasting, they can develop a proper marketing mix for the organization.</p> <p>3. It provides a practical approach for an organization's marketing operations. It helps in formulating, directing, and coordinating marketing activities to influence customers to choose the organization's products and services.</p>
8	Organizational Behaviour &	MBA 105	<p>1. To help the students to acquire and develop skill to take rational decisions in organisation. 2. Analyse the</p>

	Group Dynamics		complexities associated with management of the group behaviour in the organization. 3. Demonstrate the applicability of the concept of organizational behaviour to understand the behaviour of people in the organization.
9	Human Resource Management	MBA 106	1. To enable the students to understand the HR Management and system at various levels in general and in certain specific industries or organizations. 2. To help the students focus on and analyse the issues and strategies required to select and develop manpower resources. 3. To develop relevant skills necessary for application in HR related issues. 4. To Enable the students to integrate the understanding of various HR concepts along with the domain concept to take correct business decisions.
10	Business Environment	MBA 107	1. Explain the concept of the various constituents of environment and their impact on businesses. 2. Apply the trade theories, investment theories, exchange rate theories and regional trading bloc theories and their impact on economic welfare. 3. Analyse the principle and the different exchange rate regimes' impact on businesses. 4. Integrate the concept and opening economies of developing countries like India through RTB and multilateral route.
11	Business Laws	MBA 108	1. Demonstrate an understanding of the Legal Environment of Business. 2. Apply basic legal knowledge to business transactions. 3. Communicate effectively using standard business and legal terminology.
12	Research Methodology	MBA 109	1. Demonstrate the use of knowledge of the research processes (reading, evaluating, and developing) for the specific problem. 2. Solve the problem of the society/industry by using these research skills, tools, and techniques. 3. Identify, explain, compare, and prepare the key elements of a research proposal/report and describe sampling methods, measurement scales and instruments, and appropriate uses of each. 4. Demonstrate how educational research contributes to the objectives of doctoral program and specific career of the students as well as the objectives of the concern industry/business.
13	Production & Operations Management	MBA 110	1. Demonstrate an understanding of the concepts of production and operation management. 2. Demonstrate the ability to apply some mathematical forecasting techniques. 3. Demonstrate an awareness and an appreciation of the

			importance of the operations and supply management to the sustainability of an enterprise
14	Financial Management & Cost Accounting	MBA 111	<ol style="list-style-type: none"> <li>1. Describe the financial environment within which organisations must operate.</li> <li>2. Critically evaluate the financial objectives of various types of organisations and the respective requirements of stakeholders. As well as discuss the function of capital markets.</li> <li>3. Explain alternative sources of finance and investment opportunities and their suitability in particular circumstances.</li> <li>4. Assess the factors affecting investment decisions and opportunities presented to an organisation.</li> </ol>
15	Supply Chain Management	MBA 112	<ol style="list-style-type: none"> <li>1. To understand the foundational role of logistics as it relates to transportation and warehousing.</li> <li>2. To understand how Logistics, Supply Chain, Operations, Channels of Distribution fit in to various types of Business viz., Manufacturing, Service and Project.</li> <li>3. To Identify and Analyse Business Models, Business Strategies and, corresponding Competitive Advantage.</li> </ol>
16	Management Information System	MBA 113	<ol style="list-style-type: none"> <li>1. Understands the concept, its development and management support for the Management Information System.</li> <li>2. Ability to define needs and dimensions of MIS, steps for short- and long-range plans and budget for MIS.</li> <li>3. Analyse the elements and data sources, constraints and develops formats and documents of MIS.</li> <li>4. Develops methods, planning for implementation and process of evaluation of MIS.</li> </ol>
17	Strategic Management	MBA 121	<ol style="list-style-type: none"> <li>1. Understand the strategic decisions that organisations make and have an ability to engage in strategic planning.</li> <li>2. Explain the basic concepts, principles and practices associated with strategy formulation and implementation.</li> <li>3. Integrate and apply knowledge gained in basic courses to the formulation and implementation of strategy from holistic and multi-functional perspectives.</li> <li>4. Analyse and evaluate critically real-life company situations and develop creative solutions, using a strategic management perspective.</li> </ol>
18	Consumer Behaviour & Marketing	MBA 122	<ol style="list-style-type: none"> <li>1. To understand consumer behaviour in an informed and systematic way.</li> <li>2. To analyse personal, socio-cultural, and environmental dimensions that influence consumer decisions making.</li> <li>3. To enable students in designing and evaluating the marketing strategies based on fundamentals of consumer buying behaviour.</li> </ol>

			4. To give the students a perspective to understand the application of market research in framing effective marketing strategies.
19	Entrepreneurship Development & Project Management	MBA 123	<ol style="list-style-type: none"> <li>1. Develop idea generation, creative and innovative skills.</li> <li>2. Aware of different opportunities and successful growth stories.</li> <li>3. Learn how to start an enterprise and design business plans those are suitable for funding by considering all dimensions of business.</li> <li>4. Understand entrepreneurial process by way of studying different case studies and find exceptions to the process model of entrepreneurship.</li> <li>5. Run a small enterprise with small capital for a short period and experience the science and art of doing business.</li> </ol>
20	Corporate Governance & Ethics	MBA 124	<ol style="list-style-type: none"> <li>1. Demonstrate an enhanced appreciation for the relevance and practical application of ethics in the role of management.</li> <li>2. Critically evaluate the range of ethical issues that arise in management, and business organisations and the theories that are used to model these issues and demonstrate an ability to propose solutions to those issues.</li> <li>3. Critically evaluate the different ways in which people may respond to ethical issues at work and what may influence such responses.</li> <li>4. Demonstrate detailed knowledge of the development of Corporate Social Responsibility and the responsibilities of business corporations beyond profit maximisation.</li> </ol>
21	Summer Training Project	MBA 130	<ol style="list-style-type: none"> <li>1. To apply their knowledge and skills acquired in the classroom to a professional context.</li> <li>2. To understand what skills are transferable to new contexts; identify and understand the practices and protocols of the company and industry in which they are working.</li> <li>3. To successfully reflect on the quality of the contribution they have made to the organization.</li> <li>4. To refine and reassess their own career goals because of the experience.</li> </ol>
22	Research Project Part-1	MBA 140	<ol style="list-style-type: none"> <li>1. Carry out a substantial research-based project.</li> <li>2. Analyse data and synthesize research findings.</li> <li>3. Report research findings in written and verbal forms.</li> <li>4. Use research findings to advance education theory and practice.</li> <li>5. Demonstrate an understanding of the ethical issues associated with practitioner research.</li> </ol>
23	Seminar	MBA 141	<ol style="list-style-type: none"> <li>1. Demonstrate use of appropriate methodologies and test the strength of their thesis statement.</li> </ol>

			<p>2. Shall be able to show insight on topic, appropriate signposting, and clarity of purpose.</p> <p>3. Demonstrate problem-solving skills and apply theoretical knowledge.</p>
24	Comprehensive Viva	MBA 142	<p>1. Demonstrate knowledge in the programme domain.</p> <p>2. To be able to present views precisely and cogently.</p> <p>3. Exhibit professional etiquette suitable for career progression.</p>
25	Research Project Part-II	MBA 150	<p>1. Carry out a substantial research-based project.</p> <p>2. Analyse data and synthesize research findings.</p> <p>3. Report research findings in written and verbal forms.</p> <p>4. Use research findings to advance education theory and practice.</p> <p>5. Demonstrate an understanding of the ethical issues associated with practitioner research.</p>
26	Management of Working Capital	MBA FM 1	<p>1. Students will get to know about the working capital as well as how it is determined and managed in organizations.</p> <p>2. Explain alternative sources of finance and investment opportunities and their suitability in particular circumstances.</p> <p>3. Assess the factors affecting investment decisions and opportunities presented to an organisation.</p>
27	Security Analysis & Investment Management	MBA FM 2	<p>1. Evaluate the investment environment for Indian investor for various avenues of investment.</p> <p>2. Formulate strategies for investment in equities, bonds, and other instruments.</p> <p>3. Construct, revise and evaluate portfolios of different securities.</p>
28	Management of Financial Institutions & Services	MBA FM 3	<p>1. To acquire the skills necessary to manage a financial firm.</p> <p>2. To describe and apply financial concepts, theories, and tools.</p> <p>3. To evaluate the role of technology and the legal, ethical, and economic environment as it relates to financial institutions including the federal reserve, commercial bank, insurance companies, investment bank etc.</p>
29	Tax Planning and Financial Reporting	MBA FM 4	<p>1. To understand the nature and scope of tax management.</p> <p>2. To understand the concept and computation of Income under the different heads.</p> <p>3. To understand the process of Filing of returns, Tax appeals, Revision &amp; Review etc.</p> <p>4. To understand the concept of Goods and Services Tax (GST) and their Implications.</p>
30	Behavioural Finance	MBA FM 5	<p>1. Understand and critically discuss the differences between a behavioural finance perspective and a traditional finance perspective.</p>

			<p>2. Understand and critically discuss the cognitive biases and errors of judgment that affect financial decisions.</p> <p>3. Critically evaluate behavioural influences involving individual's investment decisions.</p> <p>4. Critically evaluate behavioural influences involving corporate (executive) financial decisions.</p>
31	Multinational Finance & Forex Management	MBA FM 6	<p>1. Demonstrate basic understanding of foreign exchange market and exchange rates.</p> <p>2. Demonstrate basic understanding of how to use foreign exchange derivatives and other techniques to manage foreign exchange exposures of firms.</p> <p>3. Demonstrate basic understanding of the issues pertaining to multinational financing and investment decisions.</p> <p>4. Demonstrate critical and analytical skills wherein they should be able to make sense out of a mass of information to address relevant issues pertaining to international finance theory.</p>
32	Financial Derivatives	MBA FM 7	<p>1. To be able to price forward and futures contracts.</p> <p>2. To develop strategies to profit from mispriced derivative assets.</p> <p>3. To hedge underlying positions using derivatives</p>
33	Cross Cultural & Global Management	MBA HR1	<p>1. The goal is to provide suitable feedback regarding different cultural practices with employees and employer on global level.</p> <p>2. Identify, analyse, evaluate, and communicate information reflective of negotiation and management formats and in cross cultural contexts.</p> <p>3. Incorporate theories, concepts, and models relevant to the global and cultural context of an international business issue or case.</p>
34	Industrial Relations & Labour Enactments	MBA HR2	<p>1. To train Human Resource students in reference to basic labour law related practices in our country.</p> <p>2. The students should be able to illustrate the role of trade union in the industrial setup.</p> <p>3. Students should be able to outline the important causes &amp; impact of industrial disputes.</p>
35	Team Building & Leadership	MBA HR3	<p>1. To build and develop student's competency in leadership and teamwork skills based on the experimental learning.</p> <p>2. Students will gain the practical aspects of the process of teamwork and team leadership.</p> <p>3. To create new, unpredictable situations that lend themselves to chaotic outcomes causing students to exhibit new leadership abilities.</p>
36	Negotiation & Counselling	MBA HR4	<p>1. Understand complex theory and practice of negotiation and conflict resolution in general.</p> <p>2. Identify the challenges we all have in dealing with</p>

			negotiation and conflict resolution. 3. Apply negotiation as a system and the important role of subsidiary factors.
37	Performance Management	MBA HR5	1. To explain the concept of performance management and different advantages of implementing well-designed performance management systems. 2. To explain and understand that performance management is an on-going process composed of several sub-processes, such as performance planning, execution, assessment, and review. 3. To understand different approaches to performance measurement. 4. To design a performance management system. 5. To understand and develop key skills involved in effective performance management.
38	Knowledge Management	MBA HR6	1. The students will be able to understand the characteristics, components and concept of knowledge economy and its management. 2. Understand need of knowledge organization, knowledge management process cycle, strategy, and its development. 3. The ability to understand knowledge management system through IT, to face the future challenges of knowledge management for grooming the career. 4. Improves the overall performance by promoting the learning efficiency, innovation, competitive challenges, creation, dissemination, and utilization of knowledge management.
39	International Marketing	MBA IB 1	1. Have developed an understanding of major issues related to international marketing. 2. Have developed skills in researching and analysing trends in global markets and in modern marketing practice. 3. Be able to assess an organization's ability to enter and compete in international markets.
40	International Business Environment & Foreign Exchange Economics	MBA IB 2	1. Explain the concepts in international business with respect to foreign trade/international business. 2. Apply the current business phenomenon and to evaluate the global business environment in terms of economic, social, and legal aspects. 3. Analyse the principle of international business and strategies adopted by firms to expand globally.
41	Export Management and Documentation	MBA IB 3	1. To understand the basics of global trade and import and export policies. 2. To understand export marketing, contracts, and the role of promotion councils. 3. To understand various import process and procedures. 4. To understand the payment methods, risks, and various

			<p>financing strategies.</p> <p>5. Understand different agencies involved in EXIM process and their role in the international trade.</p>
42	International Logistics Management	MBA IB 4	<p>1. To be able to incorporate and manage uncertainty and risk within supply chain management.</p> <p>2. To segment different customers, products, and channels and design an optimal portfolio of logistics approaches and strategies for these various segments.</p> <p>3. To highlight the importance of all activities of the supply chain and an understanding of concepts like inbound and outbound logistics, offshore and inshore logistics.</p>
43	International Financial Management	MBA IB 5	<p>1. Understand international capital and foreign exchange market.</p> <p>2. Identify and appraise investment opportunities in the international environment.</p> <p>3. Identify risk relating to exchange rate fluctuations and develop strategies to deal with them.</p> <p>4. Identify and evaluate foreign direct investment and international acquisition opportunities.</p> <p>5. Develop strategies to deal with other types of country risks associated with foreign operations.</p> <p>6. Express well considered opinion on issues relating to international financial management.</p>
44	International Marketing Research	MBA IB 6	<p>1. The students should be able to define, explain and illustrate the marketing principles that together constitute the field of study known as international marketing.</p> <p>2. Develop a high level of analytical skills and critical thinking in an international marketing context: defining problems, identifying opportunities, and interpreting their implications for decision making.</p> <p>3. Be creative and flexible to integrate and apply selected behavioural and management science tools in solving international marketing problems (e.g., culminating project).</p>
45	Database Management System	MBA IT1	<p>1. To design and build a simple database system.</p> <p>2. To demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.</p> <p>3. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra, and SQL.</p>
46	System Analysis, Design and Software Engineering	MBA IT2	<p>1. To develop a basic understanding the life cycle of a systems development project.</p> <p>2. To develop an understanding of the analysis and development techniques required as a team member of a medium-scale information systems development project.</p> <p>3. To develop an understanding of the ways in which an</p>

			analyst's interaction with system sponsors and users play a part in information systems development. 4. To gain experience in developing information systems models.
47	Data Communication & Network	MBA IT3	1. To understand the basics of data communication, networking, internet, and their importance. 2. To analyse the services and features of various protocol layers in data networks. 3. To differentiate wired and wireless computer networks and analyse TCP/IP and their protocols. 4. To recognize the different internet devices and their functions. 5. To identify the basic security threats of a network.
48	Electronic Commerce-Concept & Applications	MBA IT4	1. To understand the basic concepts and technologies used in the field of management information systems. 2. To gain knowledge of the different types of management information systems. 3. Be aware of the ethical, social, and security issues of information systems;
49	Enterprise Resource Planning	MBA IT5	1. To be able to make basic use of enterprise software. 2. To understand the role of ERP in integrating business functions. 3. To analyse the strategic option for ERP identification and adoption.
50	Managing IT Enabled Services	MBA IT6	1. To introduce students with newly emerging area of IT enabled services. 2. To be able to undertake extensive field work on role of IT in reshaping the Services Sector. 3. After successful completion of the programme, the students can secure jobs at various levels like Programmer, Web Designer, Network Administrator, System Administrator and Database Administrator in KPOs, BPOs and other industries providing IT Enabled Services.
51	Cyber Security for Business	MBA IT7	1. Student will be able to incorporate approaches for risk management and best practices. 2. Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools. 3. Comprehend and execute risk management processes, risk treatment methods, and key risk and performance indicators
52	Cloud Computing for Business	MBA IT8	1. To explain the core issues of cloud computing such as security, privacy, and interoperability. 2. To help choosing the appropriate technologies, algorithms, and approaches for the related issues. 3. To identify problems, and explain, analyse, and evaluate

			various cloud computing solutions.
53	Marketing of Services	MBA MK 1	<ol style="list-style-type: none"> <li>1. To be able to understand practical and theoretical implementation of Services marketing with knowledge of 7p's (Extended 3p).</li> <li>2. Shall be familiar with the scope of Services marketing in real world.</li> <li>3. To be able to identify critical issues in the service delivery process with an effective Service marketing system and issues related to services marketing triangle.</li> <li>4. To understand the integration of technology with services marketing for better performance.</li> </ol>
54	Brand Management	MBA MK 2	<ol style="list-style-type: none"> <li>1. Demonstrate knowledge of the nature and processes of branding and brand management.</li> <li>2. Evaluate the scope of brand management activity across the overall organisational context and analyse how it relates to other business areas.</li> <li>3. Appraise the key issues in managing a brand portfolio and making strategic brand decisions.</li> <li>4. Formulate and justify brand development decisions.</li> <li>5. Analyse and discuss contemporary brand related problems and develop appropriate strategies and initiatives.</li> </ol>
55	Sales Distribution & Management	MBA MK 3	<ol style="list-style-type: none"> <li>1. To develop a customer centric approach to the sales and distribution function.</li> <li>2. To be able to integrate advertising, sales force, and channel members by building non-conflicting and non-overlapping routes to fulfil the needs of the consumer.</li> <li>3. Developing frameworks for decision taking keeping the customers as the primary focus.</li> </ol>
56	Retail Management	MBA MK 4	<ol style="list-style-type: none"> <li>1. To introduce the student to the field of retailing management.</li> <li>2. To understand the problems and issues faced by retailers.</li> <li>3. Understand the difference between Retail and Manufacturing Supply Chain.</li> </ol>
57	Customer Relationship Management	MBA MK 5	<ol style="list-style-type: none"> <li>1. To develop understanding about customer relationship management concepts and frameworks, and how these are applied to form relationships with customers and other internal and external stakeholders.</li> <li>2. To develop skills to analyse and synthesise information and issues, related to customer relationship management, from several perspectives.</li> <li>3. To enhance business communication skills required to work effectively within a marketing team.</li> </ol>
58	Marketing Research	MBA MK 6	<ol style="list-style-type: none"> <li>1. To enhance the students understanding of the marketing research industry.</li> <li>2. To develop skills required by the researcher and understand different applications of Marketing Research.</li> <li>3. To explore different approaches of Marketing research.</li> <li>4. To be able to exploit Marketing Research data for management decision-making.</li> </ol>
59	Digital	MBA	<ol style="list-style-type: none"> <li>1. Students shall be able to demonstrate the understanding</li> </ol>

	Marketing	MK 7	<p>of Digital marketing and media concepts.</p> <p>2. Understand the Integrated digital marketing, opportunities and threats associated with it.</p> <p>3. Interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.</p> <p>4. Students can develop digital marketing strategies and segmentation the market for digital marketing.</p>
60	Integrated Marketing Communication	MBA MK 8	<p>1. To introduce students to the principle and basic concept of marketing communication process in a streamlined integrated marketing strategy.</p> <p>2. To provide an understanding of integrated marketing communications (IMC).</p> <p>3. Explain how marketers use IMC in their campaigns to execute marketing strategy.</p>
61	Entrepreneurship Development	BOE 19	<p>1. Aware of different opportunities and successful growth stories.</p> <p>2. Learn how to start an enterprise and design business plans those are suitable for funding by considering all dimensions of business.</p> <p>3. Understand entrepreneurial process by way of studying different case studies and find exceptions to the process model of entrepreneurship.</p>
62	Principles of Management	BOE 20	<p>1. Fundamentals management provides an insight to managers to manage an organization. The principles empower managers to decide, what should be done to accomplish given tasks and to handle situations, which may arise in management. It makes managers more efficient.</p> <p>2. It is helpful in identifying the areas of management in which existing &amp; future managers should be trained.</p> <p>3. Management principles makes the role of managers' concrete. Therefore, these principles act as ready reference to the managers to check whether their decisions are appropriate.</p>
63	Organisational Behaviour & Personnel Management	BOE 21	<p>1. To help the students to acquire and develop skill to take rational decisions in organisation.</p> <p>2. Analyse the complexities associated with management of the group behaviour in the organization.</p> <p>3. Demonstrate the applicability of the concept of organizational behaviour to understand the behaviour of people in the organization.</p>
64	Soft Skills	MHM 101	<p>1. Effectively communicate through verbal/oral communication and improve the listening skills.</p> <p>2. Write precise briefs or reports and technical documents.</p> <p>3. Actively participate in group discussion / meetings / interviews and prepare &amp; deliver presentations.</p>

			4. Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of teamwork, Inter-personal relationships, conflict management and leadership quality.
65	Communication for Business & Management	MHM 102	<ol style="list-style-type: none"> <li>1. Overcome the problems he/she faces in oral and written communication.</li> <li>2. Acquire knowledge of and methods for using technical communication, such as, reports, proposals, and business letters etc.</li> <li>3. Use and practice compositions correctly.</li> <li>4. Give Presentations in different sessions and make self-appraisal.</li> </ol>
66	Behavioral Psychology	MHM 103	<ol style="list-style-type: none"> <li>1. Basic understanding of human behaviour in industrial/organizational/work settings.</li> <li>2. Conversant with the major theoretical and practical perspectives on issues/processes that affect human behaviour at work.</li> <li>3. To be able to understand the role of psychology in workplace behaviour.</li> </ol>
67	Foreign Language-French	MHM 104	<ol style="list-style-type: none"> <li>1. Use of various facets of French language, its problems and understanding.</li> <li>2. To identify, formulate and solve the real-life problems with positive attitude.</li> <li>3. To inculcate the habit of learning and developing the French knowledge.</li> </ol>
68	Foreign Language-German	MHM 105	<ol style="list-style-type: none"> <li>1. Use of various facets of German language, its problems and understanding.</li> <li>2. To identify, formulate and solve the real-life problems with positive attitude.</li> <li>3. To inculcate the habit of learning and developing the German knowledge.</li> </ol>
69	Foreign Language-Spanish	MHM 106	<ol style="list-style-type: none"> <li>1. Use of various facets of Spanish language, its problems and understanding.</li> <li>2. To identify, formulate and solve the real-life problems with positive attitude.</li> <li>3. To inculcate the habit of learning and developing the Spanish knowledge.</li> </ol>
70	Advance Professional Writing	MBA-151	<ol style="list-style-type: none"> <li>1. Understand professional writing by studying management communication contexts and genres, researching contemporary business topics, analysing quantifiable data discovered by researching, and constructing finished professional workplace documents.</li> <li>2. Recognize, explain, and use the formal elements of specific genres of organizational communication: white papers, recommendation and analytical reports, proposals, memorandums, web pages, wikis, blogs, business letters, and promotional documents.</li> <li>3. Understand the ethical, international, social, and professional constraints of</li> </ol>

			audience, style, and content for writing situations a.) among managers or co-workers and colleagues of an organization, and b.) between organizations, or between an organization and the public.
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## M.Sc. Chemistry

### Course outcomes

S.no	Subject	Subject Code	Course Outcomes
1	Organic Chemistry-I	MCY-101	<ol style="list-style-type: none"><li>1. To describe the various types of reactive intermediates based on their generation, reactivity and stability.</li><li>2. To describe the Huckel's rule for aromaticity and describe the concept of anti-aromaticity and homoaromaticity.</li><li>3. To describe the concept of isomerism and classify the compound based on R/S and E/Z nomenclature. To describe the various types of aromatic and aliphatic electrophilic substitution reactions.</li><li>4. To differentiate between the various benzenoid and non-benzenoid compounds. To describe the various types of additions and eliminations reaction.</li></ol>
2	Inorganic Chemistry-I	MCY-102	<ol style="list-style-type: none"><li>1. To describe the concept of various types of symmetry, operations and symmetry classification in inorganic compounds.</li><li>2. To study the concept of stereochemistry and bonding in main group compounds based on theories, spectrochemical factors and Energy level diagrams. To study the concept of CFT, LFT, Nephelauxetic effect, Term symbols, structural effects for transition elements.</li><li>3. To describe the electronic spectra and magnetic properties of transition metal complexes and their applications.</li><li>4. To study the concept of catenation, heterocatenation, isopolyanions, heteropoly anions and various inorganic rings and cages compounds.</li></ol>
3	Physical chemistry-I	MCY-103	<ol style="list-style-type: none"><li>1. To study the concept of electrodes with classification, electrode potentials, types of electrochemical cells/galvanic cells and their applications.</li><li>2. To study the kinetics of various order reactions, kinetics theory and photophysical process.</li><li>3. To study the basic principle of quantum chemistry and their applications.</li></ol>

			4.To study the concept of unit cell, crystal defect, symmetry in crystals, and their classification
4	Molecular spectroscopy	MCY - 104	<p>1. Explain what it means to use spectroscopic methods for qualitative and quantitative analysis. Identify the terms in and describe deviations to Beer's Law. Understand principle, instrumentation and applications of UV-Visible spectroscopy and fluorimetry.</p> <p>2. Understand Theory, Instrumentation and Applications of Infra-red and Raman Spectroscopy towards determination of molecular structure. Quantitative determination using Infra-red and Raman Spectroscopy.</p> <p>3. Understand Theory, and various concepts like chemical shift, spin-spin coupling, NOE effects of <math>^1\text{H}</math>NMR and <math>^{13}\text{C}</math>NMR spectroscopy. Instrumentation and Applications of <math>^1\text{H}</math>NMR and <math>^{13}\text{C}</math>NMR towards determination of molecular structure.</p> <p>4. Understand Theory, and various concepts like isotope abundance, molecular ion, fragmentation processes of Mass Spectrometry. Instrumentation and Applications of Mass Spectrometry towards determination of molecular structure.</p>
5	Laboratory coursework-I	MCY - 105	<p>1. Brief introduction on safety, laboratory equipments and apparatus. 2. To study the complexometric titrations and preparation of inorganic complexes. Quantitative and qualitative estimation of pair of metal ions and insoluble sulfates.</p> <p>3. To estimate the organic compounds via chromatography methods. Synthesis and purification of organic molecules via several synthetic techniques.</p> <p>4. To study the physical and chemical properties of solvents and solutions through advance volumetric and techniques.</p>
6	Organic Chemistry-II	MCY - 106	<p>1. To describe and classify the various selective name reactions involved addition, substitution, condensation, coupling and redox reaction.</p> <p>2. To explain the various type of rearrangement reactions along with stereo aspect.</p> <p>3. To describe the various type of oxidizing and reducing reagent for organic synthesis and its applications.</p> <p>4. Brief description of UV, IR and NMR spectroscopy for various organic/inorganic molecule</p>

			detections.
7	Inorganic chemistry – II	MCY-107	<ol style="list-style-type: none"> <li>1. To describe the structure, bonding and ligand heptacity in inorganic complexes. To study the basic concept of catalysis in organometallic chemistry including metal Carbonyls.</li> <li>2. To describe the preparation, structure, heptacity, catalysis and spectral analysis of different metal carbonyls.</li> <li>3. To describes the substitution and anation reaction mechanism of inorganic complexes. To study the effect of acid and base in substitution reaction kinetics.</li> <li>4. To study the chemistry of non-aqueous solvents, describe the solvent and solution in aqueous medium and its titrations.</li> </ol>
8	Physical chemistry-II	MCY-108	<ol style="list-style-type: none"> <li>1. Explain the concept of phase rule and its applications.</li> <li>2. To describe the basic concept of thermodynamics, free energy, and molal quantities.</li> <li>3. Brief description of fugacity. Explain the law of thermodynamics and its applications.</li> <li>4. To describe Nernst heat theorem, and Distribution law. Brief description of non-equilibrium thermodynamics. Brief description of chemical equilibrium.</li> </ol>
9	Laboratory coursework-II	MCY - 109	<ol style="list-style-type: none"> <li>1. To estimate the alloy and ores via gravimetrically and volumetrically methods.</li> <li>2. To synthesize and characterization of metal complexes. Qualitative and quantitative analysis of soil and water.</li> <li>3. To perform distillation, crystallization, sublimation and chromatography of organic solvents, solute and mixtures respectively. To prepare of organic molecules through one pot synthesis and its applications.</li> <li>4. To determine the colligative, calorimetric, colorometric, adsorption, volumetric and adsorption properties, kinetics molecular weight and pH of various types of solutions and reactions.</li> </ol>
10	Instrumental Methods of Analysis	MCY-201	<ol style="list-style-type: none"> <li>1. Explain the principle, instrumentation and identification of elements present in a given sample by Atomic Absorption Spectroscopy.</li> <li>2. Explain the principle, working, instrumentation</li> </ol>

			and application of thermogravimetric analysis (TGA), Differential thermal Analysis (DTA) and Differential scanning calorimetry (DSC). 3. Explain the principle, instrumentation, working, and applications of Gas Chromatography (GC) technique for separation and identification of organic compounds. 4. Explain the principle, instrumentation, working, and applications of High Performance Liquid Chromatography (HPLC) technique for separation and identification of organic compounds
11	Organic Chemistry-III	MCY-202	1. Describes general principles and mechanistic studies of various name reactions. 2. Describe the importance and properties of various catalysts. 3. Describe the method of preparation of examines in condensation of secondary amines aldehydes and ketones. Studies of stereochemistry aspects. 4. Classify the carbohydrates and determine the momomeric units. Explain basic concept of amino acids and classify it.
12	Laboratorycoursework-III	MCY-203	1. To apply previous knowledge for performing experiment scientifically and safety. 2. To perform quantitative separation and determination of pair metal ions by different techniques of volumetric and gravimetric. 3. To estimate distribution coefficient between two immiscible solvents. 4. To perform saponification and conductrometric via different methods.
13	Heterocyclic Chemistry	MCY-204	1. Describe the types of strains, physic-chemical interaction and conformational aspects. Describes general principles and classification preparation of non-aromatic heterocyclic compounds. 2. Describes general principles and classification preparation of five and six membered heterocyclics with one heteroatoms. 3. Describes general principles and synthesis of five and six membered heterocyclics with two heteroatoms.4. Describes general principles, synthesis, reactivity and importance of various heterocyclic compounds with more than two heteroatoms.
14	Lab coursework-IV	MCY-	1. To study the multistep synthesis of organic

		205	compounds. 2. To determine the degree of hydrolysis and equilibrium constant by kinetics and distribution methods. 3.To understand the working mechanism and application of adsorption isotherm. 4.To study the quantitative analysis of salt and solute in various application through pH meters.
15	Chemistry in Biology	MCY 122	1. To understand the role of metal ions in biological systems at a molecular level and understanding the basic chemical principles that promote their reactivity. 2. To study the catalytic reaction of various biological cycles, enzyme kinetics, transport reaction from biological membrane and photosystems. To study the biological systems mechanism, how its work. 3. To study the role of metal and metal complex in enzymes, photosystems, transport mechanism and in medicine. 4. To analyze Molecular, Recognition, Organization, Chirality and Role of Sugar in Biological Recognition
16	Photochemistry	MCY 123	1. To study the principle and application of light reaction in different reaction mechanism. 2. To study the concept of light reaction in different rearrangement reaction. 3.To study the redox reaction. 4.To study the principle and application of light reaction in natural products.
17	Environmental Chemistry	MCY- 131	1. Describes general principles and preparation of buffer solution for acid base chemical reactions. 2. Describes general principles of atmospheric chemistry. 3. Describes general principles of solar chemical reaction for various atmospheric chemical reactions. 4. Describes the formation of soils and its physic-chemical properties such as soil-texture, bulk density, anion exchange capacity and so on. Describes and classify the hazardous materials.
19	Pericyclic Reaction	MCY 133	1. To study the types of pericyclic reactions and their reaction conditions. 2. To learn the concept of frontier orbitals, correlation diagram and woodward – Hoffmann rules for cycloaddition reactions. 3. To study the alkenes and conjugated systems of electrocyclic reactions, photochemical and thermal Electrocyclic reactions. 4. To understand the concept of transfer reaction mechanism of diimide and related compounds, retro ene reactions

20	Medicinal chemistry	MCY-141	<ol style="list-style-type: none"> <li>1. Write structure activity relationship and mechanism of action of various drugs.</li> <li>2. Perform synthesis of various types of drugs.</li> <li>3. Classify anti-cancer agents.</li> <li>4. Explain and relate physic-chemical properties with drug actions. Classify the drugs on the basis of five and six membered heterocyclic rings.</li> </ol>
21	Material Chemistry	MCY 142	<ol style="list-style-type: none"> <li>1. To study the background and origin of materials, classification and their applications.</li> <li>2. To study the preparation, characterization, properties and applications of nanomaterials.</li> <li>3. To study the preparation, characterization, properties, classification and applications of polymer &amp; composites.</li> <li>4. To study the Scope and methods used for materials characterization based on molecular and photometric spectroscopy</li> </ol>
22	Polymer Chemistry	MCY-121	<ol style="list-style-type: none"> <li>1. To gain knowledge about polymer science with respect to Classification of polymers, Structure of polymers, Chemistry of polymerization, molecular weight &amp; polydispersity, glass transition temperature (T<sub>g</sub>) &amp; crystallinity of polymers stereochemistry of polymers.</li> <li>2. To understand the mechanism and kinetics of step-growth and chain-growth polymerization. To understand the advanced techniques of controlled polymerization like living polymerization.</li> <li>3. To understand the properties and behaviour of polymer solutions: Flory-Huggins theory of polymer solutions, nature, size and shape of macromolecules in solution. To gain knowledge about speciality polymers like Liquid crystalline polymers, conducting polymers, electroluminescent polymers, inorganic polymer, nanocomposites of polymers, biomedical polymers.</li> <li>4. To understand the Analytical Techniques used for the characterization of polymer samples viz. differential thermal analysis (DTA), and differential scanning calorimeter (DSC) techniques, thermogravimetric analysis (TGA). To gain knowledge about the experimental determination of the molecular weight and structure of polymers.</li> </ol>

23	Nuclear Chemistry	MCY-143	<ol style="list-style-type: none"><li>1. Write nuclear structure and stability.</li><li>2. Describes general principles of binding energy.</li><li>3. Explain the nuclear reaction. Describes and classify the reactor theory.</li><li>4. Explain the various types of materials, which is use in reactors. Describe the elements of radiation chemistry.</li></ol>
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## M. Tech. (Earthquake Engineering and Seismic Design)

### Course Outcomes

S.no	Subject	Subject Code	Course Outcomes
1	SEISMOLOGY & TECTONICS	MCE-401	1. Understand the earthquake mechanisms, Interpretation of earthquake data. 2. Solve problems relating to origin of earthquakes and response of structures to earthquake vibrations. 3. Assessment the properties of soil effected by seismic wave propagation. 4. Evaluate the seismic susceptibility of the ground. 5. Solve problems relating to hazard analysis. Seismic hazard and risk. 6. Understand of Plate tectonics.
2	GEOTECHNICAL EARTHQUAKEENGINEERING	MCE-402	1. Understand the Seismology and earthquakes. 2. Understand Seismic Hazard Analysis, seismic wave propagation. 3. Evaluate the Dynamic properties of soil properties of soil. 4. Understanding about in-situ for geotechnical investigation. 5. Assessment of Liquefaction Potential of soils. 6. Solve problems relating to the effect of ground shaking on Seismic slope stability. 7. Understand the Remediation of Seismic Hazards
3	STRUCTURAL DYNAMICS	MCE-403	1. To convert structure into SDOF system and find response of free and force vibration (harmonic, periodic and transient). 2. To find natural frequency and mode shapes of MDOF system and carry out modal analysis
4	EARTHQUAKE RESISTANT DESIGNOFSTRUCTURES	MCE-404	1. To explain the basic concepts in seismology and correlate to earthquake engineering. 2. To construct response spectrum of an earthquake and correlate to the construction of design spectra. 3. To formulate analytical model of MDOF systems subjected to earthquake loading for a given time history and analyze using response spectrum methods. 4. To apply the code procedures for seismic analysis, design and detailing of RC building frames. 5. To

			explain and suggest a suitable seismic resistant measure for masonry load bearing structures.
5	RANDOM VIBRATIONS	MCE-461	1. Classify random excitations as stationary or non-stationary. 2. Discuss important properties of random processes. 3. Define and compute power spectral density functions. 4. Compute auto-and cross-correlation functions and relate them to power spectral density functions. 5. Describe the dynamic response of a multi-degree-of-freedom system to a stochastic excitation. 6. Quantify the distributions of peak loads and peak responses from a system subject to stochastic excitation.

