



JSPM's

# **RajarshiShahu College of Engineering**

## **Department of Civil Engineering**

### ❑ **VISION**

To provide an excellent academic environment for students to become competent Civil Engineer.

### ❑ **MISSION**

M1: To reinforce the students with fundamentals in Civil Engineering by providing scholarly and vibrant environment for successful careers.

M2: To explore and develop innovations that contributes to higher education, research and entrepreneurship development in applied domains of Civil Engineering.

M3: To serve society through knowledge and expertise in Civil Engineering.



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# RajarshiShahu College of Engineering

## Department of Civil Engineering

### Programme Specific Outcomes of the Department

**PSO 1:** Engineering Graduates will be able to satisfy the essentials in planning analysis, design and maintenance of Civil Engineering Structures by incorporating latest technologies and modern tools.

**PSO 2:** Engineering Graduates will be proficient in identifying and solving complex infrastructural problems, applying management and engineering techniques.

**PSO 3:** Engineering Graduates will be able to provide sustainable solutions to environmental and water resources challenges.



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# Rajarshi Shahu College of Engineering

## Department of Civil Engineering

### Program Outcomes

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Course Outcomes

Sr. No.	Course	Course Outcomes
1	<p><b><u>SE-SEM. III</u></b>  <b><u>BUILDING</u></b>  <b><u>TECHNOLOGY</u></b>  <b><u>AND</u></b>  <b><u>MATERIALS</u></b>  <b><u>[201001]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to identify the type of building as per NBC and choose appropriate foundation, DPC, Masonry and scaffolding from the available resources.</li> <li>2. Able to choose and demonstrate the use of new construction techniques as per requirement.</li> <li>3. Able to differentiate all the types of flooring and roofing materials and techniques</li> <li>4. Able to choose suitable type of door, window , Arches and lintel as per functional requirements of a building</li> <li>5. Able to demonstrate the construction details of vertical circulation means and protective coatings</li> <li>6. Able to identify suitable modern &amp; eco-friendly materials for particular application</li> </ol>
2	<p><b><u>ENGINEERING</u></b>  <b><u>MATHEMATIC</u></b>  <b><u>S III</u></b>  <b><u>[207001]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to build quantitative logical &amp; analytical Thinking ability.</li> <li>2. Able to collect numerical data, analyze and give conclusion.</li> <li>3. Able to help with organization and problem solving skills.</li> <li>4. Able to apply concepts of geometry &amp; trigonometry.</li> <li>5. Able to apply differential equations to calculate bending of beams.</li> <li>6. Able to solve complicated differential equations &amp; integrations arising from real life problems by numerical methods.</li> </ol>
3	<p><b><u>SURVEYING</u></b>  <b><u>[201006]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to analyse surveying data (traverse data) using distance and angle measuring equipment's, including errors and the need for error control.</li> <li>2. Able to interpret contour maps; acquire data from a map needed for the site selection, development and design of various civil engineering projects.</li> <li>3. Able to perform calculations made with surveying data, explain methods of data recording, display, and storage.</li> <li>4. Able to explain types of curves and design of curves.</li> <li>5. Able to explain different types of Instruments used for plane surveying.</li> </ol>

4	<p><b><u>STRENGTH OF MATERIALS</u></b>  <b><u>[201002]</u></b></p>	<ol style="list-style-type: none"> <li>1: Able to analyze structural members subjected to stresses using the fundamental engineering concepts.</li> <li>2: Able to analyze and learn about the concepts and determination of shear stresses and MI.</li> <li>3: Able to learn about the formulation of energy and moments for different shaft sections.</li> <li>4: Able to apply the concept, theories and failures of different types of stresses &amp; strain theory.</li> <li>5: Able to evaluate and analyze relation between BM &amp; SF diagram for different types of beams.</li> <li>6: Able to analyze and formulate various loads on different column sections.</li> </ol>
5	<p><b><u>GEOTECHNICAL ENGINEERING</u></b>  <b><u>[201003]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to analyze geotechnical concepts and identify soil classification, deposits and soil behavior relations.</li> <li>2. Able to analyze permeability of different soils by carrying out lab and field tests and describe seepage flow under earthen dams.</li> <li>3. Able to identify percentage of compaction by laboratory and field tests and analyze distribution of stress in different soils.</li> <li>4. Able to analyze shear strength of soil by different theories and carry out different laboratory tests.</li> <li>5. Able to analyze pressure exerted on retaining walls under different conditions with different theories.</li> <li>6. Able to analyze stability of slopes and concept of Geo-environment with its remedial measures.</li> </ol>
6	<p><b><u>SOFT SKILLS</u></b>  <b><u>[201010]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to identify their own goals, strengths and weaknesses and thus their opportunities.</li> <li>2. Able to Speak confidently with the correct pronunciation and accurate language, listen to the speaker with utmost attention, write a structured report of the project at hand &amp; write applications and effective resumes.</li> <li>3. Able to dress up professionally for any occasion to make a lasting impression.</li> <li>4. Able to demonstrate the art of speaking effectively and make others speak, get others involved, work together and reach the conclusion to</li> </ol>