## M. Tech. (Structural Engineering)

### Course outcome:

S.no	Subject	Subject Code	Course Outcomes
1	ADVANCED STRUCTURAL ANALYSIS	MCE-301	1. To differentiate between various methods of analysis for multistorey frames. 2. To categorize and choose appropriate structural analysis method. 3. To analyze the structure using software. 4. To prepare algorithm and flowchart for analysis of structure. 5. To formulate and analyze beams on elastic foundation.
2	CONCRETE STRUCTURES	MCE-302	1. Apply principles of RCC to design slabs and walls. 2. Analyze the loads to assess critical bending moments, shear forces and torsion. 3. Understand the behaviour of beam column joint. 4. Design & detailing of reinforcement for RCC building frames & Box frames
3	PRESTRESSED CONCRETE	MCE-303	1. To differentiate between behavior of P.S.C. and R.C.C. members. 2. To visualize the effect of prestressing on stress condition across the cross-section of the member. 3. To analyze the stresses, evaluate the losses of prestress and determine the behavior of determinate and indeterminate prestressed concrete members. 4. To determine the ultimate flexural, shear, and torsional strength of PSC member. 5. To design the PSC members using limit state concept (IS-1343) and apply to various members like beams, poles and pipes
4	ANALYSIS AND DESIGN OF DYNAMIC EFFECTS	MCE-304	1. To provide the fundamental understanding of the structural dynamics and the problem-solving ability for dynamic response. 2. To convert structure into SDOF system and find response of free and force vibration (harmonic, periodic and transient). 3. To find natural frequency and mode shapes of MDOF system and carry out modal analysis. 4. To compute the dynamic parameters of SDOF and MDOF systems using free vibration and forced vibrations. 5. To differentiate and choose appropriate methods of dynamic analysis for structural engineering problems. 6. To construct response spectrum of an earthquake and

			correlate to the construction of design spectra.
5	METAL STRUCTURES	MCE-305	1. To identify the structural behavior of components of steel factory shed and steel building. 2. Learn the various complex connection design. 3. To assess the suitability of light gauge steel sections for structural members and design. 4. To familiar with the design of Tubular structures
6	MAINTENANACE AND REHABILITATION OF STRUCTURES	MCE-351	1. The importance of maintenance and assessment method of distressed structures. 2. the strength and durability properties, their effects due to climate and temperature. 3. recent development in concrete. 4. the techniques for repair protection methods and understand the properties of repair materials. 5. repair, rehabilitation and retrofitting of structures and demolition methods.
7	PRECAST AND COMPOSITE STRUCTURES	MCE-352	1. Ability to know the composite construction, design criteria, material properties, partial shear connection, partial interaction, buckling, shear lag. 2. Ability to understand elastic analysis of composite beams, rigid plastic analysis of simply supported beams, mechanical shear connectors. 3. Ability to learn about transfer of longitudinal shear forces, stocky columns, slender columns, composite beams with service ducts
8	ROCK ENGINEERING	MCE-353	1. Define the characteristics and the mechanical properties (strength and failure criteria) of rock mass, rock matrix and discontinuities. 2. Explain methods for in situ investigation and laboratory testing of rock matrix and discontinuities. 3. Use rock mass classification systems (RMR, Q, GSI). 4. Conduct rock slope stability analyses. 5. Analyse the stress distribution (isotropic, anisotropic) in situ and around an opening in rock (competent rock, jointed rock mass, blocky rock). 6. Propose designs of excavation supports.
9	CONTINUUM MECHANICS	MCE-354	1. Apply the classical theory of Elasticity and plasticity in two- and three-dimensional state of stress. 2. Analyse the behavior of solids under different loads. 3. Evaluate the stress and strain in two- and three-dimensional problems. 4. Formulate equations governing the behavior of two-dimensional solids.
10	RETROFITTING OF	MCE-	1. Develop design concepts for Lateral loads on

	BUILDINGS	356	the buildings and will get the knowledge of ductile detailing. 2. Understand repairs, rehabilitation and retrofitting of structures. 3. Get an idea of repair and retrofitting strategies and techniques. 4. Understand the earthquake resistant masonry features. 5. Develop design concepts for Lateral loads on the buildings and also will get the knowledge of ductile detailing.
11	HYDRAULIC STRUCTURES	MCE-357	1. Understanding of the design of canal and its maintenance. 2.To know the types of canals, distributaries, canal headworks, cross-drainage and canal regulator works. 3. Understanding the various methods of analysis of canal. 4. Application of the canal, dam and distributaries in civil engineering structures.
12	MACHINE FOUNDATIONS	MCE-358	This course aims to make the student well versed with theoretical, analysis/ design and practical aspects, including field measurements, of block and frame type of machine foundations.
13	FINITE ELEMENT METHOD	MCE-359	1. To describe the finite element method, identify different types of finite elements and apply to structural analysis. 2. To formulate variational methods for analysis of various types of structures. 3. To choose appropriate isoparametric elements and solve structural problems. 4. To estimate errors in a finite element analysis to arrive at convergence of the solution. 5. To create appropriate finite element models in accordance with physics of the problems. The students would be able to analyze structural engineering problems either with the help of commercial software's or self-developed computer programs in suitable computer language.
14	NONLINEAR ANALYSIS OF STRUCTURES	MCE-361	1. Use numerical technique to solve nonlinear system of equilibrium equations. 2. Develop geometric stiffness matrix for plane frame structures. 3. Analyze structures considering geometric as well a material non-linearity. 4. Able to recognize the principal peculiarities of nonlinearity and similarities or difference with linear analysis. 5. Understand and explain basic principles and numerical procedures of nonlinear structural analysis and dynamics, its capabilities

			and limitations. 6. Conduct nonlinear static and dynamic analyses of complete structures. 7. Choose appropriate constitutive laws, element formulations and solution methods for structures undergoing inelastic deformations.
15	EARTH & ROCK FILL DAM	MCE-362	1. Analyze the given site for the construction of the earth dam. 2. Analyze the local material and design the earth dam by using the same. 3. Understand about the dam instrumentation for distress. 4. Understand the dam distresses and its remedial measures
16	PROJECT PLANNING AND CONTROL	MCE-363	1. Understand project characteristics and various stages of a project. 2. Understand the conceptual clarity about project organization and feasibility analyses – Market, Technical, Financial and Economic. 3. Analyse the learning and understand techniques for Project planning, scheduling and Execution Control. 4. Apply the risk management plan and analyse the role of stakeholders. 5. Understand the contract management, Project Procurement, Service level Agreements and productivity. 6. Understand the How Subcontract Administration and Control are practiced in the industry.
17	SOIL STRUCTURE INTERACTION	MCE-364	1. Designing structures under seismic conditions considering effect of SSI. 2. Modelling under static and dynamic SSI. 3. Ground response analysis for different soil conditions. 4. Exposure to various different codes of practices. 5. Finite element approach in solving in SSI problems
18	DESIGN OF PLATES AND SHELLS	MCE-366	1. To classify various types of plates and shells. 2. To apply various methods for the analysis of plates and shells. 3. To choose a method for the analysis. 4. To compare the results of analysis by various methods. 5. To examine the structural behavior of plates and shells.
19	INDUSTRIAL STRUCTURES	MCE-367	1. To interpret and apply the provisions of relevant IS-code for design of various RCC structure. 2. To identify structural behavior and compute the stresses developed in various components of RCC structures due to different loading. 3. To design various large span roof structures, Suspension roof structures. 4. To give complete detailing of the designed RCC structure
20	BRIDGE ENGINEERING	MCE-368	1. To enlist, classify and recommend the structural forms used for bridges. 2. To select

			different standard loads for road/railway bridges conforming to IRC, MOST, Railway Ministry codes as per current practice. 3. To analyze the bridge spans for train of moving loads. 4. To design road bridges using different forms and materials and prepare detailed drawings of the same. 5. To design railway bridges using different forms and materials and prepare detailed drawings of the same.
21	GROUND IMPROVEMENT TECHNIQUES	MCE-369	Depending on the site conditions, students will be able to identify suitable ground improvement technique for specific project and its implications.

## M. Tech. (Hill Area Development Engineering)

### Course outcome:

S.no	Subject	Subject Code	Course Outcomes
1	ADVANCES IN CIVIL ENGINEERING	MCE-000	<ol style="list-style-type: none"><li>1. Know different methods for calculating the stress strain.</li><li>2. Able to apply hook's law.</li><li>3. Able to draw the Mohr's circle for calculating the stress and strain in different direction.</li><li>4. Understand how to calculate the reactions, bending moment and shear force, and also able to draw the bending moment and shear force diagram for different type of structures The students may learn to design a water or wastewater treatment component.</li><li>5. The students can learn how to characterize source water, for physical and chemical treatment of drinking water.</li><li>6. The students can learn how to characterize wastewater, physical, chemical and microbiological treatment of wastewater.</li><li>7. The students will learn the water demand, sources of water and intake structures.</li><li>8. To identify the different types of flow in Open Channel.</li><li>9. To understand the concept of Hydraulic Jump.</li><li>10. To classify the various types of flow profile Able to understand how to control project schedule, cost, quality and risk.</li><li>11. Develop the ability to analyse the risk and feasibility of real estate projects throughout their lifecycle.</li><li>12. Students will be able to know the different types of equipment to be used in the construction projects.</li></ol>
2	ECOLOGY AND ECO-DEVELOPMENT	MCE-101	<ol style="list-style-type: none"><li>1. Define and describe the concept of ecosystem and their types.</li><li>2. Explain the ecological processes and their interaction with the environment.</li><li>3. Explain flow of energy in ecosystem, Development and evolution of ecosystems.</li><li>4. Adopting sustainability as a practice in life, society and industry.</li></ol>
3	WATER RESOURCES DEVELOPMENT	MCE-102	<ol style="list-style-type: none"><li>1. Various components of hydrologic cycle that affect the movement of water in the earth.</li><li>2. Various Stream flow measurements technique.</li><li>3. The concepts of movement of ground water beneath the earth.</li><li>4. The basic requirements of irrigation and various irrigation techniques, requirements of the crops.</li><li>5. Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design.</li></ol>

			6. Basic components of river Training works. 7. Apply math, science, and technology in the field of water resource Engineering.
4	HILL TRANSPORTATION	MCE-103	1. Types of pavements and their components. 2. Materials used for highway construction. 3. Various methods of design of flexible and rigid pavement including IRC method. 4. Construction and maintenance of different types of pavements. 5. Different types of curves provided in hilly roads. 6. Different types of traffic control system.
5	LAND RESOURCES DEVELOPMENT	MCE-104	1. This course helps to know about the fixing land and soil degradation that has been happening. 2. Students will understand how the environment influences plant growth and crop yields, and ways to modify the environment to improve plant growth and yields. 3. Students will understand how to propagate, plant, and sustainably grow, manage and harvest fruit, vegetable, grain and/or forage crops within various environmental, marketing and financial conditions. 4. Students will be able to identify soil types and how they are formed and ways to modify soil structure and drainage to reduce erosion and improve water quality and water availability to plants. 5. Students will understand how soil fertility is determined and how plant nutrient deficiencies are identified, and means of improving soil fertility and adding nutrients for plant growth. 6. Students will be able to recognize how soil type and topography affects recommended agricultural, commercial and residential use and water quality at varying locations. 7. Students will understand how to identify and sustainably manage plant diseases in various production systems. 8. Students will understand how to identify and sustainably manage insects in various plant production systems.
6	HILL HABITAT, WATER SUPPLY AND SANITATION	MCE-105	1. Student should be able to make technology choice to deal with water quality issues, operate and maintain working treatment systems and do troubleshooting of the problems in these systems. 2. The student will be able to apply the knowledge gained from the subject in EIA studies for water component and water pollution control strategies.
7	ENVIRONMENTAL QUALITY MANAGEMENT	MCE-151	1. Provide definitions of environment, management, systems and organisations in relation to environmental management. 2. Describe organisations as systems and their role in environmental management. 3. The students can understand the usefulness of systems thinking in relation to

			environmental management in organisations. 4. Explain how environmental management can be used as environmental protection and how organisations can define and manage risk.
8	EARTH AND ENVIRONMENT	MCE-152	1. Describe the scientific method as applied in the earth sciences; and 2. Describe common earth materials and their relationship to natural hazards; and 3. explain how Earth and Solar System processes create hazards to life and property; and 4. describe and explain the most common methods used to mitigate and prepare for each type of hazardous natural process; and 5. explain the causes and effects of global climate change.
9	PRINCIPLES OF REMOTE SENSING	MCE-153	1. Apply different type of remote sensing systems for various applications. 2. Operational skills necessary to acquire remote sensing data and learn to extract information from them. 3. Develop skill set to deal with different types and forms of satellite data.
10	APPLIED GEOLOGY	MCE-154	1. The students will have depended knowledge in issues related to the processes of rock formation and differentiation in specific environments, 2. The students knows the influence of these processes on the formation of the Earth, and the formation of mineral, fluid and gaseous resources. 3. The students can analyze the results of analyses with regard to prospecting for resources, geomaterial and mineral resources application in science and industry, 4. The students can achieve the expected goals in a most simple and most effective way, using a wide range of geological research works,
11	ENVIRONMENTAL IMPACT ASSESSMENT & MANAGEMENT	MCE-156	1. Explain the concepts about the Environmental Impact Assessment (EIA). 2. Express environment law, aim and concept. 3. Explain the necessity of EIA. 4. Evaluate the subjects which must be considered in EIA projects. 5. Know important plant or animal groups. 6. Identify these species or have these species identified.
12	SYSTEM ANALYSIS AND MANAGEMENT	MCE-157	1. Complete projects that require the integration of project management principles through team work, meeting scheduled milestones, utilization of presentation, writing and communications skills. 2. Analyse real project cases; develop complete project documents i.e., plans, reports, financials etc. 3. Summarize and evaluate project and people performance while exploiting project management concepts. 4. Develop

			hands-on experience with basic word processing; spread sheet and power point tools in addition to Microsoft Project.
13	SOLID WASTE MANAGEMENT	MCE-158	1.Evaluate the subject from the technical, legal and economical points by learning of all terms related to general solid waste management. 2.Explain the hierarchical structure in solid waste management and a requirement for an integrated solution. 3. Examine the technical points that are required to set up a solid waste management system. 4. Apply the legal legislation related to solid waste management. 5.Make an economical analysis of the solid waste management system. 6. set up a municipal solid waste management system. 7. make physical and chemical analysis of municipal solid wastes and apply them for a management system that will be set up.
14	GROUND WATER MANAGEMENT	MCE-159	1. To learn basic fundamentals of groundwater flow. 2. To learn the hydraulics of different kinds of wells. 3. Conjunctive use of ground water along with other fresh water sources.
15	NON-CONVENTIONAL SOURCES OF ENERGY	MCE-162	1. Demonstrate the generation of electricity from various non-Conventional sources of energy, have a working knowledge on types of fuel cells. 2. Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation. 3. Explore the concepts involved in wind energy conversion system by studying its components, types and performance. 4.Illustrate Ocean energy and explain the operational methods of their utilization.5.Acquire the knowledge on Geothermal energy.
16	EARTHQUAKE RESISTANT DESIGN OF BUILDINGS	MCE-163	1. Describe seismicity of the world and the role of plate tectonics Accurately interpret response spectra presented in the different formats including the Acceleration-Displacement Response Spectrum (ADRS) diagram for quantifying potential seismic hazards on infrastructure. 2. Accurately interpret performance limit states Predict damage to un-reinforced masonry buildings and identify the vulnerable features. 3. Assess existing building structures and provide plans for their effective retrofitting. 4. Assess seismic performance of vulnerable buildings and components in regions of low and moderate seismicity taking into account the effects of soil resonance and identify effective means of retrofitting.5. Assess seismic performance

			of non-structural components and building contents and identify effective measures to mitigate potential damage.
17	GEO-TECHNIQUE OF HILL AREA	MCE-164	1.The course will provide an understanding of the conceptual and dynamic aspects of landform development. 2.Students will also learn the relevance of applied aspects of Geomorphology in various fields. 3.Students should be able to understand the mean global atmospheric circulations and disturbances, world climate systems, climatic variability and change. 4. Students will become sensitized to concept and classification of resources, use or misuse and will learn conservation methods and techniques.
18	WATER POLLUTION	MCE-166	1.Describe the chemical compositions of natural waters, and explain how and why these compositions vary. 2. Describe the main sources of water pollution, the main types of pollutant and how. each type may be controlled. 3.Outline the extent of water pollution in the UK and in selected global locations. 4.Identify the criteria for drinking water acceptability in the EU, and outline the processes used to treat water for a public water supply. 3.Outline how sewage may be treated before discharge to the environment.
19	GEOGRAPHIC INFORMATION SYSTEMS	MCE-167	1.Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to. 2.Effectively communicate and present project results in oral, written, and graphic forms. 3.Demonstrate confidence in undertaking new (unfamiliar) analysis using GIS, troubleshoot problems in GIS, and seek help from software/website help menus and the GIS community to solve problems. 4.Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis. 5.Gather and process original data using a Global Positioning System (GPS)
20	WATER RETAINING STRUCTURES	MCE-168	1.Apply the concepts of structure design to special structural elements like curved beams, domes, water retaining structures, along with relevant IS code requirements. 2.Design and draw working structural drawings of stair case , foundation , domes and water retaining structures.
21	DISASTER MANAGEMENT	MCE-169	1.Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle. 2. The complete disaster management cycle includes the shaping of public policies and plans that either modify the

			causes of disasters or mitigate their effects on people, property, and infrastructure. 3. Capacity to obtain, analyse, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.
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## M. Tech. (Environmental Engineering)

### Course outcome

S.no	Subject	Subject Code	Course Outcomes
1	Environmental Chemistry and Microbiology	MCE-201	<ol style="list-style-type: none"><li>1. Synthesize and apply concepts from multiple sub-disciplines in environmental chemistry and toxicology.</li><li>2. Use technical and analytical skills to quantify the level and effects of xenobiotics in environmental compartments (air, water, soil, biota).</li><li>3. Identify relationships between chemical exposure and effects on physiological systems and design strategies for study of dose-response relationships.</li><li>4. Effectively understand and convey scientific material from peer-reviewed sources.</li><li>5. Conduct an individual research project within the university of other appropriate setting.</li></ol>
2	Water Treatment and Distribution	MCE-202	<ol style="list-style-type: none"><li>1. The students will understand to select or construct appropriate treatment schemes to remove certain pollutants</li></ol>

			<p>present in water or wastewater.</p> <ol style="list-style-type: none"><li>2. The students may learn to design a water or wastewater treatment component.</li><li>3. The students can understand the balance chemical reactions and use balanced reactions to determine the distribution of species at equilibrium.</li><li>4. Develop a mass balance expression for contaminants under different case scenarios and design a simple system to meet desired needs.</li><li>5. The students can learn how to characterize source water, for physical and chemical treatment of drinking water.</li><li>6. The students can learn how to characterize wastewater, physical, chemical and microbiological treatment of wastewater.</li><li>7. The students can understand selected contemporary global water and wastewater</li></ol>
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			<p>issues such as water shortage, wastewater reuse and emerging contaminants.</p> <p>8. The students will learn the water demand, sources of water and intake structures.</p> <p>9. The students can understand the transmission of water.</p>
3	Wastewater Treatment	MCE-203	<ol style="list-style-type: none"> <li>1. Knowledge of design and operational concepts of different wastewater treatment units.</li> <li>2. An outlook on treatment and disposal of sludge from wastewater treatment units. By product recovery.</li> <li>3. The students can learn how to characterize wastewater, physical, chemical and microbiological treatment of wastewater.</li> <li>4. The students can understand selected contemporary global water and wastewater issues such as water shortage, wastewater reuse and emerging contaminants.</li> </ol>
4	AIR AND NOISE POLLUTION	MCE-204	<ol style="list-style-type: none"> <li>1. Identify the sources</li> </ol>

	AND CONTROL		<p>of air and noise pollution.</p> <ol style="list-style-type: none"> <li>2. Monitor the ambient air quality</li> <li>3. Understand the concepts involved in control technologies</li> </ol>
5	Environmental Sanitation and Ecology	MCE-256	<ol style="list-style-type: none"> <li>1. gain the environment conscious and the culture human health.</li> <li>2. have some information about the tasks of environmental health.</li> <li>3. evaluate the relations among environment, human, and health.</li> <li>4. Define the concepts related to environmental issues.</li> </ol> <p>define effects reasons of environmetal health and the precautions which should be taken</p>
6	Rural Environmental Technology	MCE-259	<ol style="list-style-type: none"> <li>1. Students will understand how to propagate, plant, and sustainably grow, manage and harvest fruit, vegetable, grain and/or forage crops within various environmental, marketing and financial conditions.</li> <li>2. Students will be able to identify soil types and how they are formed and ways to modify soil structure and drainage to reduce erosion and improve water quality and water availability to plants.</li> </ol>

			<ol style="list-style-type: none"> <li>3. Students will understand how soil fertility is determined and how plant nutrient deficiencies are identified, and means of improving soil fertility and adding nutrients for plant growth.</li> <li>4. Students will be able to recognize how soil type and topography affects recommended agricultural, commercial and residential use and water quality at varying locations.</li> <li>5. Students will understand how to identify and sustainably manage plant diseases in various production systems.</li> <li>6. Students will understand how to identify and sustainably manage insects in various plant production systems.</li> <li>7. Students will understand how to identify weeds and sustainably manage them in various plant production systems.</li> </ol>
7	GroundWaterManagement	MCE-261	<ol style="list-style-type: none"> <li>1. To learn basic fundamentals of groundwater flow.</li> <li>2. To learn the hydraulics of different kinds of wells.</li> <li>3. Conjunctive use of ground water along</li> </ol>

			with other fresh water sources
8	BuildingEnvironmentalandServices	MCE-262	<ol style="list-style-type: none"> <li>1. Know state of the art concepts and strategies for lowering environmental impact of buildings and neighbourhoods</li> <li>2. Know the background and understand the reasons for a more sustainable development of the built environment</li> <li>3. Know relevant architectural concepts and projects that have been developed in the last years as response to present environmental challenges</li> <li>4. Know alternative green building concepts, recognizing their qualities and limits in lowering environmental impact</li> <li>5. Understand the architectural potential of climate and principles behind climate adaptive design</li> <li>6. Recognize materials not only for their aesthetic qualities but also in relation to their potential for environmental performance and impact on the environment</li> <li>7. Understand a building life cycle and the environmental</li> </ol>

			<p>challenges related to materials' decay and required maintenance</p> <p>8. Know alternative energy systems that could be applied in different building typologies</p>
9	HazardousWasteManagement	MCE-267	<ol style="list-style-type: none"> <li>1. Define the principles of hazardous waste management.</li> <li>2. Examine the technical points that are required to set up a hazardous waste management system.</li> <li>3. Apply the legal legislation related to hazardous waste management.</li> <li>4. Make an economical analysis of the hazardous waste management system.</li> <li>5. Design a hazardous waste recycling facility.</li> <li>6. Collect required data with regard to type of hazardous waste that will be recycled.</li> <li>7. Design the recycle process for a specific hazardous waste type.</li> </ol>
10	IndustrialWasteWaterTreatment	MCE-268	<ol style="list-style-type: none"> <li>1. compare the methods used in wastewater treatment and waste containing heavy metals such as metal plating and refinery.</li> <li>2. have information about treatment methods, pharmaceutical</li> </ol>

			<p>industry and the chemical (phenol) facilities which produces of wastewater properties of, operational problems.</p> <ol style="list-style-type: none"><li>3. make the selection process for high organic load of waste water treatment needed.</li><li>4. recognize the properties of the basic industries and the environmental impact of waste generated is able to compare.</li><li>5. define the characteristics of industrial wastewater.</li><li>6. establish a relationship between the properties of industrial wastewater.</li><li>7. explain the principles of industrial wastewater refining.</li></ol>
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## MSc. In Physics

### Course outcome:

S.no	Subject	Subject Code	Course Outcomes
1.	Mathematical Physics and Classical Mechanics	MPM-101	<ol style="list-style-type: none"><li>1. The students will understand various functions, solutions to differential equations and matrix applications to solve the related problems.</li><li>2. The foundation for understanding of different series, complex analysis and their applications will be laid.</li><li>3. Foundation for the applications of transformation techniques will be laid.</li><li>4. The students will understand dynamics of particles and conservation laws.</li><li>5. The understanding of different mechanical problems and their solutions will be developed</li></ol>
2.	Condensed Matter Physics	MPM-102	<ol style="list-style-type: none"><li>1: To disseminate fundamental knowledge about structures of materials used in manufacturing devices for various applications.</li><li>2: To make them learn about thermal, optical, semiconducting, ferro-magnetic, ferro-electric and superconducting properties of materials which have novel applications in diverse areas of science &amp; engineering.</li><li>3: To enable students to carry out experiments so that they can perform the task of characterizing materials, and correlated their</li></ol>

			<p>properties with structures.</p> <p>4: Enabling students to gain applied knowledge so that they can solve real problems in research institutions and industries.</p>
3.	Quantum Mechanics	MPM-103	<ol style="list-style-type: none"> <li>1. The students will develop the foundation for understanding of Quantum Mechanics.</li> <li>2. The student will understand the concepts of quantum mechanics and solving operator equations for different quantum problems.</li> <li>3. The students will understand wave mechanical formulation of quantum particles and various rules arising out of it.</li> <li>4. The understanding of different formulations of quantum mechanics laying foundations for the study of identical particles and their properties.</li> </ol>
4.	Semiconductor Devices and Integrated Circuit	MPM-104	<ol style="list-style-type: none"> <li>1. The students will get in-depth understanding of the electronic structure, charge carrier statistics and charge transport properties in semiconductors.</li> <li>2. Develop understanding of principles of operation of new and future electronic and photonic devices based on semiconductors.</li> <li>3. Infer the op-amp characteristics and parameters in different configuration and its application in practical circuits.</li> <li>4. Apply the information of number system in solving K-maps and digital circuits: both combinational and sequential circuits and relate their application in designing and simplifying new digital circuits.</li> <li>5. Understand the working of different devices like encoder, de-coder, multiplexer, flipflops, register, counter etc.</li> </ol>
5.	Electronic Devices and Circuit Lab	MPM-105	<ol style="list-style-type: none"> <li>1. The students will obtain and analyse the V-I characteristics of zener diode and different LEDs.</li> <li>2. Implement the experiment to study the frequency response of common source FET and MOSFET amplifiers</li> <li>3. Design and analyze circuits to study operational amplifier's frequency response and use op-amp to perform different mathematical operations.</li> </ol>

			<p>4. Demonstrate the IC 555 in astable and monostable modes.</p> <p>5. Verify the truth table for Logic gates and flip flops and also verify A/D and D/A conversion.</p>
6.	Atomic, Molecular Physics and Lasers	MPM-106	<p>1. The students will understand various mechanism of atomic transitions in view of electromagnetic radiations.</p> <p>2. Understanding of vector atom model for the successful explanation of the electromagnetic spectrum produced by different atoms.</p> <p>3. Explanation of the effect of magnetic and electric fields on the spectral lines of atoms.</p> <p>4. Understanding of various electromagnetic transitions in molecules and their applications.</p> <p>5. Basic understanding of Raman Spectroscopy and its applications.</p> <p>6. Different LASER and their applications in industries and research and developments</p>
7.	Electrodynamics	MPM-107	<p>1. The students will understand the nature of electric and magnetic fields and electromagnetic waves.</p> <p>2. Basic understanding of electric and magnetic fields and its applications.</p> <p>3. The students will understand various physics of electromagnetic waves.</p> <p>4. The students will be able to apply the concepts of electromagnetics' physics for the successful explanation of the electromagnetic wave and its characteristics.</p>
8.	Spectroscopy and Laser Lab	MPM-108	<p>1. The students will realize the practical demonstration of electromagnetic radiations due to the atomic and molecular transitions.</p> <p>2. Practical applications of photoelectric effect and LASER.</p> <p>3. Practical demonstration of the effect of magnetic fields on the spectral lines of atoms.</p> <p>4. Measurement of various electromagnetic transitions in due to different samples.</p> <p>5. Measurement of ionization potential and dissociation energy of different samples.</p>
9.	Thermodynamics and	MPM-	1: To disseminate fundamental concepts of

	Statistical Mechanics	201	<p>statistical physics, and thermodynamics.</p> <p>2: To enable students to solve complex science and engineering problems using different ensembles, free energies and statistical distributions.</p> <p>3: To make them learn and acquire knowledge about different phases of specific materials and their dependence on various parameters relevant for industry applications.</p> <p>4: To make students learn about microscopic distributions laws which yield macroscopic results independent of the microscopic detail.</p> <p>5: To help students to acquire knowledge and skill so that they can apply statistical analysis in different walks of life.</p>
10.	Optoelectronics and Optical Communication System	MPM-202	<p>1. The students will develop fundamental physical and technical base of optical processes in semiconductors and an understanding of basic laws and phenomena that define behaviour of optoelectronic systems.</p> <p>2. Analyse the working and characteristics of semiconductor laser, LEDs, photodetectors and phototransistors.</p> <p>3. Demonstrate an understanding of optical fiber communication link, structure, propagation and transmission properties of an optical fiber.</p> <p>4. Learn about different fiber components and will get practical knowledge about the fiber connectors, joint losses and the digital and analog communication system in totality.</p> <p>5. Develop a keen interest in the era of research in optoelectronic devices.</p>
11.	Nuclear and Particle Physics	MPM: 203	<p>1. The students will learn nuclear structure its energy and conservation laws.</p> <p>2. Understanding of nuclear fission and fusion and their applications in nuclear reactors.</p> <p>3. Elementary particles and their characteristics.</p> <p>4. Knowledge of conservation laws of elementary particles and the Effect of Electro-Magnetic field on elementary particles.</p> <p>5. Be prepared for research in areas related to nuclear and particle physics.</p>

12.	Optoelectronics and Optical Communication Lab	MPM-204	<ol style="list-style-type: none"> <li>1. The students will verify and study the characteristics of various optoelectronic devices like LDR and phototransistor.</li> <li>2. Design circuits to study the characteristics of photodiode and opto-coupler.</li> <li>3. Learn the method of measurement of the numerical aperture of single mode and multimode fiber.</li> <li>4. Measure the bending loss and splice loss in multimode fiber.</li> <li>5. Calculate the normalized frequency and mode field diameter of single mode fiber.</li> </ol>
13.	Microprocessor and Application	MPM-205:	<ol style="list-style-type: none"> <li>1. The students will identify the internal organization of popular 8085/8086/8051 microprocessors/microcontrollers.</li> <li>2. Analyze hardware and software interaction and integration.</li> <li>3. Impart the knowledge about the instruction set &amp; peripheral interfacing.</li> <li>4. Understand the basic idea about the data transfer schemes and its applications</li> <li>5. Develop skill in simple program writing for 8085 &amp; 8086 and applications in various electronic devices.</li> </ol>
14.	Microprocessor and Microcontroller Lab	MPM-206	<ol style="list-style-type: none"> <li>1. The students will be able to write and execute a program to add and subtract two hexadecimal and decimal numbers.</li> <li>2. Write and execute a program to add and subtract two BCD numbers using 8085 microprocessor.</li> <li>3. Write a program to perform multiplication and division of two 8 bit numbers using different methods.</li> <li>4. Find largest and smallest number from an array.</li> <li>5. Application of 8085 microprocessor in performing various operations.</li> </ol>
15.	Computational Technique & Programming	MPM-121	<ol style="list-style-type: none"> <li>1: To disseminate fundamental knowledge about computational techniques &amp; tools.</li> <li>2: To enable students to solve complex science and engineering problems using different numerical methods.</li> <li>3: To make them learn and acquire programming knowledge and skills in C++ and Fortran-77 &amp; 90.</li> </ol>

			<p>4: To enable students to work out theoretical models to solve real problems e.g. population control, traffic control and molecular modeling etc. which may also help them in finding research positions in academic institutions and industries.</p> <p>5: To make students learn computational tools &amp; techniques to perform computational experiments and match with real experimental data.</p>
16.	Physics of Materials	MPM-122	<p>1. The students will understand the Physics of Liquid crystals and Ionic Liquids and their applications in solid devices.</p> <p>2. The foundation for understanding of different properties of polymers and their applications will be laid.</p> <p>3. The student will be able to analyse the properties of super ionic solids for their applications.</p> <p>4. Foundation for the synthesis and characterisation of nanomaterials and their applications will be laid.</p>
17.	Methods of Theoretical Physics	MPM-123	<p>1. The students will understand Vector, Tensor and Matrix operations to solve the related problems.</p> <p>2. The foundation for understanding of different series, complex analysis and their applications will be laid.</p> <p>3. The student will be able to use various functions to solve the related problems.</p> <p>4. Foundation for the applications of different differential equations and transformation techniques will be laid.</p>
18.	Mobile Communication	MPM-124	<p>1. The students will be able to understand the concept of mobile computing paradigm, its novel applications and limitations.</p> <p>2. To understand the database issues in mobile environments &amp; data delivery models.</p> <p>3. Able to debate on any new technical issue related to this new paradigm and come up with a solution(s).</p> <p>4. Develop new ad hoc network applications and/or algorithms/protocols.</p> <p>5. Get detailed information about various important systems like electronic navigation &amp;</p>

			surveillance systems, blue tooth, GPS and Global Mobile Satellite Systems.
19.	Analog and Digital Communication	MPM-131	<ol style="list-style-type: none"> <li>1. The students will be able to classify the signals and systems and understand their frequency-domain and geometrical representation.</li> <li>2. Understand the concept of autocorrelation function, energy and power spectral density.</li> <li>3. Impart the detailed information about the different types of noise in the communication system and noise remedies.</li> <li>4. Learn the methods and need of digital multiplexing.</li> <li>5. Demonstrate various experiments of analog and digital modulation techniques and perform their waveform analysis.</li> </ol>
20.	Instrumentation Technology	MPM-132	<ol style="list-style-type: none"> <li>1. The students will be able to understand the fundamentals of spectroscopic and associated technologies and its application to understand the molecular properties.</li> <li>2. In-depth understanding of molecular configurations and their characteristics and applications.</li> <li>3. The students will learn the fundamentals of structural and surface characterization techniques to solve physical properties problems.</li> <li>4. The students will be able to analyse the experimental research data for electrical circuit performance</li> </ol>
21.	Solar and Astrophysics	MPM-133	<ol style="list-style-type: none"> <li>1: Students will get acquainted with fundamental concepts of formation of solar system, galaxies and the universe as a whole</li> <li>2: Students will gain knowledge about the astrophysical processes inside the Sun and its surface, Sun flare, solar wind and solar neutrinos etc., which are useful for protecting our satellite systems.</li> <li>3: Information about large scale structures, their formation, collisions etc. and the subsequent release of high energy radiations, and cosmic rays are useful for protecting our satellite systems.</li> <li>4: To help students to acquire knowledge about evolution of life on earth, and possibly on other planets in remote parts of the Universe</li> </ol>

			5: They may secure positions as Scientists and Engineers in Space Research Organizations and other Space Research Laboratories in India and abroad
22.	Satellite Communication and Remote Sensing	MPM-134	<p>1: Students will learn principles involved in satellite communications.</p> <p>2: Students will gain knowledge about the interaction of electromagnetic waves with atmospheric gases.</p> <p>3: They will learn about different types of satellites and their designing process.</p> <p>4: To help students to acquire knowledge about remote sensing and the various ways for the same.</p> <p>5: Students may secure positions as Scientists and Engineers in Space Research Organizations and other Space Research Laboratories in India and abroad</p>
23.	Advance Quantum Mechanics	MPM-221	<p>1. The students will learn the advanced concepts of quantum mechanics and its application to understand the molecular structure.</p> <p>2. Understanding of molecular electronic configurations and their characteristics and applications.</p> <p>3. The students will learn the approximate methods for solving many body problems.</p> <p>4. Be prepared for research in molecular, atomic and particle physics</p>
24.	Quantum Field Theory	MPM-222	<p>1. The students will learn the advanced concepts of quantum mechanics and its application to relativistic quantum field theory.</p> <p>2. Understanding of molecular structures and their characteristics and applications.</p> <p>3. The students will learn the atomic electronic configurations for solving energy states problems.</p> <p>4. Be prepared for research in molecular, atomic and particle physics</p>
25.	Fiber Optics and Nonlinear Optics	MPM-223	<p>1. The students will be able to understand the terms, basic theory and principle involved in designing different types of optical fiber and their application.</p> <p>2. Know the transmission method and</p>

			<p>characteristics of optical fibers.</p> <p>3. Impart the detailed information about the different types of losses in optical fiber and their remedies.</p> <p>4. Understand non-linear optical susceptibility and find its expression for classical anharmonic oscillator.</p> <p>5. Demonstrate various concepts involved in spontaneous light scattering and acoustooptics</p>
26.	Wireless Communication	MPM-224	<p>The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course</p> <p>1. The students will be able to understand the Wireless communication systems and standards.</p> <p>2. Able to understand the infrastructure to develop mobile communication system.</p> <p>3. Able to understand the characteristics of different multiple access techniques in mobile/wireless communication.</p> <p>4. Able to understand the need of coding, channel models, diversity, equalization and channel estimation techniques. Able to apply analytical and empirical models in the design of wireless links.</p>

## (M.Sc.) IN MATHEMATICS

### Course Outcomes

S.no.	Subject	Subject Code	Course Outcomes
1	Mathematical Analysis	MMS-101	<p>The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course</p> <ol style="list-style-type: none"><li>1. Describe the fundamental properties of the real numbers that underpin the formal development of real analysis.</li><li>2. Analyse the uniform and pointwise convergence of a sequence and series of functions and concept of region of convergence</li><li>3. Use theory of Riemann-Stieltjes integral in solving definite integrals arising in different fields of science and engineering</li><li>4. Deal with axiomatic structure of metric spaces and generalize the concepts of compactness, connectedness, and completeness in metric spaces.</li><li>5. Extend their knowledge of real variable theory for further exploration of the subject for going into research.</li></ol>
2	Linear Algebra and Matrix Theory	MMS-102	<p>The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course</p> <ol style="list-style-type: none"><li>1. Matrix theory, determinants, and their application to systems of linear equations.</li><li>2. the basic terminology of linear algebra in Euclidean spaces, including linear independence,</li></ol>

			<p>spanning, basis, rank, nullity, subspace, and linear transformation.</p> <p>3. the abstract notions of vector space and inner product space.</p> <p>4. finding eigenvalues and eigenvectors of a matrix or a linear transformation and using them to diagonalize a matrix.</p> <p>5. projections and orthogonality among Euclidean vectors, including the Gram-Schmidt orthonormalization process and orthogonal matrices.</p>
3	Advanced Ordinary Differential Equation	MMS-103	<p>1. Obtain solutions of the Homogeneous equation with constant coefficient and Homogeneous equation with variable coefficient</p> <p>2. Understand differential equations of Sturm Liouville type.</p> <p>3. Understand the concept and applications of eigen value problems</p> <p>4. Analyse Green's function and its applications to boundary value problems</p> <p>5. Establish existence and uniqueness for the solution of <math>y' = f(x,y)</math> when <math>f</math> satisfies the Lipschitz condition</p>
4	Mathematical Programming	MMS-104	<p>1. Apply the notions of linear programming in solving optimizations problems.</p> <p>2. Understand the theory of Duality for solving LPP &amp; QPP.</p> <p>3. Acquire knowledge in formulating quadratic and integer programming problem.</p> <p>4. Use integer and quadratic programming to solve real life problems.</p> <p>5. Know the use of dynamic programming in various applications.</p>
5	Data Analytics	MMS-105	<p>1. Define and apply basic concepts and methods of probability theory.</p> <p>2. To learn various types of probability distribution functions.</p> <p>3. To study the theory of estimation and with likelihood.</p> <p>4. To develop the ability to use of Regression</p>

			analysis in real life problems. 5. To study the hypothesis theory.
6	Complex Analysis Credit 4	MMS-106	<ol style="list-style-type: none"> <li>1. Prove basic results in complex analysis.</li> <li>2. Establish the capacity for mathematical reasoning through analysing, proving, and explaining concepts from complex analysis.</li> <li>3. Solve the problems using complex analysis techniques applied to different situations in engineering and other mathematical contexts.</li> <li>4. Evaluate complex integrals and apply Cauchy integral theorem and formula.</li> <li>5. Extend their knowledge to pursue research in this field.</li> </ol>
7	Topology	MMS-107	<ol style="list-style-type: none"> <li>1. Concepts of topological spaces and the basic definitions of open sets, neighbourhood, interior, exterior, closure and their axioms for defining topological space.</li> <li>2. Understand the concept of Bases and Subbases, create new topological spaces by using subbase.</li> <li>3. Understand continuity, compactness, connectedness, homeomorphism, and topological properties.</li> <li>4. Understand how points of space are separated by open sets, Housdroff spaces and their importance.</li> <li>5. Understand regular and normal spaces and some important theorems in these spaces.</li> </ol>
8	Advanced Algebra	MMS-108	<ol style="list-style-type: none"> <li>1. knowledge and understanding of the concept of Conjugacy class, class equation, Cauchy Theorem and Sylow's theorems.</li> <li>2. knowledge and understanding of symmetric groups, cyclic groups, direct product of groups and their properties</li> <li>3. knowledge and understanding of the concept solvable and nilpotent groups.</li> <li>4. knowledge and understanding of a field extension to various mathematical problems including geometric constructions and perfect division of a circle into n parts</li> <li>5. knowledge and understanding of Galois theory to the question of solvability of the quintic</li> </ol>

<b>9</b>	Game Theory	MMS-121	<ol style="list-style-type: none"> <li>1. Appreciate the concept of game theory and understand the different methods of Strategies.</li> <li>2. Explain the concepts of repeated games, Bayesian games, Selfish routing and Quantifying inefficiency of equilibria.</li> <li>3. Understand the concept of evolutionary game theory, price of stability.</li> <li>4. Explain the concept of N-person game.</li> <li>5. Apprehend the concept of Nash bargaining Mechanism design.</li> </ol>
<b>10</b>	Differential Geometry and Tensor Analysis	MMS-122	<ol style="list-style-type: none"> <li>1. Understand the basic concepts and results related to space curves, tangents, normals and surfaces.</li> <li>2. Explain the geometry of different types of curves and spaces.</li> <li>3. Utilize Geodesics, it's all related terms, properties and theorems.</li> <li>4. Understand the concept of Differential Manifold</li> <li>5. Understand the concept of Contravariant and covariant vectors and tensors.</li> </ol>
<b>11</b>	Integral Equations and Partial Differential Equations Credit 3 (2-1-0)	MMS-123	<ol style="list-style-type: none"> <li>1. Understand the properties of various kinds of integral equations and its solution</li> <li>2. Develop the skills while solving the various problems by using integral equations in all engineering sciences and etc</li> <li>3. Analyse the origin of first order partial differential equations and solving them using Charpit's method.</li> <li>4. Classify second order PDE and solve standard PDE using separation of variable method.</li> <li>5. Understand the formation and solution of some significant PDEs like wave equation, heat equation and diffusion equation.</li> </ol>
<b>12</b>	Discrete Mathematical Structure	MMS-124	<ol style="list-style-type: none"> <li>1. Use logical notation to define different function such as set, function and relation.</li> <li>2. understand how logic relates to computing problems</li> <li>3. Use of induction hypotheses to prove formula</li> <li>4. Explain Boolean logic problems as Truth tables,</li> </ol>

			<p>Logic circuits and Boolean algebra</p> <p>5. Explain the different concepts in automata theory and formal languages.</p>
<b>13</b>	Approximation Theory	MMS-125	<ol style="list-style-type: none"> <li>1. To study that the general functions may be approximated or decomposed into more simple form such as splines or other special functions.</li> <li>2. univariate approximation, linear and non-linear approximations.</li> <li>3. To study some important theorems like Jackson's Theorem, Bernstein Theorems, Zygmund theorem.</li> <li>4. To study the interpolation.</li> <li>5. To understand and use the theory of convergence for continuous functions as well as error estimates for smooth functions.</li> </ol>
<b>14</b>	Mathematical Methods	MMS-131	<ol style="list-style-type: none"> <li>1. Use of Laplace Transform to solve the differential equations.</li> <li>2. Use of Fourier transforms to solve integral equations and differential equations and Fourier series.</li> <li>3. Use of Z transforms to solve the difference equations.</li> <li>4. To study the calculus of variations for one or more several variables.</li> <li>5. To study the basic properties of Hankel Transform and applications.</li> </ol>
<b>15</b>	Measure Theory	MMS-132	<ol style="list-style-type: none"> <li>1. Understand the fundamentals of measure theory and be acquainted with the proofs of the fundamental theorems underlying the theory of integration.</li> <li>2. Understand measure theory and integration from theoretical point of view and apply its tools in different fields of applications.</li> <li>3. Extend their knowledge of Lebesgue theory of integration by selecting and applying its tools for further research in this and other related areas</li> <li>4. Explain the concept of length, area, volume using Lebesgue theory of integration</li> <li>5. Apply the general principles of measure theory and integration in such concrete subjects as the</li> </ol>

			theory of probability or financial mathematics.
<b>16</b>	Principles of Optimization Theory	MMS-133	<ol style="list-style-type: none"> <li>1. Explain the fundamental knowledge of linear programming and dynamic programming problems.</li> <li>2. Use classical optimization techniques and numerical methods of optimization.</li> <li>3. Describe the basics of different evolutionary algorithms.</li> <li>4. Describe the concept of separable and geometric programming.</li> <li>5. Enumerate fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas.</li> </ol>
<b>17</b>	Graph Theory	MMS-134	<ol style="list-style-type: none"> <li>1. Write precise and accurate mathematical definitions of basics concepts in graph theory.</li> <li>2. Understand and apply various proof techniques in proving theorems in graph theory.</li> <li>3. Understand the basic concepts and fundamental results in matching, domination, coloring and planarity.</li> <li>4. Apply the theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory.</li> <li>5. Obtain a solid overview of the questions addressed by graph theory and will be exposed to emerging areas of research.</li> </ol>
<b>18</b>	Computational Fluid Dynamics	MMS-135	<ol style="list-style-type: none"> <li>1. To study the basic properties of fluids and classification of the basic equations of fluid dynamics.</li> <li>2. The development of various fluid flow governing equations from the conservation laws of motion and Fluid mechanics.</li> <li>3. The rigorous and comprehensive treatment of numerical methods in fluid flow and heat transfer problems in engineering applications.</li> <li>4. The student will demonstrate the ability to analyze a flow field to determine various quantities of interest, such as flow rates, heat fluxes, pressure drops, losses, etc.</li> </ol>

			5. The student will demonstrate an ability to describe various flow features in terms of Helmholtz's vorticity equation, Navier-Stokes equations, dissipation of energy etc.
<b>19</b>	Computational Functional Analysis	MMS-201	<ol style="list-style-type: none"> <li>1. Explain the fundamental concepts of functional analysis and their role in modern mathematics.</li> <li>2. Demonstrate the concepts of functional analysis, for example continuous and bounded linear operators, normed spaces, Hilbert spaces and to study the behaviour of different mathematical expressions arising in science and engineering.</li> <li>3. Understand and apply fundamental theorems from the theory of normed and Banach spaces including the Hahn-Banach theorem, the open mapping theorem, the closed graph theorem, and uniform boundedness theorem</li> <li>4. Explain the concept of projection on Hilbert and Banach spaces</li> <li>5. Correlate Functional Analysis to problems arising in partial differential equations, measure theory and other branches of Mathematics.</li> </ol>
<b>20</b>	Theory of Computing	MMS-202	<ol style="list-style-type: none"> <li>1. Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design</li> <li>2. Explain and manipulate the different concepts in automata theory and formal languages such as formal proofs.</li> <li>3. Able to demonstrate (non-)deterministic automata, regular expressions, regular languages, context-free grammars, context-free languages, Turing machines.</li> <li>4. Be able to design FAs, NFAs, Grammars, languages modelling, small compilers basics.</li> <li>5. Be able to design sample automata.</li> </ol>
<b>21</b>	Numerical Methods for Scientific Computations Credit 4 (2-1-2)	MMS-203	<ol style="list-style-type: none"> <li>1. Apply numerical methods to find our solution of algebraic equations using different methods under different conditions, and numerical solution of system of algebraic equations.</li> <li>2. Apply various interpolation methods and finite difference concepts.</li> </ol>

			<p>3. Work out numerical differentiation and integration whenever and wherever routine methods are not applicable.</p> <p>4. Work numerically on the ordinary differential equations using different methods through the theory of finite differences.</p> <p>5. Work numerically on the partial differential equations using different methods through the theory of finite differences.</p>
22	Computing Tools	MMS-204	<p>1. To learn different platform to make presentations and documents</p> <p>2. To learn various software like Mathematica, Maple.</p> <p>3. To learn MATLAB to solve real life problems.</p> <p>4. To learn mathematical tools to solve real life problems.</p> <p>5. Group learning and problem solving.</p>
23	Number Theory and Cryptography	MMS-205	<p>1. Demonstrate the various properties of and relating to the integers including the Well-Ordering Principle, primes, unique factorization, the division algorithm, and greatest common divisors.</p> <p>2. Demonstrate certain number theoretic functions and their properties.</p> <p>3. Demonstrate the concept of a congruence and use various results related to congruences including the Chinese Remainder Theorem.</p> <p>4. Able to solve certain types of Diophantine equations.</p> <p>5. Able to know how number theory is related to and used in cryptography.</p>
24	Design and Analysis of Algorithms	MMS-206	<p>1. Able to Argue the correctness of algorithms using inductive proofs and analyse worst-case running times of algorithms using asymptotic analysis.</p> <p>2. Ability to compare algorithms with respect to time and space complexity</p> <p>3. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.</p> <p>4. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite</p>

			<p>algorithms that employ this paradigm. Synthesize greedy algorithms and analyse them.</p> <p>5. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic programming algorithms and analyse them.</p>
25	Rings and Modules	MMS-221	<ol style="list-style-type: none"> <li>1. The importance of a ring as a fundamental object in algebra.</li> <li>2. The concept of a module as a generalisation of a vector space and an Abelian group.</li> <li>3. Constructions such as direct sum, product, and tensor product.</li> <li>4. Able to demonstrate Simple modules, Schur's lemma, Semisimple modules, Artinian modules, their endomorphisms, Radical, simple and semisimple Artinian rings. Examples.</li> <li>5. Able to demonstrate Noetherian modules, the Artin-Wedderburn theorem, the concept of central simple algebras, the theorems of Wedderburn and Frobenius.</li> </ol>
26	Mathematical Modeling and Computer Simulations	MMS-222	<ol style="list-style-type: none"> <li>1. To learn history and development of mathematical modelling.</li> <li>2. To learn basic parameters to develop a mathematical model of real word situations.</li> <li>3. To learn special types of Mathematical models like Prey-Predator model, Lotka Volterra equations.</li> <li>4. To learn how to analyse the mathematical models.</li> <li>5. To learn basic and advanced concept of simulation.</li> </ol>
27	Mathematical Foundation of Artificial Intelligence	MMS-223	<ol style="list-style-type: none"> <li>1. The basic terminology of linear algebra in Euclidean spaces, including linear independence, spanning, basis, rank, nullity, subspace, linear transformation, Eigen values and diagonalization.</li> <li>2. Able to apply graphs as unifying theme for various combinatorial problems</li> <li>3. Able to perform test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases</li> </ol>

			<p>and non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit</p> <p>4. Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and perform ANOVA and F-test</p> <p>5. Able to solve optimization problems using classical optimization techniques.</p>
28	Mathematical Theory of Coding	MMS-224	<p>1. Knowledge of properties of and algorithms for coding and decoding of linear block codes, cyclic codes, and convolution codes.</p> <p>2. Knowledge of linear recurrent sequences and feedback shift register.</p> <p>3. Knowledge of arithmetic in finite fields, linear algebra over finite fields, and rings of power series.</p> <p>4. able to apply various algorithms and techniques for coding and decoding.</p> <p>5. Able to create computer programs using the concepts, data structures, and algorithms.</p>
29	Stochastic Processes and its Applications	MMS-225	<p>1. Understand the axiomatic formulation of modern Probability Theory.</p> <p>2. Characterize probability models and function of random variables based on single &amp; multiples random variables.</p> <p>3. Evaluate and apply moments &amp; characteristic functions and understand the concept of inequalities and probabilistic limits.</p> <p>4. Understand the concept of random processes and determine covariance and spectral density of stationary random processes.</p> <p>5. Demonstrate the specific applications to Poisson and Gaussian processes.</p>
30	Parallel Computing	MMS-231	<p>1. To develop an understanding of various basic concepts associated with parallel computing environments.</p> <p>2. To understand the effects that issues of synchronization, latency and bandwidth have on the efficiency and effectiveness of parallel computing applications.</p> <p>3. To gain experience in a number of different</p>

			<p>parallel computing paradigms including memory passing, memory sharing, data-parallel and other approaches.</p> <p>4. To earn experience in designing parallel computing solutions to programming problems.</p> <p>5. To understand the concept DPP using parallel computing.</p>
<b>31</b>	Operations Research	MMS-232	<p>1. Analyze real life system with limited constraints and depict it in a model form.</p> <p>2. Convert the problem into a mathematical model.</p> <p>3. Understand variety of problems such as inventory model, CPM, PERTetc.</p> <p>4. Understand different queuing situations and find the optimal solutions using models for different situations.</p> <p>5. Understand game theory problem and their solution.</p>
<b>32</b>	Fuzzy Theory and its Application	MMS-233	<p>1. Analyse a fuzzy based system.</p> <p>2. Being able to develop mathematical concepts, especially in the form of fuzzy.</p> <p>3. Able to formulate a common problem in the form of fuzzy mathematics models and get a settlement.</p> <p>4. Able to apply the frame of mathematics and computational principles to solve the problems of the development of intelligent systems.</p> <p>5. Able to identify problems and develop mathematical models and analyze the relevant fuzzy behavior.</p>
<b>33</b>	Theory of Mechanics	MMS-234	<p>1. To determine the static and dynamic forces for dynamical and statical systems.</p> <p>2. To determine the angular momentum, Euler dynamic and geometrical equations to rigid body</p> <p>3. To study the various properties of moving particles in the space.</p> <p>4. To understand the principles of vibrations</p> <p>5. To study to various principles related to moving particles like Lagrangian approach, Conservation of energy etc.</p>

34	Dynamical System	MMS-235	<ol style="list-style-type: none"> <li>1. To study the Continuous Systems through system of equations.</li> <li>2. To study to the principle of bifurcations.</li> <li>3. To study the discrete and chaos theory.</li> <li>4. To study the stability theory.</li> <li>5. To study how to analyse a real world situations in to mathematical phenomenon.</li> </ol>
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### **B.Tech. (Civil Engineering)**

#### **Course outcome:**

<b>S. no</b>	<b>Subject</b>	<b>Subject Code</b>	<b>Course Outcomes</b>
1.	MECHANICS OF STRUCTURES	BCE-01	<ol style="list-style-type: none"> <li>1. Able to compute the magnitude and direction of force and moment.</li> <li>2. Know the conditions of equilibrium of rigid body and able to compute equivalent force</li> <li>3. Able to compute the centroids and centre of gravity.</li> <li>4. Know the moment of inertia of mass and area, and also how to compute it.</li> <li>5. Understand the principle of virtual work and able apply them to find out forces and reactions.</li> <li>6. Know the different mechanism of friction and computation of frictional forces.</li> <li>7. Understand the Newton's second law and apply them on system of particles.</li> <li>8. Develop ability to apply Newton's second law on rigid body.</li> </ol>
2.	FIRE HAZARDS AND SAFETY	BCE-02	<ol style="list-style-type: none"> <li>1. Define fire fighting strategy and tactics.</li> <li>2. Describe the elements of fire fighter safety and survival.</li> <li>3. Identify the laws, rules, codes, and other regulations relevant to fire prevention and the agencies or authority having jurisdiction.</li> </ol>

			<p>4. Identify five different types of non-water based fire suppression systems and describe how these systems extinguish fire</p> <p>5. Demonstrate proficiency in building occupancy and code enforcement.</p>
3.	ENGINEERING GRAPHICS	BCE-10	<p>1. How Engineering Drawing helps to sketch the imagination?</p> <p>2. Able to effectively practice the different scales for drawings.</p> <p>3. Effectively analyze the geometrical shapes and to be able to draw.</p> <p>4. Know about out solids and discuss about their classification.</p> <p>5. How to implement the different views for a solid placed in 3d space.</p> <p>6. Construction of the object from different perspective.</p> <p>7. Comparison and contrast between frustum and truncated solid.</p> <p>8. Sketching of different sections for any 3D regular object.</p> <p>9. Discussing the principles of Isometric Projection.</p> <p>10. Sketching isometric projections for different geometrical shapes and solids.</p>
4.	BUILDING CONSTRUCTION AND PLANNING, ESTIMATION AND COSTING	BCE-19	<p>1. Identify quantities of the various materials involved in the project.</p> <p>2. Create summaries and detailed quantity surveying reports quickly and easily.</p> <p>3. Count and quantify all of your project design data more quickly and easily.</p> <p>4. Generate quantities linked to specific objects.</p> <p>5. Perform interactive examination of 3D models for material cost estimating purposes.</p> <p>6. Compile, update, and interact with quantity-related project data.</p>
5.	BASIC SURVEYING	BCE-12	<p>1. Collecting data with errors, students gain a better appreciation of data quality and how instruments and field techniques contribute to error.</p> <p>2. Learn rules for handling systematic errors, random errors and blunders.</p> <p>3. Learn elementary statistical methods to aid in error control.</p> <p>4. Appreciate the concepts of accuracy and precision.</p> <p>5. Understand how to meet client expectations in terms of data quality.</p> <p>6. Develop an appreciation of how one set of surveying data relates to another.</p>

			<p>7. Learn the importance of referencing their projects properly.</p> <p>8. Students learn to work with others, respect the contributions of others, resolve difficulties, and understand responsibility.</p> <p>9. Students will learn surveying techniques that will remain current for long periods of time.</p> <p>10. Students understand the range of calculations that can be made with surveying data and understand the linkages between surveying data and engineering design.</p> <p>11. Students learn how surveying data may be stored and retrieved for a variety of purposes.</p> <p>12. Students develop proficiency in working with raw data. Students see applications of their previous education in mathematics.</p> <p>13. Students understand the range of surveying instrumentation and the appropriate uses of each class of instrument.</p> <p>14. Students learn how surveying data is clearly and ethically reported.</p>
6.	FLUID MECHANICS	BCE-13	<p>1. Understand how to make measurements of flow.</p> <p>2. Understand the type and nature of flow.</p> <p>3. Apply the principle of momentum, energy and mass conservation in various fluid flows</p> <p>4. Explain and describe the difference between smooth and rough surface.</p> <p>5. Figure out the problems in different pipe flows</p>
7.	STRUCTURAL MECHANICS – I	BCE-14	<p>1. Know different methods for calculating the stress and strain.</p> <p>2. Able to apply Hooke's law.</p> <p>3. Able to draw the Mohr's circle for calculating the stress and strain in different directions.</p> <p>4. Understand how to calculate the reactions, bending moment and shear force, and also able to draw the bending moment and shear force diagram for different types of structures</p> <p>25</p> <p>5. Able to find out displacement using different methods.</p> <p>6. Able to find out torsional moment in different types of sections.</p> <p>7. Know the buckling phenomena and able to calculate critical load in different types of end conditions.</p>
8.	ENGINEERING	BCE-	<p>1. Understanding of rocks and their minerals</p>

	GEOLOGY AND BUILDING MATERIAL	15	<p>2. Understanding of properties of building materials like cement, aggregates, concrete, lime and bricks.</p> <p>3. To perform several experiments to find out consistency, initial and final setting time of cement, workability of concrete, crushing strength of aggregates etc.</p>
9.	HYDRAULIC AND HYDRAULIC MACHINES	BCE-16	<p>1. To identify the different types of flow in Open Channel</p> <p>2. To understand the concept of Hydraulic Jump</p> <p>3. To classify the various types of flow profiles</p> <p>4. To study the characteristics of rotodynamic Pumps</p> <p>5. To understand the working of Turbines</p>
10.	STRUCTURAL MECHANICS - II	BCE-17	<p>1. Analyze indeterminate structures by using different compatibility equations used in various methods.</p> <p>2. Analyze the shear force, thrust and bending moment acting on two hinged arches.</p> <p>3. Draw the influence line diagram for moving or rolling loads so as to determine maximum bending moment, shear force etc.</p> <p>4. Find out the forces acting on two hinged and three hinged stiffening girders.</p> <p>5. Draw the Influence line diagram for maximum bending moment and shear forces for stiffening girders.</p> <p>6. Formulate matrices for computation of unknown member forces in high degree indeterminate structures.</p> <p>7. Do plastic analysis and find out the ultimate strength.</p> <p>8. To determine the collapse load of different structures.</p>
11.	ADVANCED SURVEYING	BCE-18	<p>1. Understanding the method of triangulation and working of Total Station</p> <p>2. Importance of precision and accuracy in taking observations.</p> <p>3. The different types of curves and methods to set them out.</p> <p>4. Figure out the fundamentals of photo interpretation</p>
12.	CONCRETE & CONCRETE STRUCTURES	BCE-11	<p>1. Able to test all the concrete materials as per IS code design the concrete mix using IS code method.</p> <p>2. Able to determine the properties of fresh and hardened of concrete design special concretes and their specific applications ensure quality control while testing/ sampling and acceptance criteria.</p> <p>3. Understand limit state design philosophy.</p> <p>4. Understand the behaviour of beam under flexure and shear.</p> <p>5. Able to design beams using limit state method.</p> <p>6. Able to design one way slab using limit state method.</p>

			7. Able to design column using limit state method.
<b>13.</b>	ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT	BCE-21	<ol style="list-style-type: none"> <li>1. Understand the importance of Environmental Impact Assessment (EIA) and key issues involved in EIA.</li> <li>2. Identify the environmental attributes for EIA study.</li> <li>3. Identify methodology &amp; prepare EIA report.</li> <li>4. Identify methods for prediction of impacts.</li> <li>5. Formulate Environmental Management Plan (EMP).</li> <li>6. Understand the role of Environmental Audit (EA) and the methodology of EA.</li> </ol>
<b>14.</b>	ENVIRONMENTAL ENGINEERING-I	BCE-26	<ol style="list-style-type: none"> <li>1. Discuss water demand, sources of water and intake structures.</li> <li>2. Understand transmission of water.</li> <li>3. Discuss various types of conduits, laying and testing of water supply pipe lines and related issues.</li> <li>4. Describe storage and distribution of water, design of water distribution system and plumbing systems in buildings.</li> <li>5. Describe systems of sanitation and waste water collection.</li> <li>6. Estimate waste water flows and variations.</li> <li>7. Design sewers.</li> <li>8. Discuss types, materials and construction of sewers.</li> <li>9. Explain the concept of shallow bore sewer systems.</li> <li>10. Do planning of sewerage systems</li> </ol>
<b>15.</b>	GEOTECHNICAL ENGINEERING	BCE-27	<ol style="list-style-type: none"> <li>1. Describe the fundamental differences in engineering behavior between cohesive and cohesionless soils.</li> <li>2. Compute the groundwater seepage and distribution of groundwater pressure.</li> <li>3. Compute the applied stress beneath the ground surface.</li> <li>4. Demonstrate the fundamental difference in the strength and deformation characteristics of cohesive and cohesionless soils.</li> <li>5. Analyze field and laboratory data to determine the strength and deformation properties of cohesive and cohesionless soils.</li> <li>6. Compute settlements due to consolidation of soil.</li> <li>7. Prepare soil investigation report based on the result of various field tests.</li> <li>8. Design a shallow foundation.</li> </ol>
<b>16.</b>	TRANSPORTATION ENGINEERING-I	BCE-28	<ol style="list-style-type: none"> <li>1. Understanding the types of pavements and their components.</li> <li>2. Materials used for highway construction.</li> <li>3. Methods of design of flexible and rigid pavement including IRC method.</li> </ol>

			<p>4. Construction and maintenance of different types of pavements</p> <p>5. Basic concept about highway engineering</p> <p>6. Various types of intersection and their suitability.</p> <p>7. Different types of traffic control system</p>
17.	DESIGN OF CONCRETE STRUCTURES	BCE-29	<p>1. Understand various philosophies for design of reinforced concrete.</p> <p>2. Understand Limit state method of design.</p> <p>3. Understand the provisions of IS 456:2000 for design of one way and two way slab.</p> <p>4. Design one way and two way slab by limit state method.</p> <p>5. Understand the behavior of R.C.C. column and various types of end connections.</p> <p>6. Understand the provisions of IS 456:2000 for design of R.C.C. Columns with and without eccentricity.</p> <p>7. To use Design Chart for design of columns subjected to uni-axial biaxial bending</p> <p>8. Know the method of pre-stressing, their advantages and losses in pre-stress.</p> <p>9. Able to analyse pre-stressed rectangular and T-section.</p>
18.	SEMINAR	BCE-30	<p>1. Develop and support a relevant and informed thesis, or point of view, that is appropriate for its audience</p> <p>2. Identify, understand and discuss current, real-world issues.</p> <p>3. Improve oral and written communication skills.</p> <p>4. Distinguish and integrate differing forms of knowledge and academic disciplinary approaches</p>
19.	GEOTECHNICAL ENGINEERING-II	BCE-31	<p>1. The basic knowledge of soil mechanics</p> <p>2. Good scientific details of site investigations and in situ tests</p> <p>3. Practical knowledge of sub soil investigation report</p> <p>4. The earth pressure theories and Coloumb and Rankine approaches for soils</p> <p>5. Knowledge of retaining structures</p> <p>6. The basic and deep knowledge about foundations and bearing capacity determination of soil</p> <p>7. The basic knowledge of pile foundation, their design and construction</p> <p>8. The knowledge of well and machine foundation</p>
20.	ENVIRONMENTAL ENGINEERING-II	BCE-32	<p>1. Discuss beneficial uses of water, quality requirements and standards.</p> <p>2. Understand water borne diseases and their prevention and control.</p>

			<p>3. Discuss objectives of water and waste water treatment, unit operations and processes and flowsheets.</p> <p>4. Understand settling phenomena, coagulation and flocculation.</p> <p>5. Design primary and secondary settling tanks, flocculators and clariflocculators.</p> <p>6. Understand theory of filtration and various types of filters, disinfection process and water softening along with dosing requirements.</p> <p>7. Understand preliminary, primary, secondary and tertiary treatment of wastewater.</p> <p>8. Design primary and secondary waste water treatment processes.</p> <p>9. Discuss anaerobic digestion of sludge and the basic concept of emerging technologies for waste water treatment</p>
<b>21.</b>	<b>STEEL STRUCTURES</b>	BCE-33	<p>1. To understand concepts of strength and stiffness considerations.</p> <p>2. Analyze, and design the riveted and bolted connections.</p> <p>3. To undertake design problems on the basis of strength and serviceability concepts taught.</p> <p>4. Able to design tension and compression members.</p> <p>5. Able to design beam and flexural members.</p>
<b>22.</b>	<b>TRANSPORTATION ENGINEERING-II</b>	BCE-34	<p>1. Understand the knowledge of various systems of railway, airport and water transportation.</p> <p>2. Understand the components of railway tracks, components and types of aircraft etc.</p> <p>3. Understand the design concept of railway track, runway, taxiway etc.</p> <p>4. Apply the concept of geometric design of railway, runway, taxiway, docks &amp; harbours etc.</p> <p>5. Apply the knowledge of various signaling system for railway engineering, air traffic control, navigational aids, etc</p>
<b>23.</b>	<b>CONSTRUCTION TECHNOLOGY AND MANAGEMENT</b>	BCE-35	<p>1. Able to understand how to control project schedule, cost, quality and risk.</p> <p>2. Develop the ability to analyze the risk and feasibility of real estate projects throughout their lifecycle.</p> <p>3. Students will be able to know the different types of equipment to be used in the construction projects.</p> <p>4. Students will be able to know the different types of contracts in construction arbitration and legal</p>

			<p>aspects and its provision.</p> <p>5. Students will be able to know various construction safety concepts.</p>
24.	SURVEY CAMP	BCE-36	<p>1. Be able to conduct topographical survey of a given area.</p> <p>2. Be able to prepare topographical maps of an area.</p> <p>3. Knowledge of practical implementation of different survey works</p>
25.	PROJECT PART-I	BCE-40	<p>1. To make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.</p> <p>2. To communicate effectively and to present ideas clearly and coherently</p> <p>3. To learn on their own, reflect on their learning and take appropriate actions to improve it.</p> <p>4. Students will acquire collaborative skills through working in a team to achieve common goals.</p>
26.	WATER RESOURCES ENGINEERING	BCE-41	<p>1. Design of water management systems utilizing the basic principles of the hydrologic cycle.</p> <p>2. Apply knowledge for efficient design methods for rapid conveyance of water with lesser loss in irrigation canals.</p> <p>3. To demonstrate a knowledge of the multi-disciplinary nature of water resources engineering.</p> <p>4. Realize the importance of optimal water use for growing the crops, and apply methods for saving land from water-logging.</p> <p>5. To demonstrate technique involved in making design problems of canal and related structures to be safe and cost effective.</p> <p>6. Apply the knowledge in the design of hydraulic structures to be constructed for conveyance of irrigation water.</p> <p>7. Apply the silt control devices in canals and natural channels for long life of irrigation schemes.</p> <p>8. Formulate irrigation networks across the country to make itself self reliant in food grain production.</p> <p>9. Enumerate the need of water resource conservation and management to overcome the natural calamities such as drought and flood and its protection measures.</p> <p>10. Design of water management systems utilizing the basic principles of the hydrologic cycle.</p>
27.	EARTHQUAKE	BCE-	<p>1. To introduce nature and characteristics of various</p>

	RESISTANT DESIGN	42	<p>dynamics loads.</p> <p>2. To have considerable knowledge of theory of vibrations including multi-degree of freedom systems.</p> <p>3. To assess of structural failure due to earthquakes.</p> <p>4. To analyze and design structures subjected to seismic loading as per IS codes.</p> <p>5. To introduce ductile detailing of structures, concept of soft story and design of shear walls as per IS code.</p>
28.	ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES	BCE-43	<p>1. Use and integrate the fundamental and basic studied towards the goal of selecting, analyzing and designing of hydraulic structures.</p> <p>2. Cope with decision making and satisfy competing objectives.</p> <p>3. Design, analyse and proof that the hydraulic structures is safe and economical.</p> <p>4. Work in team and learn successful group interaction for a project.</p> <p>5. Deliver an oral presentation for the project.</p> <p>6. Perform studies of various hydraulic structures such as weir/barrages and cross-drainage works.</p> <p>7. Classify the dams and spillways and know the functioning of each type.</p>
29.	INDUSTRIAL / PRACTICAL TRAINING	BCE-45	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course
30.	PROJECT PART-II	BCE-50	<p>1. To make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.</p> <p>2. To communicate effectively and to present ideas clearly and coherently</p> <p>3. To learn on their own, reflect on their learning and take appropriate actions to improve it.</p> <p>4. Students will acquire collaborative skills through working in a team to achieve common goals.</p>
31.	SOLID WASTE MANAGEMENT	BCE-51	<p>1. Illustrate the waste generation in a technological society and analyze the waste generation trends.</p> <p>2. Discuss the essential elements for solid waste management.</p> <p>3. Propose a mathematical approach for handling waste on-site and off-site.</p> <p>4. Calculate the efficiencies of each collection system.</p> <p>5. Measure the actual volume of waste produced and</p>

			<p>reduced in terms of volume estimation.</p> <p>6. Calculate the actual amount of energy that can be recovered from waste.</p> <p>7. Designing an engineered landfill for waste produced from society.</p> <p>8. Illustrate the chemical processes involved during degradation of waste in landfill.</p> <p>9. Categorizing the various design parameters to be fulfilled while adopting composting process for waste treatment.</p> <p>10. Figure out the present situation of solid waste and its management.</p>
<b>32.</b>	<b>ENVIRONMENTAL IMPACT ASSESSMENT</b>	<b>BCE-52</b>	<p>1. Discuss and illustrate the importance of EIA for various processes of decision making in various projects</p> <p>2. Categorize the different assessment methodology for various fields of concern air, water, noise and wildlife</p> <p>3. Defend the different stages of EIS production</p> <p>4. Illustrate the difference among various case studies</p> <p>5. Figure out the Environmental Management plan to be adopted for various programmes</p>
<b>33.</b>	<b>ROCK MECHANICS</b>	<b>BCE-53</b>	<p>1. To identify the different types of rocks.</p> <p>2. To classify the rocks on the basis of their index properties.</p> <p>3. To determine the strength of the rock by various failure criteria</p> <p>4. To study the stress strain behavior of rock mass</p> <p>5. To analyse the stability of rock slopes, foundation and dams</p> <p>6. To study the application of rock mass in underground structures</p>
<b>34.</b>	<b>BRIDGE ENGINEERING</b>	<b>BCE-54</b>	<p>1. To discuss basic definitions, types, and components of bridges.</p> <p>2. To discuss sub-surface investigations required for bridge construction.</p> <p>3. To understand standard specification for bridge design.</p> <p>4. To perform design of various slab type reinforced concrete bridges.</p> <p>5. To perform design of bridges sub-structures, bearings and joints.</p>
<b>35.</b>	<b>DISASTER MANAGEMENT</b>	<b>BCE-55</b>	<p>1. Discuss the various modes of disaster arising in different areas</p> <p>2. Identify the roles of NDRF and SDRF in disaster management</p> <p>3. Illustrate the various trends of disaster management in</p>

			<p>Indian context</p> <p>4. Recommend the various disaster prevention techniques for different context</p> <p>5. Define the role of engineers in Disaster mitigation</p>
36.	ADVANCED ENGINEERING HYDROLOGY	BCE-56	<p>1. To demonstrate about the knowledge of Hydrological cycle</p> <p>2. To know the different form of precipitation and measurement of precipitation</p> <p>3. To prepare the hydrograph and different types of hydrograph</p> <p>4. To predict the flood and design flood</p> <p>5. To calculate flood by different flood routing method</p> <p>6. To have a knowledge of groundwater hydrology</p> <p>7. To demonstrate about the knowledge of surface and groundwater hydrology</p> <p>8. To have a full attitude of hydrologic engineering, i.e., surface and groundwater hydrology.</p>
37.	GEO-ENVIRONMENTAL ENGINEERING	BCE-57	<p>1. Student will aware the development of geo-environmental engineering</p> <p>2. Understand the environmental cycle and their interaction with geotechnology</p> <p>3. Student will acquire the knowledge of waste characterization, solid waste interaction and hazardous waste</p> <p>4. Student will understand how the contaminants are transported into the soils</p> <p>5. Student will acquire knowledge about the stabilization and treatment of sludge</p> <p>6. Understand the geosynthesis</p> <p>7. Will get the knowledge about geotechnical reuse of waste</p> <p>8. Student will acquire knowledge of design of landfills</p> <p>9. Student will analyze the stability and settlement including seismic stability and liquefaction</p> <p>10. Student will understand the grouting and injection process</p>
38.	ADVANCED STRUCTURAL ENGINEERING	BCE-58	<p>1. To understand how to represent real structures by idealized structural systems.</p> <p>2. To understand the classification of structures, static indeterminacy, kinematic indeterminacy.</p> <p>3. To understand the strain energy and complimentary strain energy of the structures.</p> <p>4. To understand the concept of flexibility method and be able to apply it for analysis of statically indeterminate structures.</p> <p>5. To understand the concept of stiffness method and be</p>

			<p>able to apply stiffness methods for analysis of statically indeterminate structures.</p> <p>6. To understand the equilibrium of forces for cable bridges and analysis of suspended cable bridges.</p>
<b>39.</b>	<b>PRINCIPLES OF REMOTE SENSING</b>	BCE-59	<p>1. Understand the way in which electromagnetic radiation interacts with the earth's atmosphere, the earth's surface and the remote sensing system.</p> <p>2. Develop some skills in image interpretation and analysis.</p> <p>3. Be familiar with different types of sensors and remote sensing space missions that are used to detect and record certain parts of the electromagnetic spectrum.</p> <p>4. Understand simple image enhancement, filtering operations over digital images</p> <p>5. To carry out corrections of geometric distortions in digital images</p> <p>6. Aware of some applications of remotely sensed images</p> <p>7. Develop a knowledge and understanding of spectral classification of images for feature extraction</p> <p>70</p> <p>8. Understand the concepts and principles of global positioning system</p> <p>9. Understand the sources of errors in a GPS, and tackling them.</p>
<b>40.</b>	<b>AIRPORT, DOCKS &amp; HARBOUR ENGINEERING</b>	BCE-60	<p>1. Understand the components of aircrafts &amp; different types of aircrafts.</p> <p>2. Carry out the survey for airports, docks &amp; harbours.</p> <p>3. Perform geometric design for the airports, docks &amp; harbour.</p> <p>4. Plan and layout of different types of terminals.</p> <p>5. Understand the various methods of design of runways.</p>
<b>41.</b>	<b>MATRIX METHOD OF ANALYSIS</b>	BCE-61	<p>1. To understand the basic concepts of structural analysis and matrix algebra.</p> <p>2. To understand the matrix methods can be applied to plane and space trusses; beams and grids; plane and space frames.</p> <p>3. To identify a suitable system of releases (flexibility method) or an appropriate set of degrees of freedom (stiffness method).</p> <p>4. To formulate and solve the equilibrium equations (stiffness method) or boundary conditions (flexibility method).</p> <p>5. Ability to use modern structural analysis software</p>
<b>42.</b>	<b>OPEN CHANNEL</b>	BCE-	<p>1. To explain the terms of the open channel flow</p>