		<p>the problem at hand faster.</p> <ol style="list-style-type: none"> <li>5. Able to work effectively as an associate and not a BOSS!</li> <li>6. Able to be a professional even under stress.</li> </ol>
7	<p><b><u>SE-SEM. IV</u></b>  <b><u>FLUID</u></b>  <b><u>MECHANICS I</u></b>  <b><u>[201004]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to describe properties of Fluids and perform the dimensional analysis.</li> <li>2. Able to analyze the forces applied by fluids at rest, measurement of and apply the Principles of floatation and buoyancy to design of ships and submarines.</li> <li>3. Able to describe and analyze the motion of fluids without considering the forces.</li> <li>4. Able to explain the motion of fluids with the forces causing flow and demonstrate the applications of Bernoulli's Equation.</li> <li>5. Able to describe laminar flow and boundary layer theory.</li> <li>6. Able to characterize the various properties of Turbulent flow &amp; enlist various attributes of fluid flow through Pipes.</li> <li>7. Able to apply fundamental principles of fluid mechanics for the solution of practical civil engineering problems of water conveyance in pipes, pipe networks</li> </ol>
8	<p><b><u>ARCHITECTU</u></b>  <b><u>RAL</u></b>  <b><u>PLANNING</u></b>  <b><u>AND DESIGN</u></b>  <b><u>OF BUILDINGS</u></b>  <b><u>[201005]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to relate various amenities and services including safety and land use zoning with respect to town planning.</li> <li>2. Able to identify the various legal aspects and documentation regarding town planning schemes from commencement to completion of project.</li> <li>3. Able to identify and distinguish principle of architectural planning and design along with the concept of green building.</li> <li>4. Able to contrast on various safety aspects and identify components of earthquake resistant structure.</li> <li>5. Able to identify different building services like noise and acoustics, ventilation, lighting and plumbing services and applying knowledge to actual situation.</li> <li>6. Able to apply and analyze the different types of architectural drawing and building rules and byelaws.</li> <li>7. Able to compile ideas as a whole or propose alternative solutions for planning of residential buildings.</li> <li>8. Able to compile ideas as a whole or propose alternative solutions for</li> </ol>

		planning of public buildings.
9	<b><u>STRUCTURAL ANALYSIS I</u></b> <b><u>[201008]</u></b>	<ol style="list-style-type: none"> <li>1. Able to explain the basics of configuration, classification and fundamental concepts of structural analysis.</li> <li>2. Able to determine slope and deflection of beams, frames and trusses by applying appropriate method.</li> <li>3. Able to analyse indeterminate structure using energy methods, compatibility method.</li> <li>4. Able to draw Influence line diagram for determinate beams, trusses and applications of ILD.</li> <li>5. Able to analyse arches for external and internal forces.</li> <li>6. Able to identify plastic behavior of material and perform plastic analysis of indeterminate beams and frames.</li> </ol>
10	<b><u>ENGINEERING GEOLOGY</u></b> <b><u>[207009]</u></b>	<ol style="list-style-type: none"> <li>1. Able to explain why engineering geology is essential for a Civil Engineer; identify the different types of minerals and rocks found on the earth's surface and their modes of formation.</li> <li>2. Able to identify various structural features out in the field and explain the theories postulated behind the formation of folded mountains.</li> <li>3. Able to explain the historical aspect of geology and the Way Rivers and oceans modify the geomorphology of an area.</li> <li>4. Able to explain various types of surveys, role of remote sensing and GIS in civil engineering.</li> <li>5. Able to judge the feasibility of a site as suitable for building dams, reservoirs and tunnels.</li> <li>6. Able to explain the effects of various natural disasters such as volcanoes, earthquakes and landslides while working in the field as a civil engineer and judge the feasibility of a stone as a good building stone.</li> </ol>
11	<b><u>CONCRETE TECHNOLOGY</u></b> <b><u>[201007]</u></b>	<ol style="list-style-type: none"> <li>1. Able to understand chemistry, properties, and classification of cement, fly ash, aggregates and admixtures, and hydration of cement in concrete.</li> <li>2. Able to Prepare and test the fresh concrete</li> <li>3. Able to test hardened concrete with destructive and non destructive testing instruments</li> <li>4. Get acquainted to concrete handling equipment and different special</li> </ol>