	FLOW	62	<p>equations and explain the interaction among the terms.</p> <p>2. To develop the open channel flow equations from the basic conservation equations.</p> <p>3. To solve open channel flow problems through the selection and use of appropriate equations.</p> <p>4. To explain the physical mechanisms and mathematical relationships for hydraulic jumps, surges, and critical, uniform, and gradually-varying flows as well as spatially varied flow.</p> <p>5. Analysis and design of open channel controls, upstream and downstream controls, &amp; spatially varied flow.</p> <p>6. Analysis and design of open channel transition, functions, and energy dissipaters</p>
43.	ADVANCED FOUNDATION ENGINEERING	BCE-63	<p>1. Understand foundation design in relation to ground movement</p> <p>2. Design shallow foundations, piled foundations, well foundation constructions, machine foundation and soil stability.</p> <p>3. Evaluate deformations in the soil due to foundation works</p>
44.	RIVER ENGINEERING	BCE-64	<p>1. An ability to apply knowledge of mathematics, science, and engineering.</p> <p>2. An ability to design a system, component, or process to meet desired needs with realistic constraints.</p> <p>3. An ability to identify, formulate and solve engineering problems.</p> <p>4. An ability to articulate professional ideas clearly and precisely, prepare written materials, and make oral and written presentations.</p> <p>5. An ability to design the river training structures as per area specific requirements</p>
45.	ADVANCE CONCRETE DESIGN	BCE-65	<p>1. Introduction to the various member components of Flat slab floor system.</p> <p>2. Analyse and design a Flat slab floor system for serviceability and limit state loads.</p> <p>3. Analyse and design retaining walls, counter fort retaining walls and culverts.</p> <p>4. To undertake design problems on design of water tanks.</p> <p>5. Explain the effects of prestress on the behavior of concrete beams and slabs and identify situations when prestress is needed.</p> <p>6. To determine the combined stresses induced by</p>

			<p>prestress and applied loads using basic concepts of analysis, equivalent load method and load balancing approach.</p> <p>7. To define and determine the different types of losses of pre-stressed concrete.</p>
<b>46.</b>	<b>WATER RESOURCE SYSTEMS</b>	<b>BCE-66</b>	<ol style="list-style-type: none"> <li>1. To develop system approach about water resources system development</li> <li>2. Having a knowledge about application of system engineering in reservoir operation and optimal crop water allocation</li> <li>3. Having an attitude of solving problems related with water resources</li> </ol>
<b>47.</b>	<b>PRINCIPLES OF GEOGRAPHIC INFORMATION SYSTEM</b>	<b>BCE-67</b>	<ol style="list-style-type: none"> <li>1. develop a knowledge and understanding of spectral classification of images for feature extraction</li> <li>2. Define what GIS is and know different types of spatial and non spatial data</li> <li>3. Know what are the questions that GIS can answer</li> <li>4. Differentiate between Raster and Vector Models</li> <li>5. Create maps and overlay features/raster data for basic analyses</li> <li>6. Understand the applications of GIS in the fields of environmental, geotechnical, transportation and water resources engineering</li> </ol>
<b>48.</b>	<b>EARTH AND EARTH RETAINING STRUCTURES</b>	<b>BCE-68</b>	<ol style="list-style-type: none"> <li>1. To design the Earth retaining walls</li> <li>2. To study the various types of ground improvement techniques</li> <li>3. To analyse the bearing capacity of soil</li> </ol>
<b>49.</b>	<b>AIR AND NOISE POLLUTION CONTROL</b>	<b>BCE-69</b>	<ol style="list-style-type: none"> <li>1. Identify the types and modes of air pollution in different areas.</li> <li>2. Discuss upon the air quality standards and measurement of pollutants pertaining to air quality as AQI.</li> <li>3. Recommend the control devices for Particulate and Gaseous emissions.</li> <li>4. Discuss the concepts used in air quality modelling.</li> <li>5. Explain the impacts of noise on others and explain the mathematical ways to quantify same.</li> </ol>
<b>50.</b>	<b>GROUND IMPROVEMENT TECHNIQUES</b>	<b>BCE-70</b>	<ol style="list-style-type: none"> <li>1. To analyse the quality of soil</li> <li>2. To identify the appropriate method for ground improvement</li> <li>3. To study the various insitu densification methods in granular soil and cohesive soil</li> <li>4. To study the method of dewatering and pre-loading</li> <li>5. To learn the advanced methods of ground improvement techniques</li> </ol>
<b>51.</b>	<b>TRANSPORTATIO</b>	<b>BCE-</b>	<ol style="list-style-type: none"> <li>1. Understand the different types of public</li> </ol>

	N SYSTEM AND PLANNING	71	<p>transportationsystems.</p> <p>2. Apply the principles of transportation planning process and demandestimation.</p> <p>3. Analyze the trip production and trip attractionmodels.</p> <p>4. Understand the various methods of economic evaluation for transportationprojects.</p> <p>5. Demonstrate the fundamentals of Intelligent TransportationSystems.</p>
52.	INDUSTRIAL POLLUTION CONTROL AND ENVIRONMENTAL AUDIT	BCE-72	<p>1. Discuss about various types of waste and their origin from differentindustries.</p> <p>2. Explain the various control and abatement techniques for control ofpollution.</p> <p>3. Illustrate the various types of pollutants released by differentindustries.</p> <p>4. Categorize various control and abatement techniques for handling industrialwaste.</p> <p>5. Defend the concept of zero discharge effluent fromindustries.</p> <p>6. Identify the types of industries as sources of harmful gaseousemissions.</p> <p>7. Recommend the control and abatement technology for harmful emissions from industries.</p> <p>8. Discuss about the solid waste generation fromindustries.</p> <p>9. Figure out the life cycle analysis for any by-product of specificindustry.</p> <p>10. Differentiate between environmental audit an8d6accountscredit.</p>
53.	STRUCTURAL DYNAMICS	BCE-73	<p>1. Relate the structural idealization to properties of realstructure.</p> <p>2. Able to establish dynamicequilibrium.</p> <p>3. Able to solve the Eigen value problem and knowledge to itsproperties.</p> <p>4. To calculate response from different types ofloading.</p>
54.	ADVANCED HYDRAULIC STRUCTURES	BCE-74	<p>1. To design the embankment dam and gravitydam</p> <p>2. To design the spillway and spillwaygates</p> <p>3. To demonstrate the different types of channel transition and its design aspect</p> <p>4. To develop a skill of design of hydraulicstructures</p>
55.	ENVIRONMENTAL QUALITY MANAGEMENT	BCE-75	<p>1. Discuss the importance of Environmental Impact Assessment and Environmental Audit for different projects and programmes</p> <p>2. Identify the role of environmental management to achieve sustainable development in Present scenario</p> <p>3. Figure out the rules and regulations to be followed for</p>

			<p>getting environmental clearance for industries and projects</p> <p>4. Differentiate among various routes of entry of toxic substances into animals, plants and human</p> <p>5. Illustrate the various environmental laws framed for environmental protection and handling of various types of wastes and its disposal.</p>
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## **Electronics & Communication Engineering Department**

### **B-Tech.**

#### **Course Outcomes**

<b>S.no</b>	<b>Subject</b>	<b>Subject Code</b>	<b>Course Outcomes</b>
1.	Fundamental of Electronics Engineering	BEC-01	<p>1. Able to identify schematic symbols and understand the working principles of electronic devices, e.g., Diode, Zener Diode, LED, BJT, JFET and MOSFET etc.</p> <p>2. Able to understand the working principles of electronic circuits e.g. Rectifiers, Clipper, Clamper, Filters, Amplifiers and Operational Amplifiers etc. also understand methods to analyse and characterize these circuits</p> <p>3. Able to understand the functioning and purposes of Power Supplies, Test and Measuring equipments such as multimeters, CROs and function generators etc.</p> <p>4. Able to rig up and test small electronics circuits.</p>

2.	Electronics Workshop & PCB	BEC-10	<ol style="list-style-type: none"> <li>1. Understand the design processes and production methods used in the manufacture of a printed circuit board.</li> <li>2. Understand the use of software techniques in the design and simulation of an electronic circuit.</li> <li>3. Understand the use and application of chemical etching and drilling in the manufacture of an electronic circuit.</li> <li>4. Be able to design and manufacture a prototype printed circuit board and use it to assemble and test an electronic circuit.</li> </ol>
3.	Network Analysis & Synthesis	BEC-11	<ol style="list-style-type: none"> <li>1. Able to apply the Thévenin, Norton, nodal and mesh analysis to express complex circuits in their simpler equivalent forms.</li> <li>2. Able to apply linearity and superposition concepts to analyze RL, RC, and RLC circuits in time and frequency domains.</li> <li>3. Able to analyze resonant circuits both in time and frequency domains.</li> <li>4. Able to construct and make time and frequency domain measurements on elementary RL, RC, and RLC circuits.</li> <li>5. Understand the fundamental concepts of network analysis and synthesis of two-port passive networks.</li> </ol>
4.	Digital Electronics & Circuits	BEC-12	<ol style="list-style-type: none"> <li>1. Acquired knowledge about basics of digital electronics.</li> <li>2. Acquired knowledge about solving problems related to number systems and Boolean algebra.</li> <li>3. Ability to identify, analyze and design combinational circuits.</li> <li>4. Ability to design various synchronous and asynchronous sequential circuits.</li> <li>5. Acquired knowledge about internal circuitry and logic behind any digital system</li> </ol>

5.	Signals & Systems	BEC-13	<ol style="list-style-type: none"> <li>1. Able to describe signals mathematically and understand how to perform mathematical operations on signals.</li> <li>2. Understand various signals and systems properties and be able to identify whether a given system exhibits these properties and its implication for practical systems.</li> <li>3. Understand the process of convolution between signals, &amp; able to solve differential equation using Laplace transforms techniques.</li> <li>4. Understand the intuitive meaning of frequency domain and the importance of analyzing and processing signals in the frequency domain.</li> <li>5. Able to compute the Fourier series or Fourier transform Z-transform, and further be able to use the properties and application in analysis to ideal filtering, amplitude modulation and sampling.</li> <li>6. Able to analysis and design of linear time invariant systems used in engineering</li> </ol>
6.	ELECTROMAGNETIC FIELD THEORY	BEC-14	<ol style="list-style-type: none"> <li>1. Apply vector calculus to understand the behavior of static electric fields in standard configurations.</li> <li>2. Describe and analyze electromagnetic wave propagation in free-space.</li> <li>3. Describe and analyze transmission lines.</li> <li>4. Work in a small team using cooperative learning rules.</li> <li>5. Communicate electromagnetic concepts both orally and in writing.</li> </ol>
7.	SOLID STATE DEVICES & CIRCUITS	BEC-15	<ol style="list-style-type: none"> <li>1. Ability to understand the basic operation and working of different diodes like PIN, Varactor diode etc.</li> <li>2. To understand the high frequency application of diodes.</li> <li>3. To understand and use of the device models to explain and calculate the characteristics of the field effect transistors.</li> <li>4. To be able to understand and analyze the V-I characteristics of different high power devices.</li> <li>5. Understand the operation of charge-transfer devices and charge storage device.</li> </ol>
8.	CONTROL SYSTEMS	BEC-26	<ol style="list-style-type: none"> <li>1. Describe the response characteristic and differentiate between the open loop and closed loop of a control system.</li> <li>2. Derive mathematical model for simple electrical and mechanical systems using transfer function and state variable method.</li> </ol>

			<p>3. Determine the response of a control system using poles and zeros to determine the response of a control system.</p> <p>4. Determine the stability of a control system using Routh-Hurwitz method</p>
9.	ANALOG INTEGRATED CIRCUITS	BEC-27	<p>1. Students will be able to learn about the operational amplifiers and its characteristics as well as various types of op-amps.</p> <p>2. Students will acquire the ability to design and test practical circuits for amplifiers, filters and oscillators.</p> <p>3. Students will be able to analyze the operation of comparators, data convertors and implementation of the same.</p> <p>4. Students will be able to learn the functioning of PLL, VCO, V-I, I-V converters, AGC, AVC and analog multipliers and implement them for suitable applications</p>
10.	PRINCIPLES OF COMMUNICATION	BEC-28	<p>1. Acquired knowledge about analog communication.</p> <p>2. Acquired knowledge about AM transmission and reception.</p> <p>3. Acquired knowledge about FM and PM transmission and reception.</p> <p>4. Acquired knowledge about pulse modulation.</p> <p>5. Acquired knowledge about noise.</p>
11.	ELECTRONIC MEASUREMENT & INSTRUMENTATION	BEC-29	<p>1. Able to understand operation of different instruments.</p> <p>2. Able to describe different terminology related to measurements.</p> <p>3. Understand the principles of various types of transducers and sensors.</p> <p>4. Basic concept of instrumentation and its industrial application and working &amp; performances of different kind of measuring instruments.</p> <p>5. Ability to analyze performance characteristics of measuring instruments.</p> <p>6. Ability to know, working principle &amp; Performances of different electrical transducers.</p> <p>7. Ability to understand construction, principle of operation, working and applications of waveform analyzers and spectrum analyzers, CRO and other display devices.</p> <p>8. Ability to understand principle of operation of telemetry system and data acquisition system.</p> <p>9. Ability to understand principle of operation of process</p>

			control system and its various applications
12.	SEMINAR	BEC-30	<ol style="list-style-type: none"> <li>1. To acquire in depth study in a specialized area.</li> <li>2. Acquaint the students of methods of carrying our literature survey on a given topic.</li> <li>3. Derive a balance between the depth of the work and understanding of what has been learned in this process.</li> <li>4. To be able to prepare seminar report and presentation and deliver it effectively.</li> </ol>
13.	DIGITAL COMMUNICATION	BEC-31	<ol style="list-style-type: none"> <li>1. Able to compute the bandwidth and transmission power by analysing time and frequency domain spectra of signal required under various modulation schemes.</li> <li>2. Able to apply suitable modulation schemes and coding for various applications.</li> <li>3. Able to identify and describe different techniques in modern digital communications, in particular in source coding, modulation and detection, carrier modulation, and channel coding.</li> <li>4. Able to analyze digital modulation techniques by using signal processing tools.</li> </ol>
14.	Microprocessors & Applications	BEC-32	<ol style="list-style-type: none"> <li>1. Acquired knowledge about Microprocessors and its need.</li> <li>2. Ability to identify basic architecture of different Microprocessors.</li> <li>3. Foster ability to write the programming using 8085 microprocessor.</li> <li>4. Foster ability to understand the internal architecture and interfacing of different peripheral devices with 8085 Microprocessor.</li> <li>5. Foster ability to write the programming using 8086 microprocessor.</li> <li>6. Foster ability to understand the internal architecture and interfacing of different peripheral devices with 8086 Microprocessor.</li> </ol>
15.	Data Communication Networks	BEC-33	<ol style="list-style-type: none"> <li>1. Able to describe communication protocols and layered network architectures.</li> <li>2. Able to explain conventional computer system interfacing standards and peer to peer data link communication protocols.</li> <li>3. Able to design basic network systems and various components in a data communication system.</li> <li>4. Able to describe how the physical, data link, and network</li> </ol>

			<p>layers operate in a typical data communication system.</p> <p>5. Able to understand the system design principles of data communication systems.</p> <p>6. Able to understand, define and explain data communications networks concepts</p>
16.	Microwave Engineering	BEC-34	<p>1. Able to apply electromagnetic theory to calculations regarding waveguides and transmission lines.</p> <p>2. Able to describe, analyze and design simple microwave circuits and devices e.g. matching circuits, couplers, antennas and amplifiers.</p> <p>3. Able to describe and coarsely design common systems such as radar and microwave transmission links.</p> <p>4. Able to describe common devices such as microwave vacuum tubes, high-speed transistors and ferrite devices.</p> <p>5. Able to handle microwave equipment and make measurements.</p>
17.	VLSI Technology	BEC-35	<p>1. Able to understand the fundamentals of CMOS VLSI and associated technologies.</p> <p>2. Able to solve problems in the design of CMOS logic circuits, with particular reference to speed and power consumption.</p> <p>3. Able to acquire hands-on skills of using CAD tools in VLSI design.</p> <p>4. Able to appreciate the design process in VLSI through a mini-project on the design of a CMOS sub-system.</p> <p>5. Able to explain basic operation principles of diodes and MOS transistors and their circuits level models</p> <p>6. Able to design the fundamental blocks of a VLSI circuits, both by circuit schematic and physical layout</p> <p>7. Able to analyze the influence of wires/interconnects on VLSI circuit performance.</p>
18.	Project Part-I	BEC-40	<p>1. Understanding of electronics system requirement.</p> <p>2. Defining the right architecture for right application that meets cost and performance constraints.</p> <p>3. Designing and verifying the functional model of electronics system.</p> <p>4. Analysis of the design on simulation software.</p> <p>5. Trouble shooting the design circuits using various trouble shooting equipments.</p>

19.	VLSI Design	BEC-41	<ol style="list-style-type: none"> <li>1. Able to understand the fundamentals of CMOS VLSI and associated technologies.</li> <li>2. Able to solve problems in the design of CMOS logic circuits, with particular reference to speed and power consumption.</li> <li>3. Able to acquire hands-on skills of using CAD tools in VLSI design.</li> <li>4. Able to appreciate the design process in VLSI through a mini-project on the design of a CMOS sub-system.</li> <li>5. Able to explain basic operation principles of diodes and MOS transistors and their circuits level models</li> <li>6. Able to design the fundamental blocks of a VLSI circuits, both by circuit schematic and physical layout</li> <li>7. Able to analyze the influence of wires/interconnects on VLSI circuit performance.</li> </ol>
20.	Digital Signal Processing	BEC-42	<ol style="list-style-type: none"> <li>1. Able to analyze signals using the discrete Fourier transform (DFT).</li> <li>2. Understand circular convolution, its relationship to linear convolution, and how circular convolution can be achieved via the discrete Fourier transform.</li> <li>3. Able to understand the decimation in time and frequency FFT algorithms for efficient computation of the DFT.</li> <li>4. Able to understand the characteristics of IIR and FIR filters and learn the design of infinite and finite impulse response filters for filtering undesired signals.</li> <li>5. Able to implement digital filters in a variety of forms:- Direct form I &amp; II, Parallel, Cascade and lattice structure.</li> <li>6. Able to understand the finite word length effects.</li> </ol>
21.	Wireless Communication	BEC-43	<ol style="list-style-type: none"> <li>1. Able to understand the Infrastructure to develop mobile communication system:cellular Theory.</li> <li>2. Able to understand the characteristics of different multiple access techniques in mobile/wireless communication.</li> <li>3. Able to understand the need of coding, channel models, diversity, equalization and channel estimation techniques.Able to apply analytical and empirical models in the design of wireless links.</li> <li>4. Able to understand the Wireless communication systems and standards: GSM,IS-95.</li> <li>5. Able to understand the Ad Hoc networks and new trends in Mobile/wireless communication.</li> <li>6. Able to understand the radio propagation over wireless</li> </ol>

			channel and different limitations. 7. Able to apply analytical and empirical models in the design of wireless links.
22.	Industrial / Practical Training	BEC-45	<ol style="list-style-type: none"> <li>1. Ability to demonstrate the use, interpretation and application of an appropriate international engineering standard in a specific situation.</li> <li>2. Ability to analyse a given engineering problem, identify an appropriate problem solving methodology, implement the methodology and propose a meaningful solution.</li> <li>3. Ability to apply prior acquired knowledge in problem solving.</li> <li>4. Ability to identify sources of hazards, and assess/identify appropriate health &amp; safety measures.</li> <li>5. Ability to work in a team.</li> <li>6. Ability to take initiatives.</li> <li>7. Ability to effectively communicate solution to problems (oral, visual, written).</li> <li>8. Ability to manage a project within a given time frame.</li> <li>9. Ability to adopt a factual approach to decision making.</li> <li>10. Ability to take engineering decision.</li> </ol>
23.	Project Part-II	BEC-50	<ol style="list-style-type: none"> <li>1. Understanding of electronics system requirement.</li> <li>2. Defining the right architecture for right application that meets cost and performance constraints.</li> <li>3. Designing and verifying the functional model of electronics system.</li> <li>4. Analysis of the design on simulation software.</li> <li>5. Trouble shooting the design circuits using various trouble shooting equipments.</li> </ol>
24.	Radar Technology	BEC-51	<ol style="list-style-type: none"> <li>1. Acquired knowledge about Radar and Radar Equations.</li> <li>2. Understanding the working principal of MTI and Pulse Doppler Radar.</li> <li>3. Foster ability to work using Detection of Signals in Noise and Radio Direction Finding.</li> <li>4. Foster ability to work using Instrument Landing System.</li> <li>5. Acquired knowledge about Satellite Navigation System.</li> </ol>
25.	Biomedical Instrumentation	BEC-52	<ol style="list-style-type: none"> <li>1. Students will have a clear knowledge about human physiology system.</li> <li>2. They will have knowledge of the principle operation and design and the background knowledge of biomedical instruments and specific applications of biomedical</li> </ol>

			<p>engineering.</p> <ol style="list-style-type: none"> <li>Learn several signals that can be measured from the human body. Specific examples include temperature, electrical, and pressure signals.</li> <li>Review the cardiac, respiratory and neural physiological systems.</li> <li>Study the designs of several instruments used to acquire signals from living systems. Examples of instruments studied include ECG, blood pressure monitors, spirometers, EEG, MRI, and ultrasound. Integrate information learned about biomedical signals, sensors and instrumentation design to create a design of your own.</li> </ol>
26.	Information Theory & Coding	BEC-53	<ol style="list-style-type: none"> <li>Students will be introduced to the basic notions of information and channel capacity.</li> <li>Students will be introduced to convolutional and block codes, decoding techniques, and automatic repeat request (ARQ) schemes.</li> <li>Students will be understood how error control coding techniques are applied in communication systems.</li> <li>Students will understand the basic concepts of cryptography.</li> </ol>
27.	Advanced Semiconductor Devices	BEC-54	<ol style="list-style-type: none"> <li>Students study the basic of different kinds of modern semiconductor devices.</li> <li>Ability to understand the basic operation and working of different diodes like PIN, Varactor diode etc. To understand the high frequency application of diodes.</li> <li>To understand and use of the device models to explain and calculate the characteristics of the field effect transistors.</li> <li>To be able to understand and analyze the V-I characteristics of different high power devices.</li> <li>Understand the operation of charge-transfer devices and charge storage devices.</li> </ol>
28.	Optoelectronics	BEC-55	<ol style="list-style-type: none"> <li>Understand fundamental properties of light and operation principles of basic optical components.</li> <li>Demonstrate a mastery of basic mechanisms of light generation (including lasers) through detailed understanding and analysis of operation principles, characteristics, design architectures and trade-offs of semiconductor lasers.</li> <li>Understand and compare operation principles,</li> </ol>

			<p>characteristics, design architectures and trade-offs of optical detectors and modulators of light.</p> <p>4. Understand basic system design of fiber optic communication link and fundamental theory of fiber optics.</p>
29.	Electronics Switching	BEC-56	<ol style="list-style-type: none"> <li>1. Acquire knowledge about switching theory and algebra.</li> <li>2. Ability to learn and design sequential circuits.</li> <li>3. Acquire knowledge and ability to analyze threshold gates sand their synthesis.</li> <li>4. Foster ability to use PLDs and PLAs.</li> <li>5. Acquired knowledge about and ability to design ASM and FSM.</li> <li>6. Learn about various fault tolerance and diagnosis techniques.</li> </ol>
30.	Digital System Design Using VHDL	BEC-57	<ol style="list-style-type: none"> <li>1. Model digital systems in VHDL at different levels of abstraction.</li> <li>2. Partition a digital system into different subsystems.</li> <li>3. Simulate and verify a design.</li> <li>4. Transfer a design from a version possible to simulate to a version possible to synthesize</li> <li>5. Use modern software tools for digital design in VHDL.</li> <li>6. Describe principal parts in programmable circuits (PLD, FPGA, ASIC) and describe how small designs are implemented in programmable circuits.</li> </ol>
31.	Fundamental of Satellite Communication	BEC-58	<ol style="list-style-type: none"> <li>1. Revised the fundamentals of orbital mechanics, identify the characteristics of common orbits used by communications and other satellites.</li> <li>2. Identify the Different elements used to design the earth station for satellite communication.</li> <li>3. Identify the Different elements used to design the space station for satellite communication.</li> <li>4. Calculate an accurate link budget design for the uplink and downlink in satellite communications link.</li> </ol>
32.	Microcontroller & Embedded Systems	BEC-61	<ol style="list-style-type: none"> <li>1. To develop in depth understanding on operation of microprocessor and microcontroller.</li> <li>2. Understand assembly language program for 8051.</li> <li>3. Comparative study of higher versions of microcontroller e.g. PIC.</li> <li>4. Acquired knowledge about Microcontrollers and its need.</li> <li>5. Ability to identify basic architecture of different</li> </ol>

			Microcontrollers.
33.	Optical Communication	BEC-62	<ol style="list-style-type: none"> <li>1. Fundamentals, advantages and advances in optical communication system.</li> <li>2. Types, basic properties and transmission characteristic of optical fibers.</li> <li>3. Knowledge of working and analysis of optical amplifiers and important parts at the transmitter (Semiconductor lasers/LEDs, modulators etc) as well as at the receiver sides (optical detector etc.) of the optical communications system.</li> <li>4. Configuration and architecture of coherent optical communication, advanced system techniques and nonlinear optical effects and their applications.</li> </ol>
34.	DSP Architecture & Applications	BEC-63	<ol style="list-style-type: none"> <li>1. Comprehends the knowledge &amp; concepts of digital signal processing techniques.</li> <li>2. Acquire knowledge of DSP computational building blocks and knows how to achieve speed in DSP architecture or processor.</li> <li>3. Develop basic DSP algorithms using DSP processors.</li> <li>4. Acquire knowledge about various addressing modes of DSP and are able to program DSP processor.</li> <li>5. Discuss about interfacing of serial and parallel communication devices.</li> </ol>
35.	Antenna Design	BEC-64	<ol style="list-style-type: none"> <li>1. To understand the radiation mechanism of antenna and also to learn about the basic parameters of antennas.</li> <li>2. To have insight into the derivation of field quantities of various antennas and there by deducing the other quantities like gain, directivity, impedance etc.</li> <li>3. To design, development and fabrication of various types antennas and also to explore array concepts.</li> <li>4. To understand the features of antennas test range (ATR) to perform various measurements on different antennas.</li> <li>5. To understand the wave propagation over ground and through different layers of atmosphere.</li> </ol>
36.	Digital Image Processing	BEC-65	<ol style="list-style-type: none"> <li>1. Acquired knowledge about discrete-time sequences, concept of energy and power, periodicity.</li> <li>2. Acquired knowledge DFT and FFT.</li> <li>3. Ability to design linear digital filters both FIR and IIR using different techniques and their associated structures.</li> </ol>

			<p>4. Ability to understand the concept of linear prediction and estimation.</p> <p>5. Ability to understand the concept of Multi-rate signal processing and sample rate conversion.</p> <p>6. Acquired knowledge about time-frequency analysis.</p>
37.	ATM Networks and B-ISDN	BEC-66	<p>1. Understand the basics of network protocols, access control, data link control, ATM, TCP/IP.</p> <p>2. Understand the tradeoffs involved in network design in a variety of environments- LAN and WAN, diverse link rates, and varied error and delay conditions.</p> <p>3. Understand the layered structure of protocols.</p> <p>4. Understand the importance of standards.</p> <p>5. Understand various concepts of broadband networks and subsequently conduct research in this field.</p>
38.	RF ICs	BEC-67	<p>1. Possess a basic knowledge of RF systems used in telecommunication industries.</p> <p>2. Understand the concepts of various components of circuits used in RF systems.</p> <p>3. Understand the methodology of using analog and digital modulation of an RF carrier.</p> <p>4. Understand the basic RF characterization utilizing gain, bandwidth, noise, phase noise, S parameters.</p> <p>5. Design LNAs, power amplifiers, mixer, multipliers, oscillators used in RF systems.</p> <p>6. Design basic RF circuits at the chip level.</p>
39.	Neural Networks	BEC-68	<p>1. To study the role of neural networks in engineering, artificial intelligence, and cognitive modelling.</p> <p>2. To study the learning process of the neural networks of increasing complexity and learning the generalization theory.</p> <p>3. To study the single-layer perceptron and multi-layered architecture of the neural networks.</p> <p>4. Ability to apply neural networks to particular applications, and to know what steps to take to improve the performance.</p>

## M.Tech. (Digital Systems)

### Course Outcomes

S.No	Subject Name	Paper Code	Course Outcomes (4)
1.	Advanced Microprocessor	MEC-101A	<ol style="list-style-type: none"><li>1.Foster ability to understand and program the 16-bit microprocessors.</li><li>2. Ability to design 8086 based microprocessor system using different peripheral devices.</li><li>3. Ability to understand internal architecture and features of 32-bit Microprocessors.</li><li>4. Foster ability to understand the internal architecture and features of 64-bit Microprocessors.</li></ol>
2.	Nano Design	MEC-102A	<ol style="list-style-type: none"><li>1. Development of MOS technology in the last three decades and understand the essential process of Nano CMOS design.</li><li>2. Understand the electrical behavior of MOS transistors and design issues related to current MOS transistors used in digital circuits.</li><li>3. Understand the impact of device parameters on modern CMOS logic circuits in terms of power, area and switching behavior.</li><li>4. Understand the physical design rules of nano CMOS circuits and study the modern Nano CMOS devices.</li></ol>

3.	Advanced Digital Communication	MEC-201	<ol style="list-style-type: none"> <li>1. Understand basic components and representation of digital communication systems.</li> <li>2. Design Optimum receivers with linear and decision-feedback equalizers.</li> <li>3. Analyze performance of Multichannel, Multicarrier Systems and Spread Spectrum Signals</li> <li>4. Analyse the digital communication system through Fading Multipath Channels.</li> </ol>
4.	Embedded Systems Design	MEC-104	<ol style="list-style-type: none"> <li>1. To understand hardware and software design requirements of embedded systems.</li> <li>2. To analyse the embedded systems' specification and develop software programs.</li> <li>3. To evaluate the requirements of programming Embedded Systems, related software architectures and tool chain for Embedded Systems</li> </ol>
5.	Digital Systems Design	MEC-105	<ol style="list-style-type: none"> <li>1: Summarize various delays in combinational circuit and its optimization methods.</li> <li>2: Design and implement hardware circuit to test performance and application.</li> <li>3: To test the performance of digital memory devices in modern digital systems</li> <li>4: Understand the architecture and use of microcontrollers for the basic operations and simulate using simulation software</li> </ol>
6.	Dissertation Part-I	MEC-130	<ol style="list-style-type: none"> <li>1: Understand the concepts of digital systems through design and research, theoretical and experimental approach.</li> <li>2: To identify a topic of interest and complete the preliminary work of undertaking case studies, data collection and feasibility studies.</li> <li>3: Learn computer based simulation tools/programming techniques to design or model solutions of identified research problems</li> </ol>

7.	Minor Project	MEC-120	<p>1: To understand the real time reseach project development environment in digital systems.</p> <p>2: To design and develop a project for simple research problem</p> <p>3: Analyze and validate the developed project</p>
8.	Seminar	MEC-140	<p>1: To study research papers for understanding of a novel research in the field of digital systems, to summarise facts and findings with clarity and review them.</p> <p>2: To identify key challenges of various cutting-edge technologies.</p> <p>3: To impart skills in preparing detailed report illustrating the project objectives and outcomes.</p> <p>4: To effectively communicate through an oral presentation before an evaluation committee.</p>
9.	Dissertation Part-II	MEC-150	<p>1: State research questions in the field of digital systems.</p> <p>2:Identify research methods related to problem statements through a systematic literature review in context of state of art..</p> <p>3: Critically formulate solution, analyse and evaluate and validate the work and understanding in relation to the agreed research problem</p> <p>4: able to prepare and effectively communicate in the form of a novel research paper, presentation and thesis report.</p>
10	Advanced Digital Signal Processing	MEC-202	<p>1: Understand theory of multirate DSP and wavelets and capable of designing wavelet filters.</p> <p>2: To be able to design prediction filters and understand solution of normal equation.</p> <p>3: Estimate power spectrum of signals using different methods.</p> <p>4: To study of basic wavelet transform methods</p>

11	Digital Control Systems	MEC-152	<p>1: Applications of sampling theorem in practical applications.</p> <p>2: Develop the ability to test the observability and controllability</p> <p>3: To design and test the compensator circuit.</p> <p>4: Basic knowledge of the optimal control techniques</p>
12	Low Power CMOS Circuits	MEC-153A	<p>Understand the overview of different logic families and their utility in low power CMOS circuits design.</p> <p>2. Understand the static CMOS circuit design and study the impact of emerging low power approaches in CMOS circuit design.</p> <p>3. Understand the different approaches of dynamic CMOS circuit design and its comparison with static CMOS circuit design in terms of performance parameters (power, area and switching behavior).</p> <p>4. Study the different approaches of dynamic power reduction techniques in VLSI circuits and understand the design consideration of SRAM/DRAM cell</p>
13	Computer Aided Design of Electronics Circuits	MEC-154	<p>1: Learn the CAD Tools, SPICE simulation and HDL and Verilog</p> <p>2: Modelling and characterization of semiconductor devices</p> <p>3: To design and simulate HDL and Verilog based circuit on FPGA kit</p> <p>4: To study of CAD tool</p>

14	Data and Computer Communication Networks	MEC-155	<p>1: Build an understanding of the fundamental concepts of Networking and data transmission protocols.</p> <p>2: Understand the design and implementation of networks.</p> <p>3: Know about how to measure and trouble shoot the performance of network.</p> <p>4: Awareness with cellular mobile computer communication.</p>
15	Digital Integrated Circuits	MEC-156	<p>1: To understand about modelling of various semiconductor devices</p> <p>2: To get complete understanding about different digital logic circuits.</p> <p>3: To Know various CMOS logics and their design aspects</p> <p>CO4: To get complete knowledge about different types of memories.</p>
16	Microcontrollers	MEC-157	<p>1: Analyse and introduce the basics of embedded systems and embedded microcontroller cores.</p> <p>2: Understand the basics of 8051 microcontroller and interfacing devices.</p> <p>3: Understand assembly language program for 8051</p> <p>4: Basic understanding of advanced microcontrollers like, AVR, MCS-96, and ARM microcontrollers.</p>
17	DSP Processors and Applications	MEC-158	<p>1: Build idea about issues involved in DSP processor design in terms of speed, cost, quantization error, and some other parameters.</p> <p>2: Understand the key DSP hardware elements, DSP processor, and its architecture.</p> <p>3: Identify software development tools like, assembler, linker, and simulator.</p> <p>4: Develop idea for the applications of DSP processors in the spectral analysis, filters, linear predictive coding, imaging, and instrumentation.</p>

18	RFIC	MEC-159	<p>1: Introduce with RF and wireless technology with related applications and design issues.</p> <p>2: Acquire the basic knowledge of LNA technologies, topologies, and the layout of cascade devices.</p> <p>3: Analyse general considerations and performance parameters of mixers and oscillators.</p> <p>4: To get idea about different power amplifiers, and RF transceiver design.</p>
19	Fundamental of Nanoscale Transistors	MEC-160*	<p>1: Understanding basic concepts of distribution functions, density of states, NEGF formalism, and scattering theory of MOSFET.</p> <p>2: Introduce characteristics and physical view of MOSFET, and ballistic MOSFET.</p> <p>3: Introducing various nanowire field effect transistors.</p> <p>4: Analysing Graphene nanoribbons field effect transistor, and Transition Metal Dichalcogenides Field Effect Transistors.</p>
20	VLSI Testing	MEC-161	<p>1. Analyse the use of procedural statements and routines in testbench design with Digital and Analog VLSI Testing, VLSI Technology Trends Affecting Testing.</p> <p>2. Analyse the various test generation methods for static &amp; dynamic VLSI Testing.</p> <p>3. Tackle the problems associated with testing of semiconductor circuits at earlier design levels so as to significantly reduce the testing costs.</p> <p>4. Understand test data analysis and defect level estimation.</p>
21	Artificial Intelligence	MEC-162	<p>1. Analyse the fundamental understanding of the history of artificial intelligence (AI) and its foundations.</p> <p>2. Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.</p> <p>3. Understand the various applications of AI techniques in intelligent agents, expert systems.</p>

			4. Demonstrate proficiency developing applications in an 'AI language', expert system shell, or datamining tool such as Fuzzy logic
22	Neural Networks	MEC-163	<ol style="list-style-type: none"> <li>1. Learn the concept of Neural Networks and its subsystems like ANN, learning concepts, neuron models</li> <li>2. Understand basic of Hop field model and different types of learning models</li> <li>3. Learn the concept of radial basis function and its learning laws and counter propagation networks</li> <li>4. Analyze the applications of neural networks</li> </ol>
23	Virtual Instrumentation	MEC-164	<ol style="list-style-type: none"> <li>1. Understand fundamentals of virtual instrumentation</li> <li>2. Understand the concepts of graphical programming</li> <li>3. Represent and review signals in digital domain</li> <li>4. Identify the analysing tools and simple programming of them.</li> </ol>
24	Digital Mobile Communication Systems	MEC-165	<ol style="list-style-type: none"> <li>1. Analyse and understand the various multiple access techniques in digital mobile communication system</li> <li>2. understand the concept of spread spectrum communication system</li> <li>3. Apply the concept of GSM in real time applications</li> <li>4. Identify the electronic navigation &amp; surveillance systems</li> </ol>
25	Optoelectronics Devices & Circuits	MEC-166	<ol style="list-style-type: none"> <li>1. Explain the fundamental concepts of optoelectronic devices and its position in modern physics.</li> <li>2. Demonstrate accurate and efficient use of semiconductor materials.</li> </ol>

			3. Compare the structural characteristics of different optical devices and the different fabrication processes.1.
26	Organic Electronics Devices and Circuits	MEC-167	<ol style="list-style-type: none"> <li>1. Ability to analyse organic material, polymer, and semiconductor. Merit and demerits of inorganic semiconductors.</li> <li>2. Ability to analyse Organic Thin Film Transistors (OTFTs) and Modelling of Organic Devices.</li> <li>3. Ability to describe the behaviour of Organic Light Emitting Diodes (OLEDs) and Organic Solar Cells.</li> <li>4. Ability to describe the Organic Thin Film Transistors Applications.</li> </ol>
27	High Speed Devices and Circuits	MEC-168	<ol style="list-style-type: none"> <li>1: To understand and draw the characteristics of semiconductor materials</li> <li>2: Modelling and characterization of high-speed GaAs based device</li> <li>3: To study of V-I characteristics of MESFET</li> <li>4: Performance study of HEMT and SiGe HBT based devices</li> </ol>
28	Introduction & Design of Photovoltaic Systems	MEC-169*	<ol style="list-style-type: none"> <li>1. Ability to describe the different parameters of photovoltaic cell, general design tools used for PV cell.</li> <li>2. Ability to understand Series and Parallel Interconnection, Energy From Sun, Incident Energy Estimation.</li> <li>3. Ability to describe the Sizing of PV cell, MPPT concept, MPPT algorithms, PV-Battery Interfaces: Direct PV-battery connection, Charge controller.</li> <li>4. Ability to describe the Peltier device-principle, PV and Water Pumping, AC to DC transformations, DC to AC transformations.</li> </ol>

## **Program Core for M.Tech. (Communication Engineering)**

### **Course outcomes**

S.no	Subject	Subject Code	Course Outcomes
1.	Advanced Digital Communication	MEC-201	1. Understand basic components and representation of digital communication systems. 2. Design Optimum receivers with linear and decision-feedback equalizers. 3. Analyze performance of Multichannel, Multicarrier Systems and Spread Spectrum Signals

			4. Analyse the digital communication system through Fading Multipath Channels.
2.	Advanced Digital Signal Processing	MEC-202	<p>1. Understand theory of multirate DSP and wavelets and capable of designing wavelet filters.</p> <p>2. To be able to design prediction filters and understand solution of normal equation.</p> <p>3. Estimate power spectrum of signals using different methods.</p> <p>4. Know application of DSP.</p>
3.	Optical Communication System	MEC-203A	<p>1. Know the fundamentals of active and passive components of optical communication system.</p> <p>2. Knowledge of working and analysis of optical amplifiers and important parts at the transmitter (Semiconductor lasers/LEDs, modulators etc) as well as at the receiver sides (optical detector etc.) of the optical communications system.</p> <p>3. To introduce the different types of optical amplifiers SOA, EDFA and RA with respect to operation principle and its applications.</p> <p>4. To familiarize the theory of non-linearity and optics of anisotropic media and about the nonlinear effects and Solitons.</p>
4.	Optical Wireless Communication	MEC-204A	<p>1. Ability to understand the basic concepts and regulation of optical sources in OWC channel. 2. Analyse the basic difference between the indoor and outdoor OWC and challenges occurred in the communication. 3. Understanding the concept and application of different modulation techniques on outdoor FSO channel. 4 Analysis of Communication system based on BER analysis, considering the effect of different atmospheric turbulence and implementation of diversity technique for the improvement of channel error.</p>

5.	Mobile Communication Systems	MEC-205A#	<ol style="list-style-type: none"> <li>1. Analyze the mobile radio propagation and the channel modelling.</li> <li>2. Understand the concept of mobile wireless communication.</li> <li>3. Understand the concept of cellular communication.</li> <li>4. Knowledge of evolution of Wireless technologies.</li> </ol>
6.	Minor Project	MEC-220	<ol style="list-style-type: none"> <li>1: To understand the real time reseach project development environment in communication engineering.</li> <li>2: To design and develop a project for simple research problem</li> </ol> <p>CO3: Analyze and validate the developed project</p>
7.	Dissertation Part-I	MEC-230	<ol style="list-style-type: none"> <li>1: Understand the concepts of communication engineering through design and research, theoretical and experimental approach.</li> <li>2: To identify a topic of interest and complete the preliminary work of undertaking case studies, data collection and feasibility studies.</li> <li>3: Learn computer based simulation tools/programming techniques to design or model solutions of identified research problems</li> </ol>
8.	Seminar	MEC-240	<ol style="list-style-type: none"> <li>1: To study research papers for understanding of a novel research in the field of communication engineering, to summarise facts and findings with clarity and review them.</li> <li>2: To identify key challenges of various cutting-edge technologies.</li> <li>3: To impart skills in preparing detailed report illustrating the project objectives and outcomes.</li> <li>4: To effectively communicate through an oral presentation before an evaluation committee.</li> </ol>
9.	Dissertation Part-II	MEC-250	<ol style="list-style-type: none"> <li>1: State research questions in the field of communication engineering.</li> <li>2:Identify research methods related to problem statements through a systematic literature review in context of state of art..</li> <li>3: Critically formulate solution, analyse and evaluate and validate the work and understanding in relation to the agreed</li> </ol>

			<p>research problem</p> <p>4: able to prepare and effectively communicate in the form of a novel research paper, presentation and thesis report.</p>
10.	ISDN and Broadband Networks	MEC-251	<ol style="list-style-type: none"> <li>1. Understand the basic concepts of ISDN channels, layered model, protocols and interworking between computer networks and switching components.</li> <li>2. Understand concepts of broadband networks and functioning of Frame Relay.</li> <li>3. Understand the functioning of ATM standard, protocols and services.</li> <li>4. Know about SMDS interface services and ISDN protocols.</li> </ol>
11.	Microwave Devices & Ckts	MEC-252	<ol style="list-style-type: none"> <li>1. Understand the operation of active microwave devices &amp; its uses for microwave communications</li> <li>2. Know the design concepts of passive microwave components and its application in microwave power distribution</li> <li>3. Analyse and synthesize Microwave networks</li> <li>4. Understand and explain the fabrication steps of Microwave ICs and estimate its performance characteristics</li> </ol>
12.	Opto-Electronics Integrated Circuits	MEC-253	<ol style="list-style-type: none"> <li>1. Understand optoelectronic properties of semiconductor.</li> <li>2. Understand the theory of designing optical sources.</li> <li>3. Knowledge about the different optical detection scheme.</li> <li>4. Evaluation of optoelectronic modulation and switching devices.</li> </ol>
13.	Digital Image Processing	MEC-254	<ol style="list-style-type: none"> <li>1. Review the fundamental concepts of a digital image processing system.</li> <li>2. Analyze images in the frequency domain using various transforms.</li> <li>3. Evaluate the techniques for image enhancement and image restoration.</li> <li>4. Interpret image segmentation and representation techniques.</li> </ol>

14.	Advanced Coding Theory	MEC-256	<ol style="list-style-type: none"> <li>1. Understand the basics of information and coding theories &amp; the various capacity reduction-based coding techniques for text, audio and speech type of data.</li> <li>2. Able to understand the tree diagram, different algorithms, errors in coding and decoding.</li> <li>3. Able to understand the various M-ary signaling – One and Two-dimensional TCM – Multiple TCM – Decoding and performance analysis – Implementational considerations.</li> <li>4. Able to understand the M-ary signaling – One and Two-dimensional TCM – Multiple TCM – Decoding and performance analysis – Implementational considerations.</li> </ol>
15.	Embedded Systems	MEC-257	<ol style="list-style-type: none"> <li>1. The student will be able to understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.</li> <li>2. Student will be able to get familiarized with programming environment to develop embedded solutions.</li> <li>3. Student will be able to program ARM microcontroller to perform various tasks.</li> <li>4. Student will be able to understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices.</li> </ol>
16.	Internet of Things (IOT)	MEC-258	<ol style="list-style-type: none"> <li>1. Knowledge about IoT architecture outline and standards considerations.</li> <li>2. Review IoT architectures at state of art.</li> <li>3. Understand concept of IoT data link layer &amp; network layer protocols.</li> <li>4. Understand the concept of transport &amp; session layer protocols.</li> </ol>
17.	Linear Algebra and Stochastic Process	MEC-259	<ol style="list-style-type: none"> <li>1. Understand concept of vector spaces.</li> <li>2. Understand the concept of probability spaces.</li> <li>3. Summarize the concepts associated with random process and to compute the power spectral density of the output of the system.</li> <li>4. Recognize the usage of random process in telecommunication engineering and to solve the corresponding problems.</li> </ol>

18.	RFIC	MEC-260	<p>1: Introduce with RF and wireless technology with related applications and design issues.</p> <p>2: Acquire the basic knowledge of LNA technologies, topologies, and the layout of cascade devices.</p> <p>3: Analyse general considerations and performance parameters of mixers and oscillators.</p> <p>4: To get idea about different power amplifiers, and RF transceiver design.</p>
19.	Neural Networks	MEC-163	<p>1. Learn the concept of Neural Networks and its subsystems like ANN, learning concepts, neuron models</p> <p>2. Understand basic of Hop field model and different types of learning models</p> <p>3. Learn the concept of radial basis function and its learning laws and counter propagation networks</p> <p>4. Analyze the applications of neural networks</p>
20.	Antenna Design and MIMO Systems	MEC-261	<p>1. Know the fundamentals of antenna systems, Antenna parameters, and understand antenna radiation mechanism</p> <p>2. Understand different types of antenna arrays and its applications in communication systems, Design and analyze the antenna arrays for wireless communications</p> <p>3. Learn the concepts, design, operations and applications of printed antennas and wideband antennas</p> <p>4. Analyze performance of the multiple-input-multiple-output (MIMO) antennas</p>
21.	Satellite Comm.	MEC-262	<p>1. Understand the concepts related to satellite communication and its evolution</p> <p>2. Learn the concept of satellite link design</p> <p>3. Design of satellite subsystems like space segment and earth segment</p> <p>4. Comparative analysis of competitive satellite services</p>
22.	Inter & Intra-net	MEC-263	<p>1. Understand the characteristics of Client/Server systems, protocols and networking models</p> <p>2. Understand the Client/Server Architecture and Network Programming</p> <p>3. Learn the protocols of transport layer in Internet</p> <p>4. Understanding the concept of Internet and its infrastructue, FTP protocols and the World wide web</p>

23.	Body Area Networks	MEC-264	<ol style="list-style-type: none"> <li>1. Understand the basic concepts of Body area network</li> <li>2. Design, analysis and monitoring of system hardwares for wirelss body area network</li> <li>3. Design of network topologies and protocols for wireless body area network</li> <li>4. Antenna design and analysis for body area network</li> </ol>
24.	IC Design	MEC-265	<ol style="list-style-type: none"> <li>1. Knowledge of Analog and Digital ICs and their design challenges CO2. Able to understand IC fabrication processes</li> <li>3. Able to design functions using various CMOS logics.</li> <li>4. Able to design integrated circuits using different logics</li> </ol>

### **B. Tech. (Computer Science & Engineering)**

**Course outcome:**

<b>S. no</b>	<b>Subject</b>	<b>Subject Code</b>	<b>Course Outcomes</b>
1	INTRODUCTION TO C PROGRAMMING	BCS-01	<ol style="list-style-type: none"> <li>1. Read and understand C programs.</li> <li>2. Discuss basic theory and practice of programming</li> <li>3. Design and implement practical programs using C language</li> <li>4. Use compiler and feel comfortable with Windows environment</li> <li>5. Identify and fix common C errors</li> </ol>
2	INTRODUCTION TO C & FUNCTIONAL PROGRAMMING	BCS-02	<ol style="list-style-type: none"> <li>1. Basic Terminology used in Computer Programming.</li> <li>2. Programs Development in C Language by Writing, Compiling and Debugging.</li> <li>3. Design of Programs involving Simple Statements, Conditional Statements, Iterative Statements, Array, Strings, Functions, Recursion, Structure and Union.</li> <li>4. Difference between Call by Value and Call by Reference.</li> <li>5. Dynamic Memory Allocations and Use of Pointers.</li> <li>6. Basic Operations on a File.</li> <li>7. Basics of Functional Programming.</li> </ol>
3.	SOFTWARE LAB-I	BCS-03	<ol style="list-style-type: none"> <li>1. Basic Terminology used in C, Use of Standard C Library and Evaluation of Expressions.</li> <li>2. Programming in C Language by Writing, Compiling and Debugging.</li> </ol>

			<p>3. Designing of Programs involving Simple Statements, Conditional Statements, Iterative Statements, Array, Strings, Functions, Recursion, Structure and Union.</p> <p>4. Basic Pointer Programming.</p> <p>5. Programming for Searching and Sorting.</p> <p>6. Basic Operations on a File.</p> <p>7. Basic Knowledge of Functional Programming.</p>
4.	OBJECT ORIENTED MODELING & C++	BCS-04	<p>1. Understand the Concept of Object Oriented Programming and Master OOP using C++.</p> <p>2. Implementing the Real Life Problems using Object Oriented Techniques.</p> <p>3. Improvement in Problem Solving Skills.</p>
5.	SOFTWARE LAB-II	BCS-05	<p>1. Differentiate between structures oriented programming and object oriented programming.</p> <p>2. Use object oriented programming language like C++ and associated libraries to develop object oriented programs.</p> <p>3. Understand and apply various object oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve various computing problems using C++ language.</p> <p>4. Apply concepts of operator-overloading, constructors and destructors.</p> <p>5. Reuse the code and write the classes which work like built-in types.</p> <p>6. Apply object -oriented concepts in real world applications.</p>
6.	DIGITAL CIRCUITS AND LOGIC DESIGN	BCS-11	<p>1. Design a finite state machine and sequential logic design.</p> <p>2. Synthesize a logic design from a natural language description of a problem.</p> <p>3. Realize a complete arithmetic and logic unit.</p> <p>4. Generate a realization of combinational logic in a programmable gate array.</p> <p>5. Simulate a complete design to evaluate functional correctness and timing.</p>
7.	PRINCIPLES OF DATA STRUCTURES THROUGH C/C++	BCS-12	<p>1. Describe how arrays, records, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.</p> <p>2. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs.</p> <p>3. Compare and contrast the benefits of dynamic and static data structures implementations.</p> <p>4. Identity the alternative implementations of data structures with respect to its performance to solve a real world problem.</p>

			<p>5. Demonstrate organization of information using Trees and Graphs and also to perform different operations on these data structures.</p> <p>6. Design and implement an appropriate organization of data on primary and secondary memories for efficient its efficient retrieval.</p> <p>7. Discuss the computational efficiency of the principal algorithms for sorting, searching and hashing.</p> <p>8. Describe the concept of recursion, its application, its implementation and removal of recursion.</p>
8.	INTERNET & JAVA PROGRAMMING	BCS-13	<p>1. To identify different components of client server architecture on Internet computing.</p> <p>2. Knowledge of how to develop and deploy applications and applets in JAVA.</p> <p>3. Knowledge of how to develop and deploy GUI using JAVA Swing and AWT.</p> <p>4. Design, develop and implement interactive web applications.</p> <p>5. Be able to implement, compile, test and run JAVA programs comprising more than one class and to address a particular software problem.</p> <p>6. To understand the basic concepts of Internet services and related technologies.</p> <p>7. Develop programs using the JAVA Collection API as well as the JAVA standard class library.</p>
9.	SOFTWARE LAB- III	BCS-14	<p>1. Analyze and represent problems in the object-oriented programming paradigm.</p> <p>2. Design and implement object-oriented software systems.</p> <p>3. Demonstrate the efficient implementation of various Data Structures in memory and their operation.</p> <p>4. Build programs on fundamental algorithmic problems including Searching, Sorting, Tree Traversals, Graph traversals, and shortest paths.</p> <p>5. Explain the main principles for client-server programming</p> <p>6. Design and implement Client-side systems, server-side system and event-driven graphical user interface.</p> <p>7. Integrate their knowledge and skills to produce a real life application.</p>
10.	DATABASE MANAGEMENT SYSTEMS	BCS-15	<p>1. List and define the fundamental concepts of database management system.</p> <p>2. Manually execute a given (simple) database design a</p>

			<p>transaction over it.</p> <p>3. Manually infer the type of a given (simple) database transaction.</p> <p>4. Implement (simple) algorithms and data structures as database transaction.</p> <p>5. Design (large) databases that are modular and have reusable components.</p> <p>6. Explain on a simple problem how to apply concurrency control over concurrent database transactions.</p>
11.	THEORY OF COMPUTATION	BCS-16	<p>1. Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.</p> <p>2. Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving.</p> <p>3. Prove the basic results of the Theory of Computation.</p> <p>4. State and explain the relevance of the Church-Turing thesis.</p>
13.	COMPUTER ORGANIZATION & DESIGN	BCS-17	<p>1. To understand the basic structure and operation of digital computer.</p> <p>2. To study the design of arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.</p> <p>3. To study the two types of control unit techniques and the concept of Pipelining.</p> <p>4. To study the hierarchical memory system including cache memories and virtual memory.</p> <p>5. To study the different ways of communicating with I/O devices and standard I/O interfaces</p>
14.	SOFTWARE LAB-IV	BCS-18	<p>1. Tools and techniques for optimizations in design processes.</p> <p>2. Design and develop the software packages/ systems to support the management of an organization in question.</p> <p>3. Design and develop a DBMS.</p>
15.	WEB DESIGNING	BCS-19	<p>1. Identify common design mistakes when creating a web based application.</p> <p>2. Discuss the process of editing a web page using text editors and web page editors.</p> <p>3. Cover commonly used HTML tags and discuss how this knowledge is important to a web designer.</p> <p>4. Demonstrate an understanding of basic CSS, XML</p>
16.	PRINCIPLES OF	BCS-26	<p>1. Understand the structure and functions of OS.</p>

	OPERATING SYSTEMS		<ol style="list-style-type: none"> <li>2. Learn about Processes, Threads and Scheduling algorithms.</li> <li>3. Understand the principles of concurrency and Deadlocks.</li> <li>4. Learn various memory management scheme.</li> <li>5. Study I/O management and File systems.</li> </ol>
17.	COMPUTER GRAPHICS	BCS-27	<ol style="list-style-type: none"> <li>1. Have a basic understanding of the core concepts of computer graphics.</li> <li>2. Be capable of using OpenGL to create interactive computer graphics.</li> <li>3. Understand a typical graphics pipeline.</li> <li>4. Have made pictures with their computer.</li> </ol>
18.	DESIGN & ANALYSIS OF ALGORITHMS	BCS-28	<ol style="list-style-type: none"> <li>1. Define the basic concepts of algorithms and analyze the performance of algorithms.</li> <li>2. Discuss various algorithm design techniques for developing algorithms.</li> <li>3. Discuss various searching, sorting and graph traversal algorithms.</li> <li>4. Understand NP completeness and identify different NP complete problems.</li> <li>5. Discuss various advanced topics on algorithm</li> </ol>
19.	ADVANCED COMPUTER ARCHITECTURE	BCS-29	<ol style="list-style-type: none"> <li>1. Understand the advanced concepts of computer architecture.</li> <li>2. Exposing the major differentials of RISC and CISC architectural characteristics.</li> <li>3. Investigating modern design structures of Pipelined and Multiprocessors systems.</li> <li>4. Become acquainted with recent computer architectures and I/O devices, as well as the low-level language required to drive/manage these types of advanced hardware.</li> <li>5. Preparing selected reports that imply some emergent topics supporting material essence.</li> </ol>
20.	SEMINAR	BCS-30	<ol style="list-style-type: none"> <li>1. To expose students to the 'real' working environment and get acquainted with the organization structure, business operations and administrative functions.</li> <li>2. Students will demonstrate the ability to distinguish opinions and beliefs from researched claims and evidence and recognize that kinds of evidence will vary from subject to subject.</li> <li>3. Students will demonstrate the ability to evaluate, credit, and synthesize sources.</li> </ol>
21.	PRINCIPLE OF	BCS-31	<ol style="list-style-type: none"> <li>1. Define the phases of a typical compiler, including the</li> </ol>

	COMPILER DESIGN		<p>front-- and back-- end.</p> <p>2. Identify tokens of a typical high---level programming language; define regular expressions for tokens and design; implement a lexical analyzer using a typical scanner generator.</p> <p>3. Explain the role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation; design and implement a parser using a typical parser generator.</p> <p>4. Apply an algorithm for a top---down or a bottom---up parser construction; construct a parser for a small context--free grammar.</p> <p>5. Explain the role of a semantic analyzer and type checking; create a syntax---directed definition and an annotated parse tree; describe the purpose of a syntax tree.</p> <p>6. Explain the role of different types of runtime environments and memory organization for implementation of typical programming languages.</p> <p>7. Describe the purpose of translating to intermediate code in the compilation process.</p> <p>8. Design and implement an intermediate code generator based on given code patterns.</p>
22.	ARTIFICIAL INTELLIGENCE	BCS-32	<p>1. The intelligent agents--software or hardware entities that perform useful tasks with some degree of autonomy.</p> <p>2. An understanding of the basic areas of artificial intelligence including problem solving, knowledge representation, reasoning, decision making, planning, perception and action, and learning -- and their applications (e.g., data mining, information retrieval)</p> <p>3. Design and implement key components of intelligent agents of moderate complexity in JAVA and /or Lisp or Prolog and evaluate their performance.</p> <p>4. Develop familiarity with current research problems, research methods, and the research literature in AI</p>
23.	WEB TECHNOLOGIES	BCS-33	<p>1. Identify common design mistakes when creating a web-based application.</p> <p>2. Discuss the process of editing a web page using text editors and web page editors.</p> <p>3. Cover commonly used HTML tags and discuss how this knowledge is important to a web designer.</p> <p>4. Demonstrate an understanding of basic CSS, XML, JAVA</p>

			Script, JSP, ASP.NET and PHP.
24.	COMPUTER NETWORKS	BCS-34	<ol style="list-style-type: none"> <li>1. Understand the concepts of communication architecture and protocols</li> <li>2. Identify different types of communication mediums and techniques</li> <li>3. Define and identify different types of multiplexing, data encoding, modulation, and switching techniques</li> <li>4. Illustrate different standards of Local Area Network in terms of technologies and hardware used</li> <li>5. Illustrate network addressing and analysis techniques</li> <li>6. Understand the Wide Area Network technologies</li> <li>7. Understand the network routing concepts</li> <li>8. Understand the internetworking concepts and architectures</li> <li>9. Understand the TCP/IP protocols and design architectures</li> </ol>
25.	SOFTWARE ENGINEERING	BCS-35	<ol style="list-style-type: none"> <li>1. Enhance the Software Project Management skills.</li> <li>2. Develop functioning software which benchmarks to the international standards.</li> </ol>
26.	DATABASE MANAGEMENT SYSTEM, DATA MINING & WAREHOUSING	BCS-36	<ol style="list-style-type: none"> <li>1. To educate students with fundamental concepts of Database Management System, Data Models, Different Data Base Languages.</li> <li>2. To analyze Database design methodology.</li> <li>3. To understand the basic principles, concepts and applications of data warehousing and data mining</li> <li>4. To introduce the task of data mining as an important phase of knowledge recovery process</li> <li>5. Ability to do Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment</li> <li>6. Have a good knowledge of the fundamental concepts that provide the foundation of data mining</li> </ol>
27.	NETWORK SECURITY & CRYPTOGRAPHY	BCS-37	<ol style="list-style-type: none"> <li>1. Understand the basic concept of Cryptography and Network Security, their mathematical models</li> <li>2. Various types ciphers, DES, AES, message Authentication, digital Signature, System</li> <li>3. Network security, Viruses, worms and firewall</li> <li>4. Understand mathematical foundation required for various cryptographic Algorithms.</li> <li>5. DES, AES, IDEA and RC5 cryptographic technique</li> <li>6. Public and Private Key cryptography.</li> <li>7. Various Message Digest Algorithm,</li> </ol>

			8. Comprehend and apply email security services and mechanisms 9. Comprehend and apply IP security mechanisms 10. Comprehend and apply authentication services and mechanisms 11. Comprehend and apply WEB security mechanisms 12. Design of Firewall, Intrusion and Filtering
28	PROJECT PART- I	BCS-40	1. Learning of latest trends and technology in selected field of interest. 2. Apply the acquired knowledge to practical situations. 3. Develop self-interest to explore the selected technical field of interest in future. 4. Acquire presentation skills. 5. Develop better interpersonal communication skills and increase self confidence
29.	INTRODUCTION TO MACHINE LEARNING	BCS-41	1. To explain theory underlying machine learning 2. To construct algorithms to learn linear and non-linear models 3. To implement data clustering algorithms 4. To construct algorithms to learn tree and rule-based models 5. To apply reinforcement learning techniques
30.	PARALLEL & DISTRIBUTED COMPUTING	BCS-42	1. understand and account for models, limitations, and fundamental concepts in the area of message passing and shared memory concurrency, and apply this understanding to example systems and algorithms 2. adapt, and design algorithms for execution in parallel and distributed settings, and analyze the algorithms for correctness, reliability, security, and performance
31.	MOBILE COMPUTING	BCS-43	1. Demonstrate the actual meaning of power and energy management in wireless mobile networks. 2. Outline knowledge on Mobile IP. 3. Be familiar with the network protocol stack 4. Learn the basics of mobile telecommunication system 5. Be exposed to Ad-Hoc networks 6. Gain knowledge about different mobile platforms and application development
32.	OBJECT ORIENTED TECHNIQUES & JAVA PROGRAMMING	BCS-44	1. Knowledge of how to develop and deploy applications and applets in JAVA. 2. Knowledge of how to develop and deploy GUI using JAVA Swing and AWT. 3. Design, develop and implement interactive web

			<p>applications.</p> <p>4. Be able to implement, compile, test and run JAVA programs comprising more than one class and to address a particular software problem.</p> <p>5. Develop programs using the JAVA Collection API as well as the JAVA standard class</p>
33.	INDUSTRIAL / PRACTICAL TRAINING	BCS-45	<p>1. The main objective of the Industrial Training is to experience and understand real life situations in industrial organizations and their related environments and accelerating the learning process of how student's knowledge could be used in a realistic way.</p> <p>2. In addition to that, industrial training also makes one understand the formal and informal relationships in an industrial organization so as to promote favourable human relations and teamwork. Besides, it provides the exposure to practice and apply the acquired knowledge "hands - on" in the working environment.</p> <p>3. Industrial training also provides a systematic introduction to the ways of industry and developing talent and attitudes, so that one can understand how Human Resource Development works. Moreover, students can gain hands-on experience that is related to the student understanding so that the student can relate to and widen the skills that have been learnt while being in university. Industrial training also exposes the students to the real career world and accustoms them to an organizational structure, business operation and administrative functions.</p> <p>4. Furthermore, students implement what they have learned and learn more throughout this training. Besides, students can also gain experience to select the optimal solution in handling a situation. During industrial training students can learn the accepted safety practices in the industry.</p> <p>5. Students can also develop a sense of responsibility towards society</p>
34.	PROJECT PART-II	BCS-50	<p>1. B. Tech. project is designed to allow students to work with faculty members on one long project that may require effort over two semesters. The final year project gives students an excellent opportunity to develop and demonstrate their innovation skills, design skills and research interests. These projects quite often lead to publications of their original work.</p>

			<ul style="list-style-type: none"> <li>2. Develops ability of report writing.</li> <li>3. Develops ability to be aware of current trends in specific area of interest</li> </ul>
35.	ADVANCE JAVA	BCS-51	<ul style="list-style-type: none"> <li>1. Be proficient in using JAVA Servlets and related Web development tools</li> <li>2. Identify different components of client/server Architecture on Internet computing</li> <li>3. Design, develop and implement interactive Web applications</li> <li>4. Know how to develop and deploy applications and applets in JAVA</li> <li>5. Know how to design and develop GUI using JAVA Swing and AWT</li> </ul>
36.	NET TECHNOLOGY	BCS-52	<ul style="list-style-type: none"> <li>1. Understand the most important features of .NET Framework technology</li> <li>2. Use Visual Studio .NET and .NET Framework SDK to design, run and debug simple C# console applications</li> <li>3. Write programs that use fundamental C# programming tools.</li> <li>4. Use advanced OOP tools when designing C# programs.</li> <li>5. Design web forms using ASP.Net</li> </ul>
37.	LAMP TECHNOLOGY	BCS-53	<ul style="list-style-type: none"> <li>1. Use Open Source Operating system and its distributions like Fedora, Google chrome OS, Ubuntu.</li> <li>2. To comprehend framework of BSD (Berkley System Distribution) and its installation</li> <li>3. Study of Web technologies based on openSoftware's LAMP (Linux Apache MySql and PHP/Python)</li> <li>4. To Learn HTML, XHTML, PHP and JAVA Script</li> </ul>
38.	NETWORK PROGRAMMING	BCS-54	<ul style="list-style-type: none"> <li>1. To write socket API based programs</li> <li>2. To design and implement client-server applications using TCP and UDP sockets</li> <li>3. To analyze network programs</li> </ul>
39.	MOBILE APPLICATION PROGRAMMING	BCS-55	<ul style="list-style-type: none"> <li>1. Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.</li> <li>2. Understand how to work with various mobile application development frameworks.</li> <li>3. Learn the basic and important design concepts and issues of development of mobile applications.</li> <li>4. Understand the capabilities and limitations of mobile</li> </ul>

			devices
40.	LINUX ADMINISTRATION AND SYSTEM CALL PROGRAMMING	BCS-56	<ol style="list-style-type: none"> <li>1. use the LINUX based system through various commands</li> <li>2. understand the task of LINUX system administration</li> <li>3. write programs for system programming like IPC, semaphore etc.</li> </ol>
41.	DATABASE ADMINISTRATION WITH ORACLE	BCS-57	<ol style="list-style-type: none"> <li>1. Gain a conceptual understanding of the Oracle database architecture and how its components work and interact with one another.</li> <li>2. will also learn how to create an operational database and properly manage the various structures in an effective and efficient manner including performance monitoring, database security, user management, and backup/recovery techniques</li> <li>3. Establish and in depth understanding of Database Administration using the DBMS Interfaces</li> <li>4. Create and understand the application of user rolls, privileges, and the security of the database.</li> <li>5. Discuss and understand the concepts of Backup and Recovery Procedures</li> </ol>
42.	DATA WAREHOUSING & DATA MINING	BCS-58	<ol style="list-style-type: none"> <li>1. Approach business problems data-analytically by identifying opportunities to derive business value from data.</li> <li>2. know the basics of data mining techniques and how they can be applied to extract relevant business intelligence</li> </ol>
43.	ANALYTICS AND SYSTEMS OF BIG DATA	BCS-59	<ol style="list-style-type: none"> <li>1. Demonstrate the knowledge of big data, data science, data analytics, distributed file systems, parallel Map Reduce paradigm, NoSQL, machine learning, etc</li> <li>2. Program and implement examples of big data and NoSQL applications using open source Hadoop, HDFS, Map Reduce, Hive, Pig, Mahout, etc</li> <li>3. Read current research papers and implement example research group project in big data</li> </ol>
44.	GAME THEORY	BCS-60	<ol style="list-style-type: none"> <li>1. Discuss the basics of games and the mathematics for games as well as the typical application areas for game theory.</li> <li>2. Explain the concepts of non-cooperative and cooperative games and the basic computational issues.</li> <li>3. Describe the concepts of Games with Perfect Information as well as Games with Imperfect Information.</li> <li>4. Study the non-cooperative game theory.</li> <li>5. Designing the mechanisms and understand the computational applications of mechanism design.</li> </ol>

45.	ADVANCE PROGRAMMING TECHNIQUES	BCS-66	<ol style="list-style-type: none"> <li>1. Develop algorithms from user problem statements.</li> <li>2. Express the solutions to computer -oriented problems using pseudo code.</li> <li>3. Proficiently transform designs of problem solutions into a standard programming language.</li> <li>4. Use an integrated programming environment to write, compile, and execute programs involving a small number of source files.</li> <li>5. Apply debugging and testing techniques to locate and resolve errors, and to determine the effectiveness of a program.</li> <li>6. Apply standard/structured programming techniques including design approaches, use of functions/methods, use of documentation, and avoidance of excessive branching.</li> <li>7. Proficiently use fundamental programming elements including: variable declaration, use of data types and simple data structures (arrays and objects), decision structures, loop structures, input and output for console and text files, and functions/methods.</li> </ol>
47.	COMPUTER VISION: FOUNDATIONS AND APPLICATIONS	BCS-67	<ol style="list-style-type: none"> <li>1. Understand the various operations performed on 2D image.</li> <li>2. To recover the information, knowledge about the objects in the scene and projection geometry and understanding of 3D image.</li> </ol>
48.	SOFTWARE REUSE	BCS-68	<ol style="list-style-type: none"> <li>1. To provide a solid background knowledge about software Reuse.</li> <li>2. To educate Metrics used in software reuse.</li> <li>3. To provide Knowledge about various frameworks and COTS.</li> </ol>
49.	SOFTWARE VERIFICATION & VALIDATION	BCS-69	<ol style="list-style-type: none"> <li>1. Understand the concepts and theory related to software testing.</li> <li>2. Understand different testing techniques used in designing test plans, developing test suites, and evaluating test suite coverage</li> <li>3. Understand the relationship between black-box and white-box testing and know how to apply as appropriate.</li> <li>4. Learn to use automated testing tools in order to measure code coverage.</li> <li>5. Understand how software developers can integrate a testing framework into code development in order to incrementally develop and test code.</li> </ol>
50.	SOFTWARE	BCS-70	<ol style="list-style-type: none"> <li>1. Understand Architectural styles and Quality Attributes.</li> </ol>

	DESIGN & CONSTRUCTION		<ol style="list-style-type: none"> <li>2. Understand common tools and terminology related to software design and construction.</li> <li>3. Understand the role of the Software Architect with a development project.</li> <li>4. Use methods for constructing and evaluating architectures.</li> <li>5. Understand Advance Concepts in design and construction</li> </ol>
51.	SOFTWARE QUALITY MANAGEMENT	BCS-71	<ol style="list-style-type: none"> <li>1. Define quality assurance plans</li> <li>2. Apply quality assurance tools &amp; techniques</li> <li>3. To learn about standards and certifications</li> <li>4. To describe procedures and work instructions in software organizations</li> </ol>
52.	ASPECT ORIENTED PROGRAMMING	BCS-72	<ol style="list-style-type: none"> <li>1. To master basics of aspect-oriented software development, this enables a higher degree of the separation of concerns through crosscutting concern modularization.</li> <li>2. Provides an overview of aspect-oriented approaches to software development throughout all of its stages, as well as programming languages connected with these approaches. The course also covers the relationship of aspect-oriented software development and software product lines.</li> <li>3. Will gain experience with Aspect J, which is the most important aspect-oriented programming language of today</li> </ol>
53.	NEURAL NETWORK & FUZZY SYSTEM	BCS-73	<ol style="list-style-type: none"> <li>1. Basics of ANN and its learning algorithms.</li> <li>2. Fuzzy principles and relations.</li> <li>3. Genetic algorithms and its applications.</li> <li>4. Hybrid systems and usage of MATLAB toolbox</li> </ol>
54.	FUNDAMENTALS OF CLOUD COMPUTING	BCS-74	<ol style="list-style-type: none"> <li>1. understand the concept of Existing Hosting Platforms and computing paradigms currently being used in industry and academia</li> <li>2. Identify the issues related to Cloud Computing. To analyse IASS/ PAAS and SAAS services along with Cloud models.</li> <li>3. Understand the concepts of various Cloud Platforms with comparative analysis and the concepts of virtualization with the advantages in Cloud.</li> </ol>
55.	ADVANCED MULTI-CORE SYSTEMS	BCS-75	<ol style="list-style-type: none"> <li>1. Understand the architectural techniques used in modern multi-core chips for mobile and server systems.</li> <li>2. Understand the hardware support for security and parallel programming, and advanced memory systems.</li> <li>3. Become acquainted with recent processor design techniques (superscalar cores, VLIW cores, multi-threaded cores, energy-efficient cores), cache coherence, memory</li> </ol>

			<p>consistency, vector processors, graphics processors, heterogeneous processors.</p> <p>4. Exposing with complex trade-offs between performance-power-complexity, hardware software interactions, and architecture-technology interactions.</p>
56.	CRYPTOGRAPHY AND INFORMATION SECURITY	BCS-76	<p>1. Encryption techniques and key generation techniques.</p> <p>2. Authentication and security measures.</p> <p>3. Intrusion and filtering analysis.</p>
57.	DIGITAL IMAGE PROCESSING	BCS-77	<p>1. To understand Digital Image Processing fundamentals</p> <p>2. To learn Image Transformation, Enhancement, Restoration and Compression Techniques.</p> <p>3. To implement various techniques for Segmentation of Images</p> <p>4. To learn the Image Reconstruction operations.</p> <p>5. To implement Image Processing Techniques for suitable applications</p>
58.	HIGH PERFORMANCE COMPUTING	BCS-78	<p>1. Understand the role of HPC in science and engineering.</p> <p>2. Become acquainted with the most commonly used HPC platforms and parallel programming models.</p> <p>3. Become acquainted with the means by which to measure, analyze and assess the performance of HPC applications and their supporting hardware.</p> <p>4. Develop mechanisms for evaluating the suitability of different HPC solutions to common problems found in Computational Science.</p> <p>5. Perform the role of administration, scheduling, code portability and data management in an HPC environment, with particular reference to Grid Computing.</p> <p>6. Understand potential benefits and pitfalls of Grid Computing.</p>
59.	INTRODUCTION TO REAL TIME SYSTEM	BCS-79	<p>1. Real-time scheduling and schedulability analysis</p> <p>2. Formal specification and verification of timing constraints and properties</p> <p>3. Design methods for real-time systems</p> <p>4. Development and implementation of new techniques to advance the state-of-the-art real-time systems research</p>