		<p>concrete types.</p> <p>5. Able to Design concrete mix of desired grade</p> <p>6. Able to Predict deteriorations in concrete and repair it with appropriate methods and techniques.</p>
12	<p><b><u>TE-SEM. V</u></b></p> <p><b><u>STRUCTURAL ANALYSIS II</u></b></p> <p><b><u>[301004]</u></b></p>	<p>1. Able to analyse static indeterminate structures by classical displacement methods.</p> <p>2. Able to analyse static indeterminate structures by flexibility matrix method.</p> <p>3. Able to analyse static indeterminate structures by stiffness matrix method</p> <p>4. Able to analyse statically determinate beams by finite difference method and describe applications of finite element method to one and two dimensional problems</p> <p>5. Able to analyse multi-storey frames for gravity loads and lateral loads by approximate methods.</p>
13	<p><b><u>INFRASTRUCTURE ENGINEERING</u></b></p> <p><b><u>[301002]</u></b></p>	<p>1. Able to explain scope of infrastructure engineering and components of permanent way of railway.</p> <p>2. Able to describe functions of components and geometry of track of permanent way of railways.</p> <p>3. Able to explain techniques and equipment used for dredging, dewatering and underwater drilling, blasting</p> <p>4. Able to illustrates types of tunnels and their construction techniques.</p> <p>5. Able to explain docks and Harbors.</p> <p>6. Able to describe and analyze different types of earth moving equipment.</p>
14	<p><b><u>STRUCTURAL DESIGN I</u></b></p> <p><b><u>[301003]</u></b></p>	<p>1. Able to explain various design philosophy, classify structural steel section, analyze and design of tension members.</p> <p>2. 2 .Able to analyze and design compression members along with design of base.</p> <p>3. Able to evaluate flexural strength of steel beams and to design the beams for given loading.</p> <p>4. Able to analyze the loads and their effects on connection &amp; plate girder and design of the plate girder.</p>

		<ol style="list-style-type: none"> <li>5. Able to analyze the loads and their effects on gantry girder and design of the gantry girder.</li> <li>6. Able to design an industrial steel building using I.S 800;2007</li> </ol>
15	<p><b><u>FLUID MECHANICS II</u></b>  <b><u>[301005]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to analyze flow around object and apply it to civil engineering problems.</li> <li>2. Able to explain unsteady flow.</li> <li>3. Able to explain open channel flow and its application in depth - discharge relationship in various types of flow.</li> <li>4. Able to demonstrate hydraulic jump in open channel.</li> <li>5. Able to analyze the flow of jet and its application.</li> <li>6. Able to explain terms related to hydropower plants.</li> </ol>
16	<p><b><u>HYDROLOGY AND WATER RESOURCES ENGINEERING</u></b>  <b><u>[301001]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to describe the hydrologic cycle and analyze the precipitation data.</li> <li>2. Able to explain the stream gauging.</li> <li>3. Able to explain the methods of irrigation and assess the canal revenue.</li> <li>4. Able to describe the ground water hydrology.</li> <li>5. Able to analyze the flood frequency and runoff hydrograph.</li> <li>6. Able to characterize the various terms related to reservoir planning.</li> <li>7. Able to explain the lift irrigation schemes and process of water logging</li> </ol>
17	<p><b><u>TE-SEM. VI ADVANCED SURVEYING</u></b>  <b><u>[301007]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to carry out field geodetic survey and apply triangulation adjustment with modern equipments</li> <li>2. Able to do Geodetic trigonometric levelling survey and apply corrections</li> <li>3. Able to perform hydrographic survey and get solution for problems related to it .</li> <li>4. Able to study aerial photography and applications in civil engineering</li> <li>5. Able to learn Remote sensing and GIS and its application in civil engineering FIELDS</li> </ol>
18	<p><b><u>PROJECT MANAGEMEN</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to explain the importance, objective, and functions of project management.</li> </ol>

	<p><b><u>T AND ENGINEERING ECONOMICS</u></b>  <b><u>[301008]</u></b></p>	<ol style="list-style-type: none"> <li>2. Able to analyze the network for planning and scheduling of project.</li> <li>3. Able to apply project monitoring, resource allocation as well as basic knowledge of project management software for controlling of project.</li> <li>4. Able to apply a basic project economics in construction industry.</li> <