### MTech (Computer Sc. &Engineering)

#### Course outcome:

S. no	Subject	Subject Code	Course Outcomes
1	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	MAS-213	<ol style="list-style-type: none"><li>1. Give mathematically precise arguments for their claims</li><li>2. Apply, adapt, and design efficient algorithms to solve computational problems</li><li>3. Use Graphs to formulate and solve computational problems.</li><li>4. Apply mathematical logic to verify the correctness of various security protocols.</li><li>5. Use Group theoretic techniques to apply, adapt and design efficient coding schemes.</li></ol>
2	ADVANCED ALGORITHMS AND DATA STRUCTURES	MCS-106	<ol style="list-style-type: none"><li>1. Students are familiar with various algorithmic techniques such as brute force, greedy, and divide and conquer.</li><li>2. Application of advanced abstract data type (ADT) and data structures in solving real world problems.</li><li>3. Effectively combine fundamental data structures and algorithmic techniques in building a complete algorithmic solution to a given problem</li></ol>
3.	ADVANCED COMPUTER ARCHITECTURE	MCS-107	<ol style="list-style-type: none"><li>1. To Know the classes of computers, and new trends and developments in computer architecture.</li><li>2. To understand the pipelining, instruction set architectures, memory addressing, performance metrics of processors,</li></ol>

			<p>memory, networks, and disks.</p> <p>3. To understand the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), using dynamic scheduling, multiple issue, and speculation, multithreading by using ILP and supporting thread-level parallelism (TLP).</p>
4.	INFORMATION SECURITY & CYBER LAW	MCS-206	<p>1. Understand the fundamental principles of Cryptography, access control models and techniques, authentication and secure system design.</p> <p>2. Have a strong understanding of different cryptographic techniques and be able to use them.</p> <p>3. Apply methods for authentication, access control, IP Security, intrusion detection and prevention.</p> <p>4. Identify and mitigate software security vulnerabilities in existing systems.</p> <p>5. Explain the basic information on cyber security and Cyber Laws. 6. Have knowledge on copy right issues of software's.</p> <p>7. Understand ethical laws of computer for different countries.</p> <p>8. Understand the computer forensic, Digital Forensic Methodologies and steganography.</p>
5.	INTERNET OF THINGS	MCS-181	<p>1. Understand the concepts of Internet of Things and its application areas</p> <p>2. Analyze the basic protocols in wireless sensor network and cloud</p> <p>3. Implement basic IoT applications on embedded platform</p> <p>4. Design IoT applications in different domains and be able to analyze their performance.</p>
6.	ADVANCED JAVA	MCS-174	<p>1. Develop Swing-based GUI</p> <p>2. Develop client/server applications and TCP/IP socket programming</p> <p>3. Update and retrieve the data from the databases using SQL</p> <p>4. Develop distributed applications using RMI</p> <p>5. Develop component-based Java software using JavaBeans</p> <p>6. Develop server-side programs in the form of servlets</p> <p>7. Investigate programming for Web Services</p>
7.	SYSTEM SIMULATION & MODELLING	MCS-105A	<p>1. Student will have introductory knowledge of simulation and modeling.</p> <p>2. Student will be able to simulate the common problems manually.</p> <p>3. Student will be able to model various problems.</p> <p>4. Student will be able to verify and validate a model</p>
8	COMPUTER VISION AND	MCS-179	

	IMAGE PROCESSING		
9.	WIRELESS SENSOR NETWORKS	MCS-180	<ol style="list-style-type: none"> <li>1. Understand the concepts of wireless sensor networks and its application areas</li> <li>2. Analyze the basic protocols in wireless sensor network</li> <li>3. Implement basic WSN applications</li> <li>4. Design WSN applications in different domains and be able to analyze their performance</li> </ol>
10.	MACHINE LEARNING TECHNIQUES	MCS-108	<ol style="list-style-type: none"> <li>1. Be able to formulate machine learning problems corresponding to different applications.</li> <li>2. Understand a range of machine learning algorithms along with their strengths and weaknesses.</li> <li>3. Understand the basic theory underlying machine learning.</li> <li>4. Be able to apply machine learning algorithms to solve problems of moderate complexity.</li> <li>5. Be able to read current research papers and understand the issues raised by current research.</li> </ol>
11.	LINUX NETWORKING & ADMINISTRATION	MCS-175	<ol style="list-style-type: none"> <li>1. Administrate the LINUX server/system.</li> <li>2. Get familiar with the variety of interfaces and frameworks for writing network applications.</li> <li>3. Get the knowledge of Interfaces, STREAMS, sockets, and remote procedure call libraries.</li> <li>4. Know the basic steps and underlying mechanisms of writing programs using the client-server model.</li> </ol>
12.	PYTHON PROGRAMMING	MCS-172	<ol style="list-style-type: none"> <li>1. Student will have problem solving skill.</li> <li>2. Student will be able to implement problems using python.</li> <li>3. Student will have knowledge about python packages.</li> </ol>
13.	OPEN SOURCE PROGRAMMING	MCS-208	<ol style="list-style-type: none"> <li>1. develop codes in open source web applications</li> <li>2. understand the risks associated with the open source codes</li> <li>3. write secure CGI scripts</li> </ol>
14.	SOFT COMPUTING	MCS-173	<ol style="list-style-type: none"> <li>1. Fuzzy logic and its applications.</li> <li>2. Artificial neural networks and its applications.</li> <li>3. Solving single-objective optimization problems using GAs.</li> <li>4. Solving multi-objective optimization problems using Evolutionary algorithms</li> <li>5. Applications of Soft computing to solve problems in varieties of application domains.</li> </ol>
15.	CLOUD COMPUTING	MCS-160A	<ol style="list-style-type: none"> <li>1. Able to collaborate the cloud services to any device.</li> <li>2. Exploring the online applications of cloud services.</li> <li>3. Implementing cloud computing for the corporation.</li> <li>4. Design various applications by integrating the cloud services.</li> </ol>
16.	ADVANCED COMPUTER NETWORKS	MCS-101A	<ol style="list-style-type: none"> <li>1. To gain a through understanding of the design of modern computer networks and protocols, including the Internet.</li> <li>2. To understand the workings of at least one actual TCP/IP</li> </ol>

			Stack and will be able to apply this understanding in modifying it or implementing additional protocols
17.	INFORMATION RETRIEVAL	MCS-210	<ol style="list-style-type: none"> <li>1. To apply information retrieval principles to locate relevant information in large collections of data</li> <li>2. To understand and deploy efficient techniques for the indexing of document objects that are to be retrieved</li> <li>3. To implement features of retrieval systems for web-based and other search tasks</li> <li>4. To analyse the performance of retrieval systems using test collection</li> <li>5. To develop a complete IR system from scratch</li> </ol>

### B. Tech. (CHEMICAL ENGINEERING )

S. no	Subject	Subject Code	Course Outcomes
1.	CHEMICAL ENGINEERING FLUID MECHANICS	BCT-11	<ol style="list-style-type: none"> <li>1. apply basic equation to fluid flow operations</li> <li>2. understand compressible, incompressible fluids and liquid mixing</li> <li>3. understand fluid flow measurement device and calculations of pressure drop in pipeline</li> <li>4. select device for pumping of fluids</li> </ol>
2.	MATERIALS IN CHEMICAL ENGINEERING	BCT-12	<ol style="list-style-type: none"> <li>1. Select materials for design and construction.</li> <li>2. understand the different metals and their alloys.</li> <li>3. understand characterization/ analytical techniques for the nano/micro structures</li> <li>4. understand typical engineering materials like glass, ceramics etc</li> </ol>
3.	CHEMICAL ENGINEERING PROCESS CALCULATIONS	BCT-13	<ol style="list-style-type: none"> <li>1. perform basic unit conversions and calculations.</li> <li>2. perform material and energy balance calculations without and with chemical reaction.</li> <li>3. perform energy balance calculations.</li> <li>4. apply material and energy balance calculations to unit operations</li> </ol>
4.	CHEMICAL	BCT-14	<ol style="list-style-type: none"> <li>1. understand properties of particles and the</li> </ol>

	ENGINEERING MECHANICAL OPERATIONS		separation techniques for solid particles. 2.select suitable equipment for size reduction of solids and conveying system for transportation of solids. 3. select suitable type of filter for slurry filtration, thickeners and clarifiers. 4.understand concept of fluidization
5.	TRANSPORT PHENOMENA	BCT-15	1.understand concept of viscosity, thermal conductivity and diffusivity. 2. apply shell momentum, heat and mass balances to chemical engineering problems. 3.understand concept of interphase momentum, heat and mass transport.
6.	SUGAR TECHNOLOGY	BCT-16	1.sugar production. 2. juice processing and alcoholic beverages. 3.manufacturing cabonated beverages and confectionery 4. manufacturing of miscellaneous products from sugar
7.	HEAT TRANSFER OPERATION	BCT-17	1.understand concept of conduction, convection and radiations. 2.able to do design heat exchanger. 3.understand concept of evaporation operation.
8.	CHEMICAL ENGINEERING THERMODYNAMICS – I	BCT-18	1. apply the first law of thermodynamics . 2. select appropriate equation of state for representing the P-V-T behaviour of gases. 3. calculate the ideal and actual efficiencies of heat engines and performance of heat pumps. 4. apply concept of laws of thermodynamics.
9.	CHEMICAL TECHNOLOGY	BCT-26	1.pulp & paper and chemicals derived from coal. 2.Petrochemicals. 3. sulphur and chloro-alkali industries. 4. petroleum and polymer synthetic fibre
10.	MASS TRANSFER-I	BCT-27	1.to understand concept of diffusion and theories. 2. able to design absorption column. 3. able to design cooling towers. 4. able to design crystallizer
11.	CHEMICAL REACTION ENGINEERING - I	BCT-28A	1.understand kinetics of homogeneous reactions.

			<ul style="list-style-type: none"> <li>2. design isothermal reactors.</li> <li>3. understand parallel and multiple reactions.</li> <li>4. understand fluid-fluid reactions</li> </ul>
12.	CHEMICAL ENGINEERING THERMODYNAMICS -II	BCT-29	<ul style="list-style-type: none"> <li>1.vapor-liquid equilibria and to flash calculations.</li> <li>2. chemical potential and its applications.</li> <li>3.activity coefficient, Gibbs Energy and chemical reaction equilibria.</li> <li>4. multi-phase reactions</li> </ul>
13.	Seminar	BCT-30	<ul style="list-style-type: none"> <li>1.knowledge of subject.</li> <li>2. presentation skills.</li> <li>3.writing skills.</li> <li>4.organization skills.</li> </ul>
14.	ALCOHOL TECHNOLOGY	BCT-31	<ul style="list-style-type: none"> <li>1.fermentation basic.</li> <li>2. synthesis of alcohol from molasses.</li> <li>3.synthesis of alcohol from substrates and refined chemicals.</li> <li>4. chemicals from alcohol</li> </ul>
15.	MASS TRANSFER -II	BCT-32	<ul style="list-style-type: none"> <li>1.distillation column.</li> <li>2. liquid-liquid and solid-liquid extraction column.</li> <li>3. adsorption column</li> </ul>
16.	PROCESS DYNAMICS, CONTROL & INSTRUMENTATION	BCT-33	<ul style="list-style-type: none"> <li>1.understand fundamentals of process instrumentation.</li> <li>2. understand working principals of measuring devices for pressure, temperature, level and flow</li> <li>3.understand instrumental methods of chemical analysis.</li> <li>4. understand the basic principles of process dynamics and control.</li> </ul>
17.	CHEMICAL REACTION ENGINEERING - II	BCT-34A	<ul style="list-style-type: none"> <li>1.heterogeneous processes.</li> <li>2. diffusion control reactions.</li> <li>3. gas-solid and gas-liquid reactions.</li> <li>4. fluidized bed reactors</li> </ul>
18.	PROCESS INTEGRATION Course Category: Program E	BCT-51	<ul style="list-style-type: none"> <li>1.understand of the fundamentals of process integration.</li> <li>2. perform pinch analysis.</li> <li>3.analyze and design heat exchanger networks.</li> <li>4. minimize the water consumption and waste generation.</li> </ul>
19.	PIPING DESIGN	BCT-52	<ul style="list-style-type: none"> <li>1.understand basic concept of piping engineering.</li> <li>2. do piping design, line sizing and NPSH calculations.</li> </ul>

			<ul style="list-style-type: none"> <li>3. calculate the piping insulation thickness and cost.</li> <li>4. understand P&amp;ID diagrams, various piping layout</li> </ul>
20.	Statistical Design of Experiments	BCT-53	<ul style="list-style-type: none"> <li>1.basic concept of design of experiment.</li> <li>2. apply concept of factorial design.</li> <li>3. concept of regression model and response surface methodology.</li> <li>4. model effects and design measure</li> </ul>
21.	Process Flow Sheet Simulation	BCT-54	<ul style="list-style-type: none"> <li>1.understand basic concept of process flowsheeting</li> <li>2. understand concept of system engineering.</li> <li>3. select thermodynamic properties.</li> <li>4. do model and sensitivity analysis</li> </ul>
22.	Food Technology	BCT-55	<ul style="list-style-type: none"> <li>1.basic principal of food processing.</li> <li>2. applications of unit operation in food engineering.</li> <li>3. concept in packing for various food commodities.</li> <li>4. importance of food quality assurance</li> </ul>
23.	PROCESS EQUIPMENT DESIGN	BCT-41	<ul style="list-style-type: none"> <li>1.design non-pressure and pressure vessels.</li> <li>2. design tall vessels and support.</li> <li>3.design shell and tube heat exchangers.</li> <li>4.mechanical design of distillation and absorptions columns</li> </ul>
24.	ENERGY RESOURCES & APPLICATIONS	BCT-42	<ul style="list-style-type: none"> <li>1.energy scenario and conservation.</li> <li>2. alternative sources of energy.</li> <li>3. hydro and nuclear energy.</li> <li>4. fossil and processed fuels</li> </ul>
25.	CHEMICAL CONTROL IN SUGAR PLANT	BCT-43	<ul style="list-style-type: none"> <li>1.understand concept of dynamic behaviour of simple processes.</li> <li>2.design of single loop feedback control systems.</li> <li>3. do stability analysis of feed back systems.</li> <li>4. understand frequency response and analysis linear processes</li> </ul>
26.	FERTILIZER TECHNOLOGY	BCT-61	<ul style="list-style-type: none"> <li>1.potassic fertilizer.</li> <li>2.nitrogenous fertilizer.</li> <li>3.phosphatic fertilizer.</li> <li>4. NPK and miscellaneous fertilizer.</li> </ul>
27.	NUCLEAR ENGINEERING	BCT-62	<ul style="list-style-type: none"> <li>1.nuclear physics.</li> <li>2.nuclear reactor</li> <li>3. nuclear fuels.</li> <li>4.Safety.</li> <li>5. safe dispose of nuclear waste</li> </ul>

28.	COMPUTATIONAL FLUID DYNAMICS	BCT-63	<ol style="list-style-type: none"> <li>1. understand basic governing equations in fluid mechanics.</li> <li>2. understand mathematical models for incompressible flow.</li> <li>3. solve linear differential equation using numerical methods.</li> <li>4. solve Navier stokes equation using numerical method</li> </ol>
29.	PROJECT PART-I	BCT-40	<ol style="list-style-type: none"> <li>1. demonstrate a sound technical knowledge of their selected project topic.</li> <li>2. undertake problem identification, formulation and solution.</li> <li>3. design engineering solutions to complex problems utilising a systems approach.</li> <li>4. do thermodynamic feasibility, material and energy balance of process block diagram</li> <li>5. design and optimize major equipment's in the selected project</li> <li>6. demonstrate the skills, knowledge, and attitudes of a professional engineer.</li> </ol>
30.	INDUSTRIAL/PRACTICAL TRAINING	BCT-45	<ol style="list-style-type: none"> <li>1. understand actual process plant.</li> <li>2. correlate theoretical and practical knowledge.</li> <li>3. analyse the problems in industries.</li> <li>4. develop life long learning skills.</li> </ol>
31.	CHEMICAL ENGINEERING DESIGN	BCT-46	<ol style="list-style-type: none"> <li>1. understand concept of dynamic behaviour of simple processes.</li> <li>2. design of single loop feedback control systems.</li> <li>3. do stability analysis of feed back systems.</li> <li>4. understand frequency response and analysis linear processes</li> </ol>
32.	PROJECT PART-II	BCT-50	<ol style="list-style-type: none"> <li>1. demonstrate a sound technical knowledge of their selected project topic.</li> <li>2. undertake problem identification, formulation and solution.</li> <li>3. design engineering solutions to complex problems utilising a systems approach.</li> <li>4. do thermodynamic feasibility, material and energy balance of process block diagram o design and optimize major equipment's in the selected project.</li> <li>5. demonstrate the skills, knowledge, and attitudes of a professional engineer.</li> </ol>
33.	HETEROGENEOUS CATALYSIS &	BCT-71	<ol style="list-style-type: none"> <li>1. heterogeneous processes.</li> <li>2. diffusion control reactions.</li> </ol>

	MULTIPHASE REACTOR DESIGN		<ol style="list-style-type: none"> <li>3. gas-solid and gas-liquid reactions.</li> <li>4. fluidized bed reactors</li> </ol>
34.	PETROLEUM ENGINEERING	BCT-72	<ol style="list-style-type: none"> <li>1. crude oil evaluation testing and cracking.</li> <li>2. treatment processes for crude oil purification.</li> <li>3. cracking of naphtha and gas o isomerization.</li> <li>4. alkylation and polymerization processes.</li> </ol>
35.	POLYMER SCIENCE & TECHNOLOGY	BCT-73	<ol style="list-style-type: none"> <li>1. understand basic of polymer.</li> <li>2. calculate molecular weight of polymer.</li> <li>3. understand factor affecting polymer properties.</li> <li>4. understand rheology of polymer and polymer processing</li> </ol>
36.	OPTIMIZATION TECHNIQUES IN CHEMICAL engineering	BCT-74	<ol style="list-style-type: none"> <li>1. formulate optimization problems.</li> <li>2. solve optimization problems using basic concepts.</li> <li>3. solve unconstrained single and multivariable problems.</li> <li>4. solve optimization problems using linear and nonlinear programming.</li> </ol>
37.	STANDARDIZATION & QUALITY ASSURANCE IN CHEMICAL INDUSTRY	BCT-75	<ol style="list-style-type: none"> <li>1. basic concepts of quality control.</li> <li>2. international standard guidelines of quality control.</li> <li>3. raw material specification.</li> <li>4. documentation in industry.</li> </ol>
38.	INDUSTRIAL SAFETY & HAZARD MANAGEMENT	BCT-76	<ol style="list-style-type: none"> <li>1. basic concepts of chemical process safety.</li> <li>2. importance of safety parameter.</li> <li>3. hazard and explosion management.</li> <li>4. risk, emergency and disaster management</li> </ol>
39.	PROJECT ENGINEERING & MANAGEMENT	BCT-77	<ol style="list-style-type: none"> <li>1. basics of project engineering.</li> <li>2. planning and scheduling of projects.</li> <li>3. concepts of detailed engineering and execution</li> <li>4. piping design layout</li> </ol>
40.	BIOPROCESS ENGINEERING PRINCIPALS	BCT-78	<ol style="list-style-type: none"> <li>1. basics of biology and biotechnology.</li> <li>2. metabolic pathways.</li> <li>3. design concept of bioreactor.</li> <li>4. basic of biochemical modelling and bioseparation</li> </ol>
41.	NUCLEAR REACTOR TECHNOLOGY	BCT-79	<ol style="list-style-type: none"> <li>1. basics of nuclear engineering.</li> <li>2. basic concept of nuclear reactor.</li> <li>3. design of nuclear reactor and thermal power station.</li> <li>4. practices for disposal of nuclear waste.</li> </ol>

### B.Tech (Mechanical Engineering Department)

#### Course outcome:

S. no	Subject	Subject Code	Course Outcomes
1.	ENGINEERING MECHANICS	BME-01	1. Use scalar and vector analytical techniques for analysing forces in statically determinate structures. 2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems 3. Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts); 4. Understand basic dynamics concepts – force, momentum, work and energy and Newton's laws of motion
2.	FUNDAMENTALS OF MECHANICAL ENGINEERING	BME-02	1. The knowledge of basic laws of thermodynamics; steam generation and its properties; refrigeration cycles, properties and machines; and reciprocating engine such as two/four strokes IC engines. 2. The knowledge of measuring instruments, types of transducers for measurement of different geometrical parameters. 3. The ability to understand different types of stresses, Hooke's law and its applications, different mechanical properties of engineering materials. 4. The knowledge of different types of beams, shear force and bending moment diagrams for statically determinate beams, stresses in simple bending of beams and torsion in circular shafts.
3.	MANUFACTURING PROCESSES	BME-03	1. The students will be able to understand the basic manufacturing processes and different types of mechanical properties of ferrous, non-ferrous metals and alloys. 2. The basic knowledge of different forming and

			<p>casting processes and foundry tools used for the manufacturing of different products.</p> <p>3. The knowledge of different machine tools and machining processes, welding processes and their applications.</p> <p>4. The knowledge of sheet metal processes and their applications, powder metallurgy process, basic heat treatment processes, nonmetallic materials and features of manufacturing establishment.</p>
4	WORKSHOP TECHNOLOGY	BME-10	<p>1. Understand the importance, materials, applications and safety in different shops for the development of a product/component.</p> <p>2. The knowledge of tools and processes used in carpentry and foundry shops for the development of products through casting process.</p> <p>3. The knowledge of forming process will develop skills for producing products using different tools and processes in black smithy and sheet metal shops.</p> <p>4. The knowledge of tools and processes in machine shop and welding shop will develop ability of producing different products.</p>
5	MATERIAL SCIENCE AND ENGINEERING	BME-11	<p>1. Understand the importance of numerous materials with their basic concepts including crystallography and imperfections.</p> <p>2. The understanding about the advanced materials testing by different testing methods for measuring various mechanical properties.</p> <p>3. The knowledge of different surface behavior studies about materials including heat treatment processes, TTT diagram and other related processes.</p> <p>4. The knowledge of various materials and their non-mechanical properties; electrical, magnetic, electronic, etc.</p>
6	ENGINEERING THERMODYNAMICS	BME-12	<p>1. The basic understanding of Thermodynamic processes for pure substances and ideal gases and ability to demonstrate the Zeroth law and First Law of Thermodynamics.</p> <p>2. Ability to apply the First Law of Thermodynamics for control surface and control volume systems and demonstrate the Second Law of Thermodynamics and its application to various systems.</p> <p>3. Students will demonstrate the use of Second Law of Thermodynamics of systems for entropy and analysis of different Thermodynamics processes.</p> <p>4. Ability to demonstrate the various properties of</p>

			steam and introduction to power cycles.
<b>7</b>	<b>MEASUREMENT &amp; METROLOGY</b>	<b>BME-13</b>	<ol style="list-style-type: none"> <li>1. Understanding of measurement and measuring instruments, sensors and transducers, signal transmission and processing.</li> <li>2. The knowledge of time related measurements, measurements of pressure, strain, temperature, force, torque, acceleration and vibration.</li> <li>3. The knowledge of standards of linear measurement, line and end standards, limit fits and tolerances, interchangeability and standardization, linear and angular measuring devices and systems, comparators, limit gauges and gauge design.</li> <li>4. The knowledge of measurement of geometric forms like straightness, flatness, roundness, tool maker's microscope, profile project autocollimator, Interferometry, Measurement of screw threads, gears and surface texture.</li> </ol>
<b>8</b>	<b>MECHANICS OF SOLIDS</b>	<b>BME-14</b>	<ol style="list-style-type: none"> <li>1. Ability to determine stresses in solid members under different conditions.</li> <li>2. The ability to calculate deflections in beams under different support conditions, deflection in helical and leaf springs under different loading conditions.</li> <li>3. The ability to determine stresses in thin and thick cylindrical and thin spherical shells and buckling loads in columns under different support conditions.</li> <li>4. Able to understand advanced topics of Mechanics of solids for further Research and Industry Applications.</li> </ol>
<b>9</b>	<b>ENGINEERING MATERIALS</b>	<b>BME-15</b>	<ol style="list-style-type: none"> <li>1. The importance of materials including understanding of crystallography and imperfections.</li> <li>2. The understanding about the advanced materials testing by different testing methods for measuring various mechanical properties.</li> <li>3. The knowledge of different surface behavior studies about materials including heat treatment processes, TTT diagram and other related processes.</li> <li>4. The knowledge of various materials and their non-mechanical properties; electrical, magnetic, electronic, etc.</li> </ol>
<b>10</b>	<b>FLUID MECHANICS</b>	<b>BME-16</b>	<ol style="list-style-type: none"> <li>1. The fundamental concepts of fluid mechanics and knowledge of fluid and its properties, types of fluid flows, 3D fluid flow, etc.</li> <li>2. The knowledge of parameters of fluid statics, Pressures on plane and curved surfaces, stability of immersed and floating bodies.</li> <li>3. Understand the various aspects of Laminar and</li> </ol>

			<p>Turbulent Flow.</p> <p>4. The ability to carry out dimensional analysis in fluid mechanics.</p>
<b>11</b>	<b>KINEMATICS OF MACHINES</b>	<b>BME-17</b>	<p>1. To understand the kinematics of links, its classification and applications in different planar mechanisms and machines, and ability to determine kinematic quantities of links 24 in different planar mechanisms.</p> <p>2. To study the mechanisms consisting of lower pairs, and to be able to synthesize of slider crank mechanism and four bar mechanisms.</p> <p>3. To understand the gear tooth profiles, law of gearing and different types of gear trains for power transmission</p> <p>4. To understand different types of cams and followers motions, cam profile generation techniques</p>
<b>12</b>	<b>ENERGY CONVERSION SYSTEMS</b>	<b>BME-18</b>	<p>1. Understand the general principles of mass and energy conservation, thermodynamic relations; ability to analyze combustion of fuels, heat reaction and calculation, study different types of condensers and its performance parameters.</p> <p>2. The knowledge of different types of boilers, heat balance and different types of vapor power cycles</p> <p>3. Turbine, different types of steam turbines and related parameter calculations.</p> <p>4. Working of gas turbines cycles, jet propulsion and introduction to rocket engine.</p>
<b>13</b>	<b>MECHANICAL ENGINEERING DRAWING</b>	<b>BME-20</b>	<p>1. Understand layout of drawing sheet, IS codes, scales, different types of lines, section lines, dimensioning, etc.</p> <p>2. The orthographic projections of simple solids; drawings of parts of temporary fastener, i.e., nuts and bolts and permanent fasteners, i.e., riveted joints and its applications to boiler joint.</p> <p>3. The knowledge of assembly drawing of cotter joint, knuckle joint, stuffing box, etc. and production drawing of simple machine components</p> <p>4. The knowledge of basic commands and development of drawings of simple solids in AutoCAD software and free hand sketching of machine components.</p>
<b>14</b>	<b>MACHINE DESIGN-I</b>	<b>BME-26</b>	<p>1. The understanding of design of mechanical components/systems, associated design parameters and standards, and knowledge of engineering materials and their properties.</p> <p>2. The ability to design mechanical components</p>

			<p>under the static loads and dynamic loads based on different criteria.</p> <p>3. The ability to design temporary and permanent joints such as riveted, bolted and welded joints as well as design of cotter and knuckle joints and its engineering applications.</p> <p>4. The knowledge of design of circular shafts under the combined loadings, selection of keys, and design of rigid &amp; flexible couplings.</p>
<b>15</b>	<b>HEAT AND MASS TRANSFER</b>	<b>BME-27</b>	<p>1. Understand the basic laws of heat transfer and steady state one-dimensional heat conduction for different co-ordinate systems.</p> <p>2. The knowledge of application of fins for enhancing the heat transfer rate and natural heat convection over the surfaces of different shapes.</p> <p>3. The understanding of concepts and estimation of heat transfer under the forced convection, condensation and boiling phenomenon on surfaces and pipes and able to design the different types of heat exchangers, Heat pipes.</p> <p>4. The understanding of concepts and analysis of thermal radiation and its numerical solutions and introduction to mass transfer.</p>
<b>16</b>	<b>DYNAMICS OF MACHINES</b>	<b>BME-28</b>	<p>1. Ability to carry out static and dynamic force analysis of four bars mechanism and slider crank mechanism, and design of flywheels.</p> <p>2. To understand types of centrifugal governors, the effects of characteristic parameters and controlling force diagrams and principles of gyroscopic effect and its engineering applications.</p> <p>3. To Understand the balancing of rotating and reciprocating masses and ability to analyze single degree freedom systems subjected to free, damped and forced vibrations as well as calculation of critical speeds of shaft.</p> <p>4. To Understand the applications of friction in pivot and collar bearings, belt drives, clutches, brakes and dynamometers.</p>
<b>17</b>	<b>MANUFACTURING SCIENCE</b>	<b>BME-29</b>	<p>1. Able to understand the fundamentals and analysis of Forging and Rolling processes.</p> <p>2. Knowledge of wire drawing, extrusion, sheet metal working, and unconventional metal forming process such as explosive forming and electromagnetic forming.</p> <p>3. Knowledge of principles, working and applications of various types of welding processes.</p> <p>4. Able to understand pattern allowances, moulding</p>

			sand properties, elements of mould and casting processes.
<b>18</b>	SEMINAR	BME-30	<ol style="list-style-type: none"> <li>1. Ability to develop effective writing on recent technological development.</li> <li>2. Ability to make effective presentation on power point.</li> <li>3. Ability to comprehend question/answers during presentation.</li> <li>4. Enhance oral communication skills.</li> </ol>
<b>19</b>	MACHINE DESIGN - II	BME-31	<ol style="list-style-type: none"> <li>1. The ability to design different types of mechanical spring under static and fatigue loading, and knowledge of different types of screw threads and design of screw jack.</li> <li>2. The knowledge of tooth forms, gear tooth materials, manufacturing methods and design of spur gear, helical gear and worm gear.</li> <li>3. The knowledge of different parameters and selection criteria for the sliding contact bearing, rolling contact ball and roller bearing, its lubrication and mountings.</li> <li>4. The knowledge of design considerations of IC engines parts and design of cylinder head, piston assembly, connecting rod and crankshaft.</li> </ol>
<b>20</b>	REFRIGERATION & AIR CONDITIONING	BME-32	<ol style="list-style-type: none"> <li>1. Understand the refrigeration principles, air refrigeration cycles and introduction to the different refrigerants.</li> <li>2. Understand the knowledge of vapour compression refrigeration system and performance calculations.</li> <li>3. Understand the knowledge of vapour absorption refrigeration systems.</li> <li>4. Understand the psychrometry in air conditioning systems and introduction to various refrigerating equipment and its application.</li> </ol>
<b>21</b>	IC ENGINES	BME-33	<ol style="list-style-type: none"> <li>1. The importance &amp; Classification of engine and air standard cycles.</li> <li>2. The knowledge of SI Engines, of carburetor and performance parameters.</li> <li>3. The knowledge of CI Engines, performance parameters and its control.</li> <li>4. The knowledge of cooling systems and lubrication systems Supercharging &amp; Turbocharging.</li> </ol>
<b>22</b>	MACHINE TOOLS & MACHINING	BME-34	<ol style="list-style-type: none"> <li>1. Able to understand mechanics of metal cutting, lubricants, tool materials, economics of metal cutting, etc.</li> <li>2. Study the principles, construction of various parts and working of different machine tools.</li> <li>3. Able to understand the grinding and super finishing operations and concepts of Standardization &amp; Interchangeability, Limits, Fits &amp; Tolerance and</li> </ol>

			Surface roughness 4. Understand principle and working of different non-conventional machining processes.
23	INTRODUCTION TO INDUSTRIAL ENGINEERING	BME-35	1. Understand the concept, function and application of Industrial Engineering, production and productivity, measurement of productivity, work study, work sampling. 2. The knowledge of job evaluation and analysis, wage-incentive payment plans, materials handling, objectives and functions of production planning and control, break-even-analysis. 3. The understanding of depreciation, service life of assets, inventory control, Control charts, acceptance plan and acceptance sampling. 4. Understand the concept and importance of organization, organizational structure, organizational chart, sole & proprietary enterprise, labour legislation, factory act, wage and insurance act.
24	PROJECT PART-I	BME-40	1. Able to apply knowledge of various streams of mechanical engineering to finalize the statement of project. 2. To carry out literature review of relevant project problem using books, research papers and internet. 3. To finalize the activities to be carried out to complete the project through bar chart.
25	AUTOMOBILE ENGINEERING	BME-41	1. Good knowledge of automotive components and machineries and Ability to absorb the concerned problem at first instance and provide the suitable remedial measure to the problem. 2. Proficient in designing innovative projects and various transmission systems for fuel efficient engine. 3. Ability to demonstrate the various braking system, chassis and suspension system and electrical systems for automobiles like ignition, horn and battery. 4. Ability to demonstrate the fuel supply, air-conditioning, cooling and lubrication and maintenance systems for automobiles.
26	COMPUTER AIDED DESIGN	BME-42	1. The importance, benefits, applications and essential elements of CAD such as graphics input, display and output devices. 2. The knowledge of graphics software, graphics standards, configuration and functions; skill of writing algorithm for generating 2D graphic elements; and understand the mathematics behind 2D & 3D individual and combined geometric

			<p>transformations.</p> <p>3. The ability of mathematical representation of parametric form of analytic planar curves and synthetic space curves such as Hermite, Bezier and B-spline curves and knowledge of their properties.</p> <p>4. The knowledge of polygonal, quadric and superquadric surfaces, blobby objects, color models and different solid modeling techniques and skill of developing 3D geometric models in CAD software.</p>
27	COMPUTER AIDED MANUFACTURING	BME-43	<p>1. Ability to understand the role of computer in the areas of automation and manufacturing for improving their effectiveness and fundamentals of CNC machine tools.</p> <p>2. Ability to develop manual part program and computer assisted part program for the production of components.</p> <p>3. Ability to design and develop various systems such as feedback, interpolator, material handling and implementation of adaptive control.</p> <p>4. Ability to apply the concept of group technology and computer assisted process planning and knowledge about Robotics.</p>
28	INDUSTRIAL / PRACTICAL TRAINING	BME-45	<p>1. An ability to apply knowledge of mathematics, science and engineering in the development of product and process.</p> <p>2. An ability to design and conduct experiments as well as to analyze and interpret data.</p> <p>3. An ability to perform multidisciplinary task for the professional development in the field of engineering.</p> <p>4. Ability to identify sources of hazards, and assess/identify appropriate health &amp; safety measures</p> <p>5. Ability to demonstrate the use, interpretation and application of an appropriate international engineering standard in a specific situation</p>
29	PROJECT PART-II	BME-50	<p>1. Able to design the various component/subsystem of project using basic and advanced knowledge of science and engineering courses.</p> <p>2. Able to analyse the various components/process of project problem.</p> <p>3. Able to fabricate the hardware through different fabrication techniques available.</p> <p>4. Able to make computer programme to design and analyse different components of product.</p> <p>5. Able to make conclusion of given project.</p>
30	HYDRAULIC MACHINES	BME-51	<p>1. Define basic principles of operation of different types of Hydraulic Turbines and estimate</p>

			<p>hydrodynamics thrust of jet on fixed and moving plate.</p> <p>2. Principles, construction, working and design of Francis Turbine and Kaplan Turbines, and its performance characteristics.</p> <p>3. Classification, Principles, construction, working and design of centrifugal pumps and its performance characteristics.</p> <p>4. Principles, construction, working of positive displacement reciprocating and rotary pumps and basic aspects of its design. Principles, construction and working of hydraulic accumulator, hydraulic press, hydraulic lift cranes, hydraulic ram, jet pumps, etc.</p>
<b>31</b>	<b>PRINCIPLES OF MACHINE TOOLS DESIGN</b>	<b>BME-52</b>	<p>1. The knowledge of developments in machine tools, construction and operations of basic machine tools, tool wear and force analysis.</p> <p>2. Understand the elements of mechanical and hydraulic transmission system, fundamental of kinematic structure of machine tools.</p> <p>3. Demonstrate an understanding of regulation of speed, feed rates and design of machine tool structure – bed, column and housing.</p> <p>4. The knowledge of designing guideways and power screw, dynamic stability of cutting process, machine tool installation and maintenance.</p>
<b>32</b>	<b>PRODUCTION PLANNING &amp; CONTROL</b>	<b>BME-53</b>	<p>1. Recognize the objectives, functions, applications of Production Planning and Control and forecasting techniques.</p> <p>2. Summarize various aggregate production planning techniques.</p> <p>3. Solve routing and scheduling problems.</p> <p>4. Knowledge of various process planning approaches.</p> <p>5. Explain different inventory control techniques.</p> <p>6. The importance of productivity, productivity patterns, role of ergonomics in productivity.</p>
<b>33</b>	<b>INDUSTRIAL TRIBOLOGY</b>	<b>BME-54</b>	<p>1. Understand the scope of tribology and its applications in manufacturing and machining processes.</p> <p>2. The knowledge of theory of friction and its mechanisms in metals, ceramics and polymers.</p> <p>3. The knowledge of wear, its classification, different theories, wear models and its engineering applications.</p> <p>4. The understanding of lubrication, types of</p>

			lubricant and their flow, and different lubrication mechanisms.
<b>34</b>	<b>TOTAL QUALITY MANAGEMENT</b>	<b>BME-55</b>	<ol style="list-style-type: none"> <li>1. Acquire the basic knowledge of quality and its evolution.</li> <li>2. The knowledge of Organization structure and design and Total Quality Management principles for continuous improvement.</li> <li>3. The understanding of quality management tools to evaluate the quality.</li> <li>4. The knowledge of ISO-9000, ISO 14000 and TQM implementation.</li> </ol>
<b>35</b>	<b>ENERGY MANAGEMENT</b>	<b>BME-56</b>	<ol style="list-style-type: none"> <li>1. The importance and applications of renewable energy sources their utilization and energy management.</li> <li>2. Students will be able to apply the 1st and 2nd law of thermodynamics for energy audit performance analysis of different solar systems.</li> <li>3. The student will be able to convert the electrical energy for comfort of human being in a building and energy audit of combustion process.</li> <li>4. Student will be able to understand the effect of pollution in environment and government's regulation to control them.</li> </ol>
<b>36</b>	<b>MECHANICAL VIBRATIONS</b>	<b>BME-57</b>	<ol style="list-style-type: none"> <li>1. Understand different types of vibration and mathematical analysis of single degree freedom system under free vibration and damped vibration.</li> <li>2. The mathematical analysis of single degree freedom system subjected to forced vibration; understand the principles and working of vibration measuring instruments and able to calculate the critical speeds of shaft.</li> <li>3. Understand the analysis of two-degree freedom system under free, damped and forced vibrations and principle and working of different types of vibration absorbers.</li> <li>4. The ability to carry out exact and numerical analysis of multi degree freedom system subjected to different types of vibration.</li> </ol>
<b>37</b>	<b>RENEWABLE ENERGY TECHNOLOGIES</b>	<b>BME-58</b>	<ol style="list-style-type: none"> <li>1. The importance and applications of renewable energy sources their utilization and collection of solar energy.</li> <li>2. Student will be able to understand the application of solar energy and wind energy, its conversion, performance analysis of different solar collectors and solar photovoltaic system.</li> <li>3. The understanding of photosynthesis, biogas</li> </ol>

			<p>production aerobic and anaerobic bio conversion process, biogas applications and energy recovery from urban waste and biomass resource development in India.</p> <p>4. The knowledge of the fundamentals and application of tidal power, ocean thermal energy, wave energy, geothermal energy and hydro energy.</p>
<b>38</b>	<b>POWER PLANT TECHNOLOGIES</b>	<b>BME-61</b>	<p>1. Ability to understand the magnitudes of conventional and renewable energy resources and economics of power plants.</p> <p>2. Able to understand steam power plant with its components.</p> <p>3. Able to understand diesel engine power plant and gas turbine power plant with their components.</p> <p>4. Able to understand nuclear power plant and hydro-electric power plant with their components.</p>
<b>39</b>	<b>TURBO MACHINERY</b>	<b>BME-62</b>	<p>1. Student will be able to understand the working and construction of impulse steam turbine, velocity triangles and designing of blades.</p> <p>2. Student will be able to understand the working and construction of reaction steam turbine, velocity triangles, degree of reaction and various losses.</p> <p>3. Student will be able to understand the working and construction of centrifugal and axial flow compressor and their velocity triangles and performance calculations.</p> <p>4. Students will be able to demonstrate the working of gas turbine plants and efficiency calculations. Further mechanical design consideration followed by turbine blade cooling.</p>
<b>40</b>	<b>PROJECT MANAGEMENT</b>	<b>BME-63</b>	<p>1. Knowledge of various phases of project management.</p> <p>2. Knowledge of structure of different types of organization and its selection.</p> <p>3. Know about project appraisal and cost estimation.</p> <p>4. Understand the various aspects of CPM and PERT and their implementation in Project</p>
<b>41</b>	<b>ADVANCED WELDING TECHNOLOGY</b>	<b>BME-64</b>	<p>1. Understand the importance and application of welding, conventional welding, weld design and inspection/testing. 2. Develop good knowledge about Thermal and Metallurgical consideration of welding, HAZ, automation and safety in welding.</p> <p>3. Student will have through knowledge about plasma arc, laser beam, electron beam, ultrasonic and diffusion welding.</p> <p>4. Develop good knowledge about explosive</p>

			welding, underwater welding, metal spraying and surfacing
42.	ADVANCED MANUFACTURING TECHNOLOGY	BME-65	<ol style="list-style-type: none"> <li>1. Understand the need of unconventional manufacturing processes and familiar with abrasive water jet cutting and machining process.</li> <li>2. Knowledge of working principle, advantages, limitations and applications of Electrochemical Machining, Electric Discharge machine and chemical machining.</li> <li>3. Understand working, effect of process variables and applications of Laser beam machining, Electron beam machining, Ultrasonic machining, Plasma arc machining.</li> <li>4. Knowledge High energy forming processes, and Diffusion and Photo- Lithography process.</li> </ol>
43	ADVANCED ENGINEERING MATERIALS	BME-66	<ol style="list-style-type: none"> <li>1. To understand the basic structures, atomic bonding, and importance of materials for different applications.</li> <li>2. To understand the surface behavior of materials with their phase diagrams.</li> <li>3. The knowledge of ferrous and nonferrous materials with the inclusion of advanced materials.</li> <li>4. The knowledge and applications of Mechanical and thermal behavior of different materials.</li> </ol>
44.	ADVANCED MECHANICS OF SOLIDS	BME-67	<ol style="list-style-type: none"> <li>1. Understanding and application of three-dimensional stress and strain, principal stresses and principal strains, Mohr circle.</li> <li>2. Understanding of generalized Hooke's law, relation between elastic constants, equations of equilibrium and determination of stresses &amp; deflection due to unsymmetrical bending.</li> <li>3. Determine stresses due to rotation of uniform and variable thicknesses of solid disc, rotating shafts and cylinders. Design of thick cylindrical shell and compound cylinders subjected to internal and external pressure</li> <li>4. Determine stresses in curved beams such as crane hooks and circular ring under tension and compression. Torsional stresses of prismatic, circular, elliptical bars and thin walled tubes &amp; rolled section.</li> </ol>
45	GAS DYNAMICS AND PROPULSION	BME-68	<ol style="list-style-type: none"> <li>1. Student will understand the concept of gas dynamics, fundamental equations and isentropic flow.</li> <li>2. Ability to get the knowledge of compressible flows and pertaining calculations.</li> </ol>

			<p>3. Student will be able to demonstrate the wave phenomena and make calculations for variable flow area like nozzle design pressure and efficiency.</p> <p>4. Able to understand and demonstrate the basics of jet propulsion, various jet propulsion engines and their efficiency calculations.</p>
46.	COMPUTATIONAL TOOLS FOR MECHANICAL ENGINEERING	BME-69	<p>5. Acquire the basic knowledge of Programming with MATLAB &amp; numerical methods</p> <p>6. The knowledge of different optimization method</p> <p>7. The understanding of direct numerical integration methods</p> <p>8. The knowledge of engineering mechanics and Mechanical Vibration</p>
47.	FINITE ELEMENT METHOD	BME-59	<p>1. Understand the fundamental concepts of Finite Element method and different approaches used in FEM</p> <p>2. Able to solve two-dimensional problem</p> <p>3. Able to solve the problem related to Beams &amp; Frames</p> <p>4. The knowledge of Heat Transfer and able to formulate the FE Program for critical speeds of a shaft.</p>

### M.Tech (Energy Technology and Management)

#### Course outcome:

S. no	Subject	Subject Code	Course Outcomes
1.	Computational Methods in Engineering	MME-102A	<p>1. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions</p> <p>2. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.</p> <p>3. Ability to select appropriate numerical methods for various types of problems in engineering.</p> <p>4. Analyse and evaluate the accuracy of common</p>

			numerical methods.
2.	ADVANCED ENERGY CONVERSION SYSTEM	MME-201A	<ol style="list-style-type: none"> <li>1. Ability to apply the concept of Exergy in energy conversion systems.</li> <li>2. Ability to analyze the different parameters of combined vapour power cycles which affects the overall efficiency of the thermal power plant.</li> <li>3. Ability to analyze the different operating and design parameters of the air propulsion system.</li> <li>4. Ability to analyze the performance of energy conversion utility system.</li> </ol>
3.	REFRIGERATION & AIR CONDITIONING SYSTEM DESIGN	MME-206	<ol style="list-style-type: none"> <li>1. Understand the basics of refrigeration, different refrigeration cycles and different types of refrigeration systems.</li> <li>2. Understand the properties of refrigerants, its impact on environment and designing of different components of refrigeration and air conditioning system.</li> <li>3. Basics and design calculations of air conditioning systems.</li> <li>4. Knowledge of different types of non-conventional refrigeration systems.</li> </ol>
4.	ADVANCED HEAT TRANSFER	MME-204	<ol style="list-style-type: none"> <li>1. Student will be able to calculate the temperature profile and rate of heat transfer in 1D system with variable thermal conductivity and heat generation and also the study of various fin profiles.</li> <li>2. Student will be able to make calculations for temperature and rate of heat transfer in steady state and unsteady state 2D systems using Groeber's and Heisler charts.</li> <li>3. Ability to understand the basics of radiation and its various models of successive reflection and also radiation through absorbing media.</li> <li>4. Ability to understand and calculate velocity and temperature profile and rate of heat transfer by convection over a flat plate and tubes.</li> </ol>
5.	CLEAN ENERGY SYSTEMS	MME-204A	<ol style="list-style-type: none"> <li>1. Ability to understand basics of solar energy, solar time calculations and production and utilization of biomass in different areas.</li> <li>2. Student will be able to understand basics of wind energy, power calculations, site selection and wind power production plants.</li> <li>3. Ability to understand the principle, construction and application of fuel cell and also about power production and distribution by hydel energy.</li> </ol>

			<p>4. Ability to apply the concept of material and energy balance by various methods and flow charts.</p> <p>5. Ability to understand the methods and tools of energy audit along with maximizing the energy efficiency.</p>
6.	MINOR PROJECT	MME-220	<p>1. Understanding of importance of literature survey.</p> <p>2. Develop ability to comprehend the research paper</p> <p>3. Understanding of steps involved in writing the research paper. 4. Develop the ability to write a research paper.</p>
7.	DISSERTATION PART-I	MME-230	<p>1. Analyze and apply prior knowledge to designing and implementing solutions to open-ended computational problems while considering multiple realistic constraints. 2. Analyze the selected topic, organize the content and communicate to audience in an effective manner. 3. Application of various thermal engineering concepts and analyze Database. 4. Evaluate the various validation and verification methods</p>
8.	SEMINAR	MME-240	<p>1. Ability to understand the working in real environment and get acquainted with the organization structure, business operations and administrative functions.</p> <p>2. They able to enhance the communications and presentation skills.</p> <p>3. Ability to evaluate, credit, and synthesize sources.</p> <p>4. Understanding to write technical documents and give oral presentations related to the work completed.</p>
9.	DISSERTATION PART-II	MME-250	<p>1. Synthesizing and applying prior knowledge to designing and implementing solutions to open-ended computational problems while considering multiple realistic constraints.</p> <p>2. Analyze the selected topic, organize the content and communicate to audience in an effective manner. 3. Application of various thermal engineering concepts and analyze Database. 4. Evaluate the various validation and verification methods</p> <p>5. Analyzing professional issues, including ethical,</p>

			legal and security issues, related to computing projects
<b>10.</b>	<b>ECONOMICS AND PLANNING OF ENERGY SYSTEMS</b>	MME-251	<ol style="list-style-type: none"> <li>1. Ability to understand the evaluation of energy technology and economics of energy conservation.</li> <li>2. Ability to understand Energy demand, Energy models and energy planning.</li> <li>3. Ability to understand implications of energy, clean development mechanism, energy transfer with financing.</li> <li>4. Ability to understand the carbon credits, trading opportunities and energy policy acts with regulations.</li> </ol>
<b>11.</b>	<b>COMBUSTION ENGINEERING</b>	MME-254	<ol style="list-style-type: none"> <li>1. Ability to understand the basics, importance and thermodynamics behind combustion.</li> <li>2. Ability to understand kinetics of combustion and various aspects pertaining to propagation of flame.</li> <li>3. Ability to understand advances of burning of fuel in spray form and also about the ignition.</li> <li>4. Student will be able to tell combustion generated pollution and their controls.</li> </ol>
<b>12.</b>	<b>DESIGN OF HEAT TRANSFER EQUIPMENTS</b>	MME-253	<ol style="list-style-type: none"> <li>1. Student will be able to design co-current, counter current and cross flow heat exchangers.</li> <li>2. Student will be able to design hair-pin heat exchangers and their calculations.</li> <li>3. Student will be able to design shell and tube heat exchangers and boiling curve &amp; condensation mechanisms.</li> <li>4. Student will be able to design the cooling tower and evaporators in various applications.</li> </ol>
<b>13.</b>	<b>ENERGY STORAGE SYSTEMS</b>	MME-256	<ol style="list-style-type: none"> <li>1. Understand need and potential of energy storage system.</li> <li>2. Understand the concept electrochemical energy storage and sensible heat storage system.</li> <li>3. Understand the concept of phase change material and numerical analysis of heat transfer mechanism of PCM during melting and freezing process.</li> <li>4. Understanding about the application of energy storage system in the field of solar energy, waste heat, drawing and heating for process industries.</li> </ol>
<b>14.</b>	<b>HYDROGEN ENERGY</b>	MME-255	<ol style="list-style-type: none"> <li>1. Ability to understand the basics of hydrogen energy such as- requirements, storage, utilization etc. and various methods of hydrogen generation.</li> <li>2. Ability to understand the physical &amp; chemical properties of hydrogen and various methods of</li> </ol>

			<p>storage of hydrogen.</p> <p>3. Ability to apply the concept of hydrogen utilization in various applications such as- IC engines, gas turbines, power plants etc. and its various characteristics related to performance and emission in SI engines.</p> <p>4. Ability to understand the various safety issues for using hydrogen energy and risk analysis along with simulation of crash tests.</p>
<b>15.</b>	<b>FINITE ELEMENT METHOD</b>	<b>MME-161</b>	<p>1. To develop the ability to generate the governing finite element equations for systems governed by partial differential equations.</p> <p>2. To understand the use of the basic finite elements for structural applications using truss, beam, frame and plane elements;</p> <p>3. To understand the application and use of the finite element method for heat transfer problems.</p> <p>4. To demonstrate the ability to evaluate and interpret Finite Element Method analysis results for design and evaluation purposes.</p> <p>5. To develop a basic understanding of the limitations of the Finite Element Method and understand the possible error sources in its use.</p>
<b>16.</b>	<b>ENERGY MODELLING AND PROJECT MANAGEMENT</b>	<b>MME-261</b>	<p>1. Understand the importance of energy management and application of energy management in boiler, turbine and heat exchanger etc.</p> <p>2. Understand the concept of energy audit and responsibility of energy auditor.</p> <p>3. Knowledge of material and energy balance of energy converting devices</p> <p>4. Understand the purpose energy policies, managerial function, strategies, marketing, training and planning of any organization</p>
<b>17.</b>	<b>ADVANCES IN MATERIAL SCIENCE AND APPLICATIONS</b>	<b>MME-162</b>	<p>1. Ability to understand the role of computer in the areas of automation, planning and manufacturing for improving their effectiveness.</p> <p>2. Ability to develop manual part program and computer assisted part program to produce components.</p> <p>3. Ability to design and develop various system such as feedback, interpolator, material handling and implementation of adaptive control.</p> <p>4. Ability to apply the concept of group technology and computer assisted process planning.</p>

18.	ALTERNATIVE FUELS FOR TRANSPORTATION	MME-262	<ol style="list-style-type: none"> <li>1. Ability to understand the basics and need of alternate fuels in current scenario.</li> <li>2. Ability to utilize the alcoholic fuels and their blends in place of conventional fuels and their performance.</li> <li>3. Ability to utilize Natural Gas, LPG, Hydrogen and Biogas in SI and CI engines and their performance and emission characteristics.</li> <li>4. Ability to have knowledge of vegetable oils and their performance and basics of Electric, Hybrid, Fuel Cell and Solar Cars.</li> </ol>
19.	NUCLEAR SCIENCE AND ENGINEERING	MME-263	<ol style="list-style-type: none"> <li>1. Ability to understand the concept of nuclear physics, Laws of radioactive decay and nuclear models.</li> <li>2. Ability to develop and design blade and understand the performance of horizontal and vertical axis wind machines.</li> <li>3. Ability to understand Nuclear reactions, nuclear fission and liquid drop model.</li> <li>4. Ability to control and understand the working of different nuclear reactor.</li> </ol>
20.	ENVIRONMENTAL IMPACT OF ENERGY SYSTEMS	MME-265	<ol style="list-style-type: none"> <li>1. Understand need and potential of energy storage system.</li> <li>2. Understand the concept electrochemical energy storage and sensible heat storage system.</li> <li>3. Understand the concept of phase change material and numerical analysis of heat transfer mechanism of PCM during melting and freezing process.</li> <li>4. Understanding about the application of energy storage system in the field of solar energy, waste heat, drawing and heating for process industries.</li> </ol>

### **MTech (Computer Integrated Manufacturing)**

**Course outcome:**

<b>S. no</b>	<b>Subject</b>	<b>Subject Code</b>	<b>Course Outcomes</b>
<b>1</b>	NUMERICAL METHODS & ENGINEERING OPTIMIZATION	MAS-101	
<b>2</b>	ADVANCED COMPUTER AIDED DESIGN	MME-101	<ol style="list-style-type: none"><li>1. The knowledge of computer graphics system and its hardware such as graphics input, display and output devices.</li><li>2. The ability to generate circle and ellipse using Bresenham's algorithm and understand the mathematics behind 3D geometric transformations.</li><li>3. Understand analytical representations of different types of parallel such as</li></ol>

			<p>orthographic, oblique and axonometric projections as well as non parallel such as perspective and stereographic projections.</p> <p>4. The analytical representations of parametric planar curves and synthetic space curves such as Hermite, Bezier, non rational &amp; rational B-spline curves and their properties.</p> <p>5. The synthetic surfaces and their parametric representations, different solid modeling techniques and skill of generating 3D geometric models in CAD software.</p>
<b>3</b>	Computational Methods in Engineering	MME-102A	<ol style="list-style-type: none"> <li>1. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.</li> <li>2. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.</li> <li>3. Ability to select appropriate numerical methods for various types of problems in engineering.</li> <li>4. Analyse and evaluate the accuracy of common numerical methods.</li> </ol>
<b>4</b>	MACHINING SCIENCE	MME-103	<ol style="list-style-type: none"> <li>1. Ability to understand the mechanics metal cutting, shear angle, chip flow and chip control methods.</li> <li>2. Ability to apply the concept of Thermodynamics of chip formation, tool wear and tool life.</li> <li>3. Ability to design and develop Economics of metal cutting-Single and multipass machining operations.</li> <li>4. Ability to develop methods for defining Dynamic metal cutting, Problems associated with machining of plastics and Analysis of non-conventional machining processes ECM, EDM, LBM, WJM, USM etc.</li> </ol>
<b>5</b>	ADVANCED COMPUTER AIDED MANUFACTURING	MME-104	<ol style="list-style-type: none"> <li>1. Understanding the implementation of automation in production system and ability to know the role of computer in the area of manufacturing.</li> <li>2. Ability to design and develop various parts of CNC Machines for improving their</li> </ol>

			<p>effectiveness and implementation of adaptive control.</p> <p>3. Ability to develop manual part program and computer assisted part program for the production of components</p> <p>4. Ability to understand the various modules of FMS and apply the concept of group technology and computer assisted process planning</p>
<b>6.</b>	ADVANCED MACHINING PROCESSES	MME-105	<p>1. Able to understand the limitations of conventional and need of unconventional processes.</p> <p>2. Able to understand working principle, mechanics of material removal, and applications of USM, AJM, and MAF.</p> <p>3. Acquire the knowledge about working principle and applications of EDM, PAM, LBM and EBM.</p> <p>4. Ability to know about chemical, electrochemical and hybrid unconventional machining processes.</p>
<b>7.</b>	MINOR PROJECT	MME-120	<p>1. Understanding of importance of literature survey.</p> <p>2. Develop ability to comprehend the research paper.</p> <p>3. Understanding of steps involved in writing the research paper.</p> <p>4. Develop the ability to write a research paper.</p>
<b>8.</b>	DISSERTATION PART-I	MME-130	<p>1. Analyze and apply prior knowledge to designing and implementing solutions to open-ended computational problems while considering multiple realistic constraints.</p> <p>2. Analyze the selected topic, organize the content and communicate to audience in an effective manner</p> <p>3. Analyze Database, Network and Application Design methods.</p> <p>4. Evaluate the various validation and verification methods</p>
<b>9.</b>	SEMINAR	MME-140	<p>1. Ability to understand the working in real environment and get acquainted with the organization structure, business operations and administrative functions.</p> <p>2. They able to enhance the communications and presentation skills.</p>

			<p>3. Ability to evaluate, credit, and synthesize sources.</p> <p>4. Understanding to write technical documents and give oral presentations related to the work completed.</p>
<b>10.</b>	DISSERTATION PART-II	MME-150	<p>1. Synthesizing and applying prior knowledge to designing and implementing solutions to open-ended computational problems while considering multiple realistic constraints.</p> <p>2. Analyze the selected topic, organize the content and communicate to audience in an effective manner.</p> <p>3. Analyze Database, Network and Application Design methods.</p> <p>4. Evaluate the various validation and verification methods.</p> <p>5. Analyzing professional issues, including ethical, legal and security issues, related to computing projects</p>
<b>11.</b>	MACHINE TOOL DESIGN	MME-151	<p>1. Design different machine tools considering static and dynamic loads.</p> <p>2. Familiar with various attachments, equipment's and machine tools required for metal cutting processes</p> <p>3. Able to select/optimize various machining parameters</p> <p>4. Understand effect of vibrations on life of machine tools.</p> <p>5. Understand design considerations for Special features in Machine tools.</p>
<b>12.</b>	DESIGN FOR MANUFACTURE AND ASSEMBLY	MME-152	<p>1. Understand the quality aspects of design for manufacture and assembly.</p> <p>2. Apply the concept of DFM for casting, welding, forming and assembly.</p> <p>3. Identify the design factors and processes as per customer specifications.</p> <p>4. Apply the DFM method for a given product.</p>
<b>13.</b>	ROBOTIC ENGINEERING	MME-154A	<p>1. Ability to understand the Classification of Robots, Robot specifications, applications and Robot Sensors.</p> <p>2. Ability to solve problems related to Manipulator kinematics, modeling of mechanical systems and elements.</p> <p>3. Ability to solve problems related to</p>

			<p>Manipulator dynamics.</p> <p>4. Ability to design and develop various Robot Control and robot programming for welding, material handling.</p>
<b>14.</b>	DESIGN OF EXPERIMENTS	MME-159	<p>1. Able to plan, design and conduct experiments efficiently and effectively, and analyse the resulting data to obtain objective conclusions.</p> <p>2. Both design and statistical analysis issues are discussed.</p>
<b>15.</b>	MICRO-MACHINING AND PRECISION ENGINEERING	MME-155	<p>1. The importance of micromachining technologies by studied characterization of micro-machining, Tool making, Micro-machinability of materials, LIGA and Diamond micro-machining etc.</p> <p>2. The Different machining principle of micro EDM, micro-WEDG, micro-ECM, hybrid micro-machining method, on-line measurement by machine vision and integrated probe.</p> <p>3. Different Abrasive micromachining and micro grinding behavior of materials surface by Laser micromachining, laser micro-drilling, laser micro-adjustment, and laser surface structuring etc.</p> <p>4. The different concepts regarding Micro-machining by finishing techniques by scanning tunneling microscopes, atomic force microscope, elastic transmission method, computer aided measurement testingetc.</p>
<b>16.</b>	PRODUCTION AND OPERATIONS MANAGEMENT	MME-156	<p>1. Ability to understand the Operations strategy, forecasting method, MRP type systems, Embedding JIT into MRP.</p> <p>2. Ability to solve problems of Scheduling &amp; control functions, Simulation methodology and Two assembly simulation.</p> <p>3. Ability to develop various Design of Facilities &amp; Jobs, JIT implementation, Considerations in job design, Work measurements and standards.</p> <p>4. Ability to apply the concept of Product Design &amp; Process Selection.</p> <p>5. able to understand the basics of material management and inventory.</p>
<b>17.</b>	ADDITIVE	MME-	<p>5. Ability to understand the fundamental of</p>

	MANUFACTURING	157	<p>Additive manufacturing and its varieties like liquid based, solid based and powder-based AM technologies, their potential to support design and manufacturing.</p> <p>6. Ability to understand the various types of Pre-processing, processing, post-processing errors in AM and to acknowledge the various types of data formats and software's used in AM.</p> <p>7. Ability to demonstrate the applications of AM in design analysis, aerospace, automotive, biomedical and other fields and research challenges associated with AM.</p>
<b>18.</b>	FINITE ELEMENT METHOD	MME-161	<p>1. To develop the ability to generate the governing finite element equations for systems governed by partial differential equations.</p> <p>2. To understand the use of the basic finite elements for structural applications using truss, beam, frame and plane elements;</p> <p>3. To understand the application and use of the finite element method for heat transfer problems.</p> <p>4. To demonstrate the ability to evaluate and interpret Finite Element Method analysis results for design and evaluation purposes.</p> <p>5. To develop a basic understanding of the limitations of the Finite Element Method and understand the possible error sources in its use.</p>
<b>19.</b>	ADVANCE MATERIAL & CHARACTERIZATION	MME-169	<p>1. Ability to understand the role of computer in the areas of automation, planning and manufacturing for improving their effectiveness.</p> <p>2. Ability to develop manual part program and computer assisted part program to produce components.</p> <p>3. Ability to design and develop various system such as feedback, interpolator, material handling and implementation of adaptive control.</p> <p>4. Ability to apply the concept of group technology and computer assisted process planning.</p>
<b>20</b>	INDUSTRIAL AUTOMATION	MME-163	<p>1. Ability to identify and explain potential areas of automation in manufacturing.</p>

			<p>2. Ability to differentiate the various control aspects of automation.</p> <p>3. Ability to design components and systems related to industrial automation considering the economic, social, manufacturability and sustainability aspects</p>
<b>21.</b>	<b>FLEXIBLE MANUFACTURING SYSTEM</b>	MME-164	<p>1. The understanding about factors responsible for the growth of FMS, FMS types and applications, Economic justification for FMS, Co-ordinate measuring machines, Cleaning and deburring machines, FMS system support equipment.</p> <p>2. Ability to know about the concept of GT, Part family formation-coding and classification systems, mathematical programming and graph theoretic model approach for part grouping, Cellular vs. FMS production.</p> <p>3. Ability to understand CAPP system: Importance, principle of Generative CAPP system.</p> <p>4. Ability to understand the concept of Quantitative methods, Implementation techniques for CAPP, criteria for selecting a CAPP system and benefits of CAPP</p>
<b>22.</b>	<b>CONCURRENT ENGINEERING &amp; PRODUCT LIFECYCLE MANAGEMENT</b>	MME-165	<p>1. Ability to understand the fundamentals of Concurrent Engineering, CE tool box and Collaborative product development.</p> <p>2. Ability to apply the concept of IT support, Solid modeling, Product data management, Artificial Intelligence.</p> <p>3. Ability to design and develop various Design Stage such as Lifecycle design of products, CE in optimal structural design, Importance of PLM, Implementing PLM, Responsibility for PLM etc.</p> <p>4. Ability to understand Components of PLM, Product organizational structure, System components in lifecycle, slicing and dicing the systems, Interfaces, Information, Standards.</p>
<b>23.</b>	<b>ADVANCED STRENGTH OF MATERIALS</b>	MME-166	<p>1. To provide a thorough understanding of advanced topics concerning the response of materials and structural elements to applied forces of deformation.</p>

			<p>2. Students should obtain an understanding of advanced strength of materials principles and practices that should assist them in making informed design decisions and solving complex problems.</p> <p>3. To acquaint with energy methods to solve structural problems.</p>

## DEPARTMENT OF ELECTRICAL ENGINEERING

### Course outcome:

S. no	Subject	Subject Code	Course Outcomes
1	PRINCIPLES OF ELECTRICAL ENGINEERING	BEE- 01	<p>1. Able to understand the basic concepts of network and circuit.</p> <p>2. To solve the basic electrical circuits.</p> <p>3. Familiarity with the basic concepts of AC circuits.</p> <p>4. Introductory concept of measurement, instrumentation, working &amp; performances of different kind of measuring instruments (PMMC, MI).</p> <p>5. Able solve magnetic circuits.</p> <p>6. Able to analyze three phase circuits.</p> <p>7. Introduction and application to different electrical machines.</p>
2	ELECTRICAL CIRCUIT ANALYSIS	BEE-02	<p>1. Able to understand the basic concepts of network and circuit.</p> <p>2. To solve the basic electrical circuits.</p> <p>3. Familiarity with the basic concepts of</p>

			<p>AC circuits.</p> <ol style="list-style-type: none"> <li>4. Able to analyze the transient behavior of the circuit.</li> <li>5. Able solve magnetic circuits.</li> <li>6. Able to analyze three phase circuits.</li> <li>7. Need of earthing of equipment's with safety issues.</li> </ol>
<b>3</b>	<b>BASIC SYSTEM ANALYSIS</b>	<b>BEE -11</b>	<ol style="list-style-type: none"> <li>1. Analyze as well as synthesize Continuous and discrete signals.</li> <li>2. Classify and identify different signals.</li> <li>3. Familiarity with continuous and discrete models and their representation.</li> <li>4. Acquire the knowledge of analogous electrical systems of different non-electrical systems.</li> <li>5. Application of Laplace, Z and Fourier Transform</li> <li>6. Modeling through State variable analysis</li> </ol>
<b>4</b>	<b>ELECTRICAL MEASUREMENT &amp; MEASURING INSTRUMENTS</b>	<b>BEE- 12</b>	<ol style="list-style-type: none"> <li>1. Basic concept of measurement, instrumentation, working &amp; performances of different kind of measuring instruments</li> <li>2. Ability to analyze performance characteristics of measuring instruments.</li> <li>3. Ability to know, working principle &amp; Performances of AC Bridges.</li> <li>4. Ability to understand construction, principle of operation, working and applications of waveform analyzers and spectrum analyzers.</li> <li>5. Ability to understand construction, principle of operation, working and applications of harmonic distortion analyzers.</li> <li>6. Ability to understand construction, principle of operation, working and measurements of Cathode Ray Oscilloscope (CRO).</li> </ol>
<b>5</b>	<b>ELECTRO-MECHANICAL ENERGY CONVERSION –I</b>	<b>BEE – 13</b>	<ol style="list-style-type: none"> <li>1. Ability to learn basic concept of design, working &amp; performances of DC Machines (Generator &amp; Motor).</li> <li>2. Ability to solve theoretical &amp; numerical problems related with DC Machines (Generator &amp; Motor).</li> <li>3. Ability to know constructional details, working principle &amp; Performances of Single Phase &amp; 3 phase transformer.</li> </ol>

			4. Ability to understand electro-mechanical energy conversion process of rotating electrical machines in singly excited & doubly excited magnetic system
6.	NETWORK ANALYSIS AND SYNTHESIS	BEE -14	<ol style="list-style-type: none"> <li>1. Able to solve the circuits through graph theory.</li> <li>2. Able to understand the concept of transfer function &amp; time response analysis.</li> <li>3. Able to analyze a two port network.</li> <li>4. Able to synthesis a network.</li> <li>5. Able to understand the basic concepts of filter.</li> </ol>
7.	INTRODUCTION TO MICROPROCESSORS	BEE -15	<ol style="list-style-type: none"> <li>1. Acquire the introductory knowledge of Digital Computer, microprocessor internal architecture and microprocessor development system.</li> <li>2. Student gains knowledge on Intel 8085 microprocessor detailed internal architecture along with its assembly language programming.</li> <li>3. Student gains knowledge on Intel 8086 microprocessor detailed internal architecture, instruction set and interrupts.</li> <li>4. Student gains knowledge on DMA controller, programmed I/O, interrupt controller and programmable timer/counter interface of Intel's 8-bit and 16-bit microprocessors.</li> <li>5. With the above knowledge the students will be able to understand advanced microprocessors and microcontroller systems</li> </ol>
8.	ELECTROMECHANICAL ENRGY CONVERSION	BEE- 16	<ol style="list-style-type: none"> <li>1. The concepts DC machines with numerical calculation.</li> <li>2. The concept of Transformer with numerical calculation.</li> <li>3. The concept of Synchronous machine &amp; IM with numerical calculation.</li> </ol>
9.	SIMULATION TECHNIQUES	BEE - 20	<ol style="list-style-type: none"> <li>1. Student gains knowledge on MATALAB desktop and its basic functions.</li> <li>2. Acquire the knowledge of application of numerical technique in MATALAB functions.</li> <li>3. Students develop the MATALAB programming skill.</li> </ol>

			<p>4. With the above knowledge/skill students will be able to solve simultaneous linear equations, differential equations etc., applied in the electrical circuit solutions.</p> <p>5. Learning of MATLAB Toolboxes helps the students able to develop and verify the concepts of various complex electrical engineering problems.</p>
<b>10.</b>	<b>ELECTRO-MECHANICAL ENERGY CONVERSION – II</b>	<b>BEE -26</b>	<ol style="list-style-type: none"> <li>1. Ability to learn basic concept of design, working &amp; performances of three phase AC Machines (Generator &amp; Motor).</li> <li>2. Ability to solve theoretical &amp; numerical problems related with three phase AC Machines (Generator &amp; Motor).</li> <li>3. Ability to know constructional details, working principle &amp; Performances of Single Phase AC Machines</li> <li>4. Ability to understand working, characteristics &amp; applications of Special Electrical Machines (Universal Motor, AC series motor, Hysteresis Motor, Reluctance Motor)</li> </ol>
<b>11.</b>	<b>POWER SYSTEM-1</b>	<b>BEE- 27</b>	<ol style="list-style-type: none"> <li>1. Basic Layout of power system.</li> <li>2. The concept of supply system</li> <li>3. The analysis of O/H Transmission lines.</li> <li>4. The understanding of EHVAC &amp; HVDC Transmission lines.</li> <li>5. The Corona, insulator, neutral grounding &amp; mechanical design of Transmission line.</li> </ol>
<b>12.</b>	<b>CONTROL SYSTEM ENGINEERING</b>	<b>BEE-28</b>	<ol style="list-style-type: none"> <li>1. Basic Block diagram of control system.</li> <li>2. The control system components.</li> <li>3. The analysis of time response.</li> <li>4. The analysis of frequency response.</li> <li>5. The Compensator design.</li> </ol>

13.	INSTRUMENTATION AND PROCESS CONTROL	BEE-29	<ol style="list-style-type: none"> <li>1. Basic concept of instrumentation and its industrial application and working &amp; performances of different kind of measuring instruments.</li> <li>2. Ability to analyze performance characteristics of measuring instruments.</li> <li>3. Ability to know, working principle &amp; Performances of different electrical transducers.</li> <li>4. Ability to understand construction, principle of operation, working and applications of waveform analyzers and spectrum analyzers, CRO and other display devices.</li> <li>5. Ability to understand principle of operation of telemetry system and data acquisition system.</li> <li>6. Ability to understand principle of operation of process control system and its various elements.</li> </ol>
14.	POWER SYSTEM-II	BEE-31	<ol style="list-style-type: none"> <li>1. The L and C expressions for various configurations and analyze different types of Transmission lines</li> <li>2. The Traveling wave theory and derive expressions for reflection and refraction coefficients with various terminations of the lines.</li> <li>3. The analysis symmetrical as well as unsymmetrical faults.</li> <li>4. Load flow analysis.</li> <li>5. The concept of Power system stability.</li> </ol>
15.	POWER ELECTRONICS	BEE-32	<ol style="list-style-type: none"> <li>1. The working &amp; principle of various semiconductor devices.</li> <li>2. The concept of phase controller converters.</li> <li>3. The analysis of Inverters in various configurations.</li> <li>4. The concept of DC-Choppers, AC Voltage Controllers &amp; Cyclo-converters.this course</li> </ol>
16.	POWER PLANT ENGINEERING	BEE-33	<ol style="list-style-type: none"> <li>1. The concept of conventional &amp; non-conventional source of energy.</li> <li>2. The general layout, principle, working &amp; performance of a steam power plant.</li> <li>3. The general layout, principle, working &amp; performance of a Hydro-electric power plant.</li> <li>4. The general layout, principle,</li> </ol>

			working & performance of a Diesel power plant.
<b>17.</b>	<b>ELECTRIC DRIVES</b>	<b>BEE -41</b>	<p>1. Knowledge of electric drive and its parts, significance of power modulator ,electric motors ,sensing units, loads and control units in electric drives, advantages and classification of electric drive, multi quadrant operation of the drive.</p> <p>2. Knowledge of dynamic behavior of motor, transient and steady state behavior of drives</p> <p>3. Knowledge of thermal model of the drive, classes of motor duties and technique to calculate the rating of the drive for various duty cycles, overloading factor estimation and load equalization.</p> <p>4. Purpose and types of braking, significance and application of different electrical braking, energy loss during starting and braking.</p> <p>5. Control of separately excited and dc series motor dc drive by single phase and three phase converter, dual converter control of dc drive, applications and limitations of various control, chopper control of dc series and servo motor.</p> <p>6. Static control of dc motor by single phase, three phase and dual converters. chopper control of dc series and servomotor ,idea and effect of supply harmonics.</p> <p>7. Static control of three phase induction motor by CSI,VSI and Cycloconverter. static voltage and frequency control, static rotor resistance control and slip power recovery scheme, selection of motor for particular application.</p> <p>8. Constructional features , working and of switched reluctance and brush less motor, selection of motor for particular services</p>
<b>18.</b>	<b>SWITCH GEAR &amp; PROTECTION</b>	<b>BEE-42</b>	<p>1. Student gains knowledge on different Protective Equipments of Power Systems.</p> <p>2. Know about various protective systems-how it works and where it works.</p> <p>3. Student gains knowledge on different Protective Equipments of Power Systems.</p> <p>4. Different applications of the relays,</p>

			<p>circuit breakers, grounding for different elements of power system are also discussed in the subject.</p> <p>5. Ability to discuss Recovery and Restricting. 6. Ability to express Oil circuit Breaker, Air Blast circuit Breakers, SF6 Circuit Breaker.</p> <p>7. Ability to identify DMT, IDMT type relays.</p>
<b>19.</b>	<b>POWER SYSTEM OPERATION AND CONTROL</b>	<b>BEE-43</b>	<p>1. Ability an understanding of Energy control center, analysis of real time control of power system parameters, learn about SCADA system.</p> <p>2. Ability to solve load dispatch problems with computer aided techniques for economy load dispatch.</p> <p>3. Ability to analysis of real &amp; reactive power control, load frequency control &amp; Interconnected power systems.</p> <p>4. Ability to analysis of automatic excitation control systems and explore static and dynamic responses of system.</p> <p>5. Ability to explain the importance of FACTS devices &amp; their controllers.</p>
<b>20.</b>	<b>UTILIZATION AND TRACTION</b>	<b>BEE-44</b>	<p>1. Advantages and methods of electrical heating, concept of resistance heating, electrical arc heating, induction heating and dielectric heating.</p> <p>2. Knowledge of electric arc welding, resistance welding and electronic welding control, laws of electrolysis, concept of electro deposition and application of electrolysis.</p> <p>3. Laws of illumination, requirement of good lighting, design of indoor and outdoor lighting , concept of refrigeration and air condoning systems ,domestic refrigerator and water cooler, concept of window air conditione.</p> <p>4. Knowledge of types of electric traction, system of electrification, traction mechanism ,speed time curve specific energy consumption mechanism of train movement, coefficient of adhesion and its influence.</p> <p>5. Salient features of traction drives, series</p>

			parallel control of traction drives and energy saving, power electronic control dc and ac traction drives, diesel electric traction
21.	POWER QUALITY	BEE-46	<ol style="list-style-type: none"> <li>1. Acquire the knowledge of different terms and definitions of power quality.</li> <li>2. Gains knowledge on causes and effects of voltage sags and its mitigations.</li> <li>3. Gains knowledge on power system transients and harmonics with their effects and mitigation techniques.</li> <li>4. Know about various power quality measuring, analyzing and testing devices.</li> <li>5. Get introductory knowledge of custom power devices for further knowledge enhancement</li> </ol>
22.	HIGH VOLTAGE ENGINEERING	BEE- 51	<ol style="list-style-type: none"> <li>1. The concepts of break down in gases, solids &amp; liquids with numerical calculation.</li> <li>2. The concept of generation &amp; measurement of high voltages &amp; currents.</li> <li>3. The concept of various high voltage testing.</li> </ol>
23.	INTELLIGENT INSTRUMENTATION	BEE- 52	<ol style="list-style-type: none"> <li>1. The concepts of intelligent instrumentation system.</li> <li>2. The concept of signal processing, manipulation &amp; transmission.</li> <li>3. The concept of Smart Sensors, Interfacing Instruments &amp; Computers.</li> <li>4. Recent trends in sensor technology.</li> </ol>
24.	DIGITAL CONTROL SYSTEM	BEE-53	<ol style="list-style-type: none"> <li>1. The concepts of Signal Processing in Digital Control.</li> <li>2. The concept of Time Domain and Frequency Domain Analysis.</li> <li>3. The concept of State Space Analysis and Design.</li> <li>4. Stability of Discrete System.</li> </ol>
25.	CONVENTIONAL& CAD OF ELECTRICAL MACHINES	BEE- 54	<ol style="list-style-type: none"> <li>1. The concepts of transformer design.</li> <li>2. The concept of 3-phase synchronous machines, IM &amp; computer aided design.</li> </ol>
26.	EHV AC & DC TRANSMISSION	BEE- 55	<ol style="list-style-type: none"> <li>1. The basic concepts of EHV &amp; DC transmission.</li> <li>2. The concept of Extra High Voltage Generation, Measurement and Testing .</li> <li>3. The concept of HVDC transmission</li> </ol>
27.	ADVANCED	BEE- 56	<ol style="list-style-type: none"> <li>1. Its Architecture &amp; assembly languages.</li> </ol>

	MICROPROCESSOR AND MICRO CONTROLERS		<ol style="list-style-type: none"> <li>2. Interfacing &amp; Coprocessor 8087.</li> <li>3. The concept of Micro-controller.</li> <li>4. High end processor.</li> </ol>
28.	MODERN CONTROL SYSTEM	BEE-57	<ol style="list-style-type: none"> <li>1. The concept of control system design, state space analysis &amp; state space control design.</li> <li>2. The concept of Non-Linear System.</li> </ol>
29.	SCADA & ENERGY MANAGEMENT SYSTEM	BEE- 58	<ol style="list-style-type: none"> <li>1. The concepts of SCADA &amp; its use in power system.</li> <li>2. The concept of energy management system.</li> <li>3. SCADA System Components and Applications.</li> </ol>
30.	ENERGY EFFICIENCY & CONSERVATION	BEE- 59	<ol style="list-style-type: none"> <li>1. The concepts of Energy conservation &amp; Energy Audit.</li> <li>2. The concept of Demand Side Management, Voltage and Reactive power in Distribution System.</li> <li>3. The concept of Efficiency in Motors and Lighting system.</li> </ol>
31.	BIO INSTRUMENTATION	BEE-60	<ol style="list-style-type: none"> <li>1. The Fundamentals of Bio-Medical Instrumentation.</li> <li>2. The concept of the Cardiovascular System and Measurements.</li> <li>3. The concept of the Nervous &amp; Respiratory System and its Measurements.</li> <li>4. Patient Care Monitoring &amp; Imaging Techniques.</li> </ol>
32.	NON-CONVENTIONAL ENERGY RESOURCES	BOE- 10	<ol style="list-style-type: none"> <li>1. Various non-conventional energy resources.</li> <li>2. The concept of Solar Thermal Energy.</li> <li>3. The concept of Geothermal Energy &amp; Wind Energy Generation.</li> </ol>
33.	FUNDAMENTALS OF ELECTRIC DRIVES	BOE-11	<ol style="list-style-type: none"> <li>1. The concepts of basic electric drives &amp; its dynamics.</li> <li>2. The concept of Motor power rating, Braking and Calculation of Energy loss.</li> <li>3. The concept of Power Electronic Control of DC Drives.</li> <li>4. Power Electronic Control of AC Drives, Special Drives &amp; Application of Motors.</li> </ol>

**DEPARTMENT OF ELECTRICAL ENGINEERING**

**M. Tech( Power Electronics & Drives)**

**Course outcome:**

<b>S. no</b>	<b>Subject</b>	<b>Subject Code</b>	<b>Course Outcomes</b>
<b>1.</b>	Advance Microprocessors and Applications	MEE-101	1. Develop an ALP in 8085 microprocessor using the internal organization for the given specification. 2. Describe the architecture and functional block of 8051 microcontroller.

			3. Develop an embedded C and ALP in 8051 microcontroller using the internal functional blocks for the given specification.
2.	Electric Drives & Traction	MEE-102	<ol style="list-style-type: none"> <li>1) Understand the basics of Electric Traction System.</li> <li>2) Identify different Traction Drives and controlling techniques.</li> <li>3) Develop protection system for Electric Locomotive</li> <li>4) Design the Electric Traction Sub-Systems (Overhead Equipment).</li> </ol>
3.	Power Converter –I	MEE-103	<ol style="list-style-type: none"> <li>1. Acquire knowledge about fundamental concepts and techniques used in power electronics.</li> <li>2. Ability to analyze various single phase and three phase power converter circuits and understand their applications.</li> <li>3. Foster ability to identify basic requirements for power electronics based design application.</li> <li>4. To develop skills to build, and troubleshoot power electronics circuits.</li> <li>5. Foster ability to understand the use of power converters in commercial and industrial applications.</li> </ol>
4.	Modeling, Simulation & Evolutionary Techniques	MEE-104	<ol style="list-style-type: none"> <li>1. Students will understand the techniques of modeling in the context of hierarchy of knowledge about a system and develop the capability to apply the same to study systems through available software.</li> <li>2. Students will learn different types of simulation techniques.</li> <li>3. Students will learn to simulate the models for the purpose of optimum control by using software.</li> </ol>
5.	Power Converter –II	MEE-105	<ol style="list-style-type: none"> <li>1. Capability in designing isolated converters.</li> <li>2. Ability to dynamic analysis of power Converters.</li> <li>3. Competency in operation of resonant converter.</li> </ol>

			4. Know-how of multilevel converter.
<b>6.</b>	Power System Planning & Optimization	MEE-151	<ol style="list-style-type: none"> <li>1. Know-how of equipment of converter station.</li> <li>2. Ability to develop Mathematical model of each technique.</li> <li>3. Competency in designing FACTS controllers.</li> <li>4. Capability to design Active power filters.</li> </ol>
<b>7.</b>	Power Semiconductor Controlled Drives	MEE-152	<ol style="list-style-type: none"> <li>1. Understand the Control of D.C. separately and series excited motor drives using controlled converters and Choppers.</li> <li>2. Able to learn the operation of induction and synchronous motor drives from voltage source and current source inverters.</li> </ol>
<b>8.</b>	System Reliability	MEE-153	<ol style="list-style-type: none"> <li>1. Understand the Reliability calculation for series, parallel, parallel-series and K-Out-M systems.</li> <li>2. Able to understand the Design considerations for maintainability.</li> </ol>
<b>9.</b>	Operation Research	MEE-154	<ol style="list-style-type: none"> <li>1. Understand the concepts of Linear Programming,</li> <li>2. Able to learn the Integer Programming.</li> <li>3. Able to analyze the Inventory Models.</li> <li>4. Able to the understand the Project Scheduling by CPM/PERT.</li> </ol>
<b>10.</b>	Fuzzy, ANN and AI Systems	MEE-155	<ol style="list-style-type: none"> <li>1. Understand the concepts of Fuzzy System.</li> <li>2. Ability to contrive optimum NN architecture for specific engineering problem.</li> <li>3. Competency in applying NN technology in control problems.</li> <li>4. Skill in framing fuzzy rules &amp; employing fuzzy technique in solving engineering problems.</li> </ol>
<b>11.</b>	Robotics & Automation	MEE-156	<ol style="list-style-type: none"> <li>1. Able to understand the direct &amp; inverse kinematics of robot arm dynamics.</li> <li>2. Able to learn the Image processing fundamentals for robotic applications, image acquisition and preprocessing.</li> </ol>

<b>12.</b>	FACTS Controllers & Devices	MEE-157	<ol style="list-style-type: none"> <li>1. Understand the Fundamentals of ac power transmission, transmission problems.</li> <li>2. Able to analyze the needs, emergence of FACTS-FACTS control considerations, FACTS controllers.</li> </ol>
<b>13.</b>	Modeling and Simulation of Power Electronic Circuits	MEE-158	<ol style="list-style-type: none"> <li>1. Able to learn the Simulation Tools</li> <li>2. Understand the Modeling of Power Electronic Drives,</li> <li>3. Able to analyze the Simulation of Power Electronic Circuits.</li> </ol>
<b>14.</b>	New and Renewable Energy Resources	MEE-159	<ol style="list-style-type: none"> <li>1. Demonstrate the generation of electricity from various Non-Conventional sources of energy, have a working knowledge on types of fuel cells.</li> <li>2. Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation.</li> <li>3. Explore the concepts involved in wind energy conversion system by studying its components, types and performance.</li> <li>4. Illustrate ocean energy and explain the operational methods of their utilization.</li> <li>5. Acquire the knowledge on Geothermal energy.</li> </ol>
<b>15.</b>	Electric Power Quality	MEE-160	<ol style="list-style-type: none"> <li>1. Able to understand the Power Quality Problems and Monitoring,</li> <li>2. Able to analyze the Solution to Power Quality Problems,</li> <li>3. Able to analyze the Minimization of disturbances at Customer Site.</li> </ol>
<b>16.</b>	Power System Instrumentation	MEE-161	<ol style="list-style-type: none"> <li>1. To be able to develop computer programs to perform power flow analysis on a power system.</li> <li>2. To be able to define automatic generation control scheme on a power system and analyze generation control on a power system using imulation tools.</li> <li>3. To be able to define generation dispatching on a power system and develop generation dispatching</li> </ol>

			<p>schemes using MATLAB.</p> <p>4. To be able to define State Estimation problem and analyze state estimation of a power system using analysis programs.</p>
<b>17.</b>	Digital Signal Processing	MEE-162	<ol style="list-style-type: none"> <li>1. Interpret, represent and process discrete/digital signals and systems</li> <li>2. Thorough understanding of frequency domain analysis of discrete time signals.</li> <li>3. Ability to design &amp; analyze DSP systems like FIR and IIR Filter etc.</li> <li>4. Practical implementation issues such as computational complexity, hardware resource limitations as well as cost of DSP systems or DSP Processors.</li> <li>5. Understanding of spectral analysis of the signals</li> </ol>
<b>18.</b>	HVDC Systems	MEE-163	<ol style="list-style-type: none"> <li>1. To introduce students with the concept of HVDC Transmission system.</li> <li>2. To familiarize the students with the HVDC converters and their control system.</li> <li>3. To expose the students to the harmonics and faults occur in the system and their prevention</li> </ol>
<b>19.</b>	Energy Management	MEE-164	<ol style="list-style-type: none"> <li>1. Students will be able to apply the knowledge of the subject to calculate the efficiency of various thermal utilities.</li> <li>2. Students will be able to design suitable energy monitoring system to analyze and optimize the energy consumption in an organization.</li> <li>3. Students will be able to improve the thermal efficiency by designing suitable systems for heat recovery and co-generation.</li> <li>4. Students will be able to use the energy audit methods learnt to identify the areas deserving tighter control to save energy expenditure.</li> </ol>
<b>20.</b>	Power System Dynamics & Control	MEE-165	<ol style="list-style-type: none"> <li>1. Derive synchronous machine models</li> </ol>

			<ol style="list-style-type: none"> <li>2. Analyze synchronous machine automatic voltage controllers</li> <li>3. Analyze turbine models and speed governors</li> <li>4. Derive single machine two-axis and flux-decay dynamic models and study their underlying hypotheses</li> <li>5. Derive multi-machine power system dynamic models</li> <li>6. Evaluate and apply numerical solution methods of differential-algebraic equations governing multi-machine power systems</li> </ol>
<b>21.</b>	Special Electric Machines	MEE-166	<ol style="list-style-type: none"> <li>1. Formulation of electrodynamic equations of all electric machines and analyse the performance characteristics.</li> <li>2. Knowledge of transformations for the dynamic analysis of machines.</li> <li>3. Knowledge of determination of stability of the machines under small signal and transient conditions.</li> </ol>

### M. Tech( Control& Instrumentation)

#### Course outcome:

<b>S. no</b>	<b>Subject</b>	<b>Subject Code</b>	<b>Course Outcomes</b>
<b>1.</b>	Advance Control Systems	MEE-201	<ol style="list-style-type: none"> <li>1.To familiarize the students with MATLAB software and simulink.</li> <li>2.To help the students understand and practice the modeling and simulation.</li> <li>3. To study the effects of poles and zeros location in the s-plane on the transient and steady state behavior. Do modeling and analysis of various control systems including nonlinear systems and Power electronic devices using software.</li> </ol>

2.	Optimal Control	MEE-202	<ol style="list-style-type: none"> <li>1. Have complete familiarity with Calculus of Variation.</li> <li>2. Understand different forms of performance measures as applied to variety of optimal control problems.</li> <li>3. Model linear regulator problem.</li> <li>4. Understand Pontryagin's minimum principle.</li> <li>5. Apply dynamic programming.</li> <li>6. Apply optimal control law.</li> <li>7. Apply computational procedure to solve optimal control problems.</li> <li>8. Understand and apply Hamilton-Jacobi-Bellman equations.</li> </ol>
3.	Advance Measurement & Instrumentation Technology	MEE-203	<ol style="list-style-type: none"> <li>1. Ability to select suitable instruments for given applications.</li> <li>2. Ability to Design signal conditioning circuit for given application.</li> <li>3. Knowledge of measurement system design.</li> <li>4. Designing of instruments for higher reliability.</li> </ol>
4.	Nonlinear Systems & Adaptive Control	MEE-204	<ol style="list-style-type: none"> <li>1. demonstrate non-linear system behavior by phase plane and describing function methods and the 2. perform the stability analysis nonlinear systems by Lyapunov method develop design skills in optimal control problems.</li> <li>3. derive discrete-time mathematical models in both time domain (difference equations, state equations) and zdomain (transfer function using z-transform).</li> <li>4. predict and analyze transient and steady-state responses and stability and sensitivity of both open-loop and closed-loop linear, time-invariant, discrete-time control systems.</li> <li>5. acquire knowledge of state space and state feedback in modern control systems, pole placement, design of state observers and output feedback controllers</li> </ol>
5.	Biomedical Engineering	MEE-251	1. Basic Management, elements of

			<p>healthcare management, organizational hierarchy, Introduction to principles of management in Healthcare environment, health ergonomics and related technologies</p> <p>2. Importance of Healthcare service providers, knowledge about the healthcare market in India, important requirement of health care setup system</p> <p>3. Comprehend indian and global healthcare market and organisation structure</p> <p>4. Knowledge of Various hierarchy of hospital system, Role of biomedical engineers</p>
6.	Digital Control Systems	MEE-252	<p>1.Ability to analyze the concept of State Space Analysis, Signal Processing in Digital Control and Stability in Discrete System.</p> <p>2.State Variable Analysis of Digital Control System.</p>
7.	Bio-Medical Signal Processing	MEE-253	<p>1.Understand practical problems in objective analyses of biomedical signals.</p> <p>2.Understand the theoretical background underlying the use of digital signal processing and statistical techniques for biomedical applications.</p> <p>3.Identify the best solution for specific problems by considering the benefits and limitations of various digital signal processing approaches.</p> <p>4.Implement appropriate signal processing algorithms for practical problems involving biomedical signals and systems.</p> <p>5.Propose, carry out, orally present, and write up in conference-proceedings format, a biomedical-research mini project using signal-processing.</p>
8.	Digital Image Processing	MEE-254	<p>1. Understand the need for image</p>

			<p>transforms different types of image transforms and their properties.</p> <ol style="list-style-type: none"> <li>2. Develop any image processing application.</li> <li>3. Understand the rapid advances in Machine vision.</li> <li>4. Learn different techniques employed for the enhancement of images.</li> <li>5. Learn different causes for image degradation and overview of image restoration techniques.</li> <li>6. Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.</li> <li>7. Learn different feature extraction techniques for image analysis and recognition</li> </ol>
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### B.Tech (Information Technology)

**Course outcome:**

<b>S. no</b>	<b>Subject</b>	<b>Subject Code</b>	<b>Course Outcomes</b>
<b>1</b>	Fundamentals of Information Technology	BIT-01	<ol style="list-style-type: none"> <li>1. understand the basics of computers Hardware/Software.</li> <li>2. understand the importance of data compression and the algorithms for lossy and lossless data compression.</li> <li>3. understand the concept of operating system and fundamentals of computer networking.</li> </ol>
<b>2.</b>	Software Tools-I	BIT-02	<ol style="list-style-type: none"> <li>1. Understanding of Booting Process and installation of Operating system.</li> </ol>

			<ul style="list-style-type: none"> <li>2. Usage of Operating system commands.</li> <li>3. Understanding of Shell and its usage as a programming language.</li> <li>4. Understanding of Computer Networking concepts.</li> </ul>
3.	Programming Fundamentals	BIT-03	<ul style="list-style-type: none"> <li>1. Describing the basics of terminologies used in computer programming.</li> <li>2. Practicing C language programming by writing, compiling and debugging the code.</li> <li>3. Designing programs involving simple statements, conditional statements, iterative statements, array, strings, functions, recursion and structure.</li> <li>4. Discussing the dynamic memory allocations and use of the pointers.</li> <li>5. Applying basic operations on files through programs.</li> <li>6. Studying and implementing the codes using macros, preprocessor directives and command line arguments.</li> </ul>
4.	SWITCHING THEORY & LOGIC DESIGN	BIT-11	<ul style="list-style-type: none"> <li>1. Design a finite state machine and sequential logic design.</li> <li>2. Synthesize a logic design from a natural language description of a problem.</li> <li>3. Realize a complete arithmetic and logic unit.</li> <li>4. Generate a realization of combinational logic in a programmable gate array.</li> <li>5. Simulate a complete design to evaluate functional correctness and timing.</li> </ul>
5.	DATA STRUCTURES	BIT-12	<ul style="list-style-type: none"> <li>1. Write the algorithms and understand their complexities.</li> <li>2. Learn various linear data structures such as stack and queue.</li> <li>3. Learn various non-linear data structures such as tree and graph.</li> <li>4. Know applications of linear and</li> </ul>

			<p>non-linear data structures.</p> <ol style="list-style-type: none"> <li>5. Implement the different data structures statically (using array).</li> <li>6. Implement the different data structures dynamically (using pointer or linked list).</li> <li>7. Understand various searching and sorting techniques.</li> <li>8. Understand different hashing techniques</li> </ol>
<b>6.</b>	<b>OBJECT ORIENTED PROGRAMMING</b>	<b>BIT-13</b>	<ol style="list-style-type: none"> <li>1. Write basic and advance object oriented programs.</li> <li>2. Create and use classes and objects</li> <li>3. Write code for Constructors and Destructors.</li> <li>4. Write code for Inheritance.</li> <li>5. Write code for Polymorphism.</li> <li>6. Write code for Operator Overloading.</li> <li>7. Write code for Exception handling</li> <li>8. Write code for file handling and various file operations</li> </ol>
<b>7.</b>	<b>Software Tools-II</b>	<b>BIT-14</b>	<ol style="list-style-type: none"> <li>1. Understanding of process handling in Operating system.</li> <li>2. Usage of kernel system calls.</li> <li>3. Understanding of multiprogramming function of operating system using system calls.</li> </ol>
<b>8.</b>	<b>SWITCHING THEORY &amp; LOGIC DESIGN</b>	<b>BIT-11</b>	<ol style="list-style-type: none"> <li>1. Design a finite state machine and sequential logic design.</li> <li>2. Synthesize a logic design from a natural language description of a problem.</li> <li>3. Realize a complete arithmetic and logic unit.</li> <li>4. Generate a realization of combinational logic in a programmable gate array.</li> <li>5. Simulate a complete design to evaluate functional correctness and timing.</li> </ol>
<b>9.</b>	<b>DATA STRUCTURES</b>	<b>BIT-12</b>	<ol style="list-style-type: none"> <li>1. Write the algorithms and understand their complexities.</li> <li>2. Learn various linear data structures such as stack and queue.</li> <li>3. Learn various non-linear data</li> </ol>

			<p>structures such as such as tree and graph.</p> <ol style="list-style-type: none"> <li>4. Know applications of linear and non-linear data structures.</li> <li>5. Implement the different data structures statically (using array).</li> <li>6. Implement the different data structures dynamically (using pointer or linked list).</li> <li>7. Understand various searching and sorting techniques</li> <li>8. Understand different hashing techniques</li> </ol>
<b>10</b>	<b>OBJECT ORIENTED PROGRAMMING</b>	<b>BIT-13</b>	<ol style="list-style-type: none"> <li>1. Write basic and advance object-oriented programs.</li> <li>2. Create and use classes and objects</li> <li>3. Write code for Constructors and Destructors.</li> <li>4. Write code for Inheritance.</li> <li>5. Write code for Function Overloading</li> <li>6. Write code for Operator Overloading</li> <li>7. Write code for Dynamic or Run-time Polymorphism (Overriding).</li> <li>8. Write code for Exception handling.</li> <li>9. Write code for file handling and various file operations</li> </ol>
<b>11.</b>	<b>SOFTWARE TOOLS-II</b>	<b>BIT-14</b>	<ol style="list-style-type: none"> <li>1. Understanding of process handling in Operating system.</li> <li>2. Usage of kernel system calls.</li> <li>3. Understanding of multiprogramming function of operating system using system calls</li> </ol>
<b>12.</b>	<b>DESIGN &amp; ANALYSIS OF ALGORITHM</b>	<b>BIT-15</b>	<ol style="list-style-type: none"> <li>1. Analyze the time and space complexity of a given algorithm.</li> <li>2. Apply the techniques of algorithm in solving real world problems.</li> <li>3. Systematic development of an algorithm for solving a problem.</li> </ol>
<b>13.</b>	<b>COMPUTER ORGANIZATION &amp; ARCHGITECTURE</b>	<b>BIT-16</b>	<ol style="list-style-type: none"> <li>1. Discuss the basic concepts and structure of computers.</li> <li>2. Understand concepts of register transfer logic and arithmetic operations.</li> </ol>

			<p>3. Explain different types of addressing modes and memory organization.</p> <p>4. Explain the function of each element of a memory hierarchy.</p> <p>5. Identify and compare different methods for computer I/O.</p>
<b>14.</b>	<b>DATABASE MANAGEMENT SYSTEM</b>	<b>BIT-17</b>	<p>1. Understand the basic concepts, techniques and terminology of the database management system.</p> <p>2. Know and understand the basic syntax, semantics, and pragmatics of SQL &amp; PL/SQL.</p> <p>3. Analyse problems and apply DBMS concepts and techniques for developing the programs to solve them.</p> <p>4. Evaluate alternative database designs to determine which are better according to selected criteria,</p> <p>5. Know the concepts of Normalization and apply it to solve various problems related to database design.</p> <p>6. Know and understand the basic features of database transactions and concurrency control.</p> <p>7. Reason about and manipulate concurrency control techniques.</p>
<b>15.</b>	<b>Software Tools-III</b>	<b>BIT-18</b>	<p>1. Understanding the various functions of Linux Operating System.</p> <p>2. Usage of Apache Web Server, MySQL and PHP for creating different kinds of websites.</p> <p>3. Developing ability to create the desktop based and mobile based web applications</p>
<b>16.</b>	<b>OPERATING SYSTEM</b>	<b>BIT-26</b>	<p>1. Describe how computing resources (such as CPU and memory) are managed by the operating system; describe the basic principles used in the design of modern operating systems.</p> <p>2. Summarise the full range of considerations in the design of file</p>

			<p>systems, summarise techniques for achieving synchronisation in an operation system.</p> <p>3. Explain the objective and functions of modern operating systems, explain memory hierarchy and costperformance trade-offs, explain the operation, implementation and performance of modern operating systems, and the relative merits and suitability of each for complex user applications.</p> <p>4. Compare and contrast the common algorithms used for both pre-emptive and non-pre-emptive scheduling of tasks in operating systems, such a priority, performance comparison, and fair-share schemes. Contrast kernel and user mode in an operating system.</p> <p>5. Evaluate and report appropriate design choices when solving real-world problems.</p> <p>6. Analyze the key trade-offs between multiple approaches to operating system design</p>
<b>17.</b>	<b>COMPUTER NETWORKS</b>	<b>BIT-27</b>	<p>1. Provide insight about networks, topologies, and the key concepts.</p> <p>2. Know the basic concepts of network security and its various security issues related with each layer.</p> <p>3. Identify different types of communication mediums and techniques.</p> <p>4. Define and identify different types of multiplexing, data encoding, modulation and switching techniques</p> <p>5. Illustrate different standards of Local Area Network in terms of technologies and hardware used.</p> <p>6. Illustrate network addressing and analysis techniques.</p> <p>7. Understand the Wide Area Network technologies.</p>

			<p>8. Understand the network routing concepts</p> <p>9. Understand the internetworking concepts and architectures</p> <p>10. Understand the TCP/IP protocols and design architectures</p>
<b>18.</b>	<b>SOFTWARE ENGINEERING</b>	<b>BIT-28</b>	<p>1. List and define the fundamental concepts of Software Engineering and its applications.</p> <p>2. Design and develop the DFD, E-R Diagram, Flow Chart etc for a project.</p> <p>3. Design and develop the SRS for a project, ISO 9000 Models, SEI-CMM Model etc.</p> <p>4. List and define the test cases, fundamental concepts of testing to be applied on various projects.</p> <p>5. Implement and analyse the various model of software development for a project.</p> <p>6. Design and define the cost estimations, size estimations using various techniques.</p> <p>7. List and define the fundamental concepts of Software maintenance.</p> <p>8. Explain the CASE tool, Reverse Engineering, Re-Engineering, Software risk analysis and management.</p>
<b>19.</b>	<b>AUTOMATA THEORY</b>	<b>BIT-29</b>	<p>1. Understand, design, construct, analyze and interpret Regular languages, Expression and Grammars.</p> <p>2. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.</p> <p>3. Understand, design, analyze and interpret Context Free languages, Expression and Grammars.</p> <p>4. Understand, design, analyze and interpret Context Free languages, Expression and Grammars.</p> <p>5. Design different types of Push down Automata as Simple Parser.</p> <p>6. Design different types of Turing Machines (Acceptor, Verifier, Translator &amp; Basic computing</p>

			machine). 7. Compare, understand and analyze different languages, grammars, Automata and Machines and appreciate their power and convert Automata to Programs and Functions
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### M.Tech (Information Technology)

**Course outcome:**

S. no	Subject	Subject Code	Course Outcomes
1.	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	MAS-213	1. Give mathematically precise arguments for their claims. 2. Apply, adapt, and design efficient algorithms to solve computational problems. 3. Use Graphs to formulate and solve computational problems. 4. Apply mathematical logic to verify the correctness of various security protocols. 5. Use Group theoretic techniques to apply, adapt and design efficient coding schemes
2.	ADVANCED ALGORITHMS AND DATA STRUCTURES	MCS-106	1. Students are familiar with various algorithmic techniques such as brute force, greedy, and

			<p>divide and conquer.</p> <p>2. Application of advanced abstract data type (ADT) and data structures in solving real world problems.</p> <p>3. Effectively combine fundamental data structures and algorithmic techniques in building a complete algorithmic solution to a given problem.</p>
3.	ADVANCED COMPUTER ARCHITECTURE	MCS-107	<p>1. To Know the classes of computers, and new trends and developments in computer architecture.</p> <p>2. To understand the pipelining, instruction set architectures, memory addressing, performance metrics of processors, memory, networks, and disks.</p> <p>3. To understand the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), using dynamic scheduling, multiple issue, and speculation, multithreading by using ILP and supporting thread-level parallelism (TLP).</p>
4.	INFORMATION SECURITY & CYBER LAW	MCS-206	<p>1. Understand the fundamental principles of Cryptography, access control models and techniques, authentication and secure system design.</p> <p>2. Have a strong understanding of different cryptographic techniques and be able to use them.</p> <p>3. Apply methods for authentication, access control, IP Security, intrusion detection and prevention.</p> <p>4. Identify and mitigate software security vulnerabilities in existing systems.</p> <p>5. Explain the basic information on cyber security and Cyber</p>

			<p>Laws.</p> <p>6. Have knowledge on copy right issues of software's.</p> <p>7. Understand ethical laws of computer for different countries.</p> <p>8. Understand the computer forensic, Digital Forensic Methodologies and steganography.</p>
5.	INTERNET OF THINGS	MCS-181	<p>1. Understand the concepts of Internet of Things and its application areas.</p> <p>2. Analyze the basic protocols in wireless sensor network and cloud</p> <p>3. Implement basic IoT applications on embedded platform.</p> <p>4. Design IoT applications in different domains and be able to analyze their performance</p>
6.	ADVANCED JAVA	MCS-174	<p>1. Develop Swing-based GUI.</p> <p>2. Develop client/server applications and TCP/IP socket programming.</p> <p>3. Update and retrieve the data from the databases using SQL.</p> <p>4. Develop distributed applications using RMI.</p> <p>5. Develop component-based Java software using JavaBeans.</p> <p>6. Develop server-side programs in the form of servlets.</p> <p>7. Investigate programming for Web Services</p>
7.	SYSTEM SIMULATION & MODELLING	MCS-105A	<p>1. Student will have introductory knowledge of simulation and modeling.</p> <p>2. Student will be able to simulate the common problems manually.</p> <p>3. Student will be able to model various problems.</p> <p>4. Student will be able to verify and validate a model.</p>
8.	COMPUTER VISION AND IMAGE PROCESSING	MCS-179	
9.	WIRELESS SENSOR NETWORKS	MCS-180	1. Understand the concepts of

			<p>wireless sensor networks and its application areas.</p> <ol style="list-style-type: none"> <li>Analyze the basic protocols in wireless sensor network.</li> <li>Implement basic WSN applications.</li> <li>Design WSN applications in different domains and be able to analyze their performance</li> </ol>
<b>10.</b>	<b>MACHINE LEARNING TECHNIQUES</b>	<b>MCS-108</b>	<ol style="list-style-type: none"> <li>Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.</li> <li>Have an understanding of the strengths and weaknesses of many popular machine learning approaches.</li> <li>Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.</li> <li>Be able to design and implement various machine learning algorithms in a range of real-world applications.</li> </ol>
<b>11.</b>	<b>LINUX NETWORKING &amp; ADMINISTRATION</b>	<b>MCS-175</b>	<ol style="list-style-type: none"> <li>Administrate the LINUX server/system.</li> <li>Get familiar with the variety of interfaces and frameworks for writing network applications.</li> <li>Get the knowledge of Interfaces, STREAMS, sockets, and remote procedure call libraries.</li> <li>Know the basic steps and underlying mechanisms of writing programs using the client-server model.</li> </ol>
<b>12.</b>	<b>PYTHON PROGRAMMING</b>	<b>MCS-172</b>	<ol style="list-style-type: none"> <li>Student will have problem solving skill.</li> <li>Student will be able to implement problems using python.</li> </ol>

			3. Student will have knowledge about python packages.
<b>13.</b>	OPEN SOURCE PROGRAMMING	MCS-208	1. develop codes in open source web applications. 2. understand the risks associated with the open source codes . 3. write secure CGI scripts
<b>14.</b>	SOFT COMPUTING	MCS-173	1. Fuzzy logic and its applications. 2. Artificial neural networks and its applications. 3. Solving single-objective optimization problems using GAs. 4. Solving multi-objective optimization problems using Evolutionary algorithms. 5. Applications of Soft computing to solve problems in varieties of application domains
<b>15.</b>	CLOUD COMPUTING	MCS-60A	1. Able to collaborate the cloud services to any device. 2. Exploring the online applications of cloud services. 3. Implementing cloud computing for the corporation. 4. Design various applications by integrating the cloud services.
<b>16.</b>	ADVANCED COMPUTER NETWORKS	MCS-101A	1. To gain a through understanding of the design of modern computer networks and protocols, including the Internet. 2. To understand the workings of at least one actual TCP/IP Stack and will be able to apply this understanding in modifying it or implementing additional protocols
<b>17.</b>	INFORMATION RETRIEVAL	MCS-210	1. To apply information retrieval principles to locate relevant information in large collections of data. 2. To understand and deploy efficient techniques for the indexing of document objects that are to be retrieved.

			<p>3. To implement features of retrieval systems for web-based and other search tasks.</p> <p>4. To analyse the performance of retrieval systems using test collection.</p> <p>5. To develop a complete IR system from scratch</p>
<b>18.</b>	<b>NATURAL LANGUAGE INTERFACE</b>	<b>MCS-163</b>	

### **MCA (Master of Computer Applications)**

**Course outcome:**

<b>S. no</b>	<b>Subject</b>	<b>Subject Code</b>	<b>Course Outcomes</b>
<b>1.</b>	<b>OBJECT ORIENTED PROGRAMMING WITH C++</b>	<b>MCA-111</b>	<p>1. Write basic and advance object oriented programs.</p> <p>2. Create and use classes and objects</p> <p>3. Write code for Constructors and Destructors.</p> <p>4. Write code for Inheritance.</p> <p>5. Write code for Polymorphism.</p> <p>6. Write code for Exception handling</p> <p>7. Write code for file handling and various file operations</p>
<b>2.</b>	<b>DATABASE MANAGEMENT SYSTEMS</b>	<b>MCA-112</b>	<p>1. list and define the fundamental concepts of database management system.</p> <p>2. manually execute a given</p>

			<p>(simple) database design a transaction over it. 3. manually infer the type of a given (simple) database transaction.</p> <p>4. implement (simple) algorithms and data structures as database transaction.</p> <p>5. design (large) databases that are modular and have reusable components.</p> <p>6. explain on a simple problem how to apply concurrency control over concurrent database transactions.</p>
<b>3.</b>	<b>COMPUTER ORGANISATION &amp; ARCHITECTURE</b>	<b>MCA-113</b>	<p>1. Ability to understand the merits and pitfalls in computer performance measurements.</p> <p>2. Ability to understand memory hierarchy and its impact on computer cost/ performance.</p>
<b>4.</b>	<b>SOFTWARE ENGINEERING</b>	<b>MCA-114</b>	<p>1. Enhance the Software Project Management skills.</p> <p>2. Develop functioning software which benchmarks to the international standards.</p>
<b>5.</b>	<b>SOFTWARE LAB-1</b>	<b>MCA-115</b>	<p>1. Understanding of Booting Process and installation of Operating system</p> <p>2. Usage of Operating system commands</p> <p>3. Understanding of Shell and its usage as a programming language</p> <p>4. Understanding of Computer Networking concepts</p>
<b>6.</b>	<b>JAVA PROGRAMMING</b>	<b>MCA-201</b>	<p>1. Analyze and explain the behavior of programs involving the fundamental program constructs.</p> <p>2. Identify and correct syntax and logic errors in short programs.</p> <p>3. Design and implement a class based on attributes and behaviors of objects.</p> <p>4. Describe the parameter passing mechanisms in terms of formal parameters, actual parameters, non-object parameters and object</p>

			parameters.
<b>7.</b>	<b>DATA STRUCTURE &amp; APPLICATIONS</b>	<b>MCA-202</b>	<ol style="list-style-type: none"> <li>1. To understand the various techniques of sorting and searching</li> <li>2. To design and implement arrays, stacks, queues, and linked lists.</li> <li>3. To understand the complex data structures such as trees and graph</li> </ol>
<b>8.</b>	<b>WEB TECHNOLOGIES</b>	<b>MCA-203</b>	<ol style="list-style-type: none"> <li>1. Identify common design mistakes when creating a web based application.</li> <li>2. Discuss the process of editing a web page using text editors and web page editors.</li> <li>3. Cover commonly used HTML tags and discuss how this knowledge is important to a web designer.</li> <li>4. Demonstrate an understanding of basic CSS, XML, JAVA Script, JSP, ASP.NET and PHP.</li> </ol>
<b>9.</b>	<b>OPERATING SYSTEM CONCEPTS</b>	<b>MCA-204</b>	<ol style="list-style-type: none"> <li>1. List and define the fundamental concepts of Operating System.</li> <li>2. Study various CPU scheduling, Disk scheduling algorithms and compare their performance.</li> <li>3. Ability to simulate the given problems</li> </ol>
<b>10.</b>	<b>SOFTWARE LAB-2</b>	<b>MCA-205</b>	<ol style="list-style-type: none"> <li>1. Understanding of process handling in Operating system.</li> <li>2. Usage of kernel system calls.</li> <li>3. Understanding of multiprogramming function of operating system using system calls</li> </ol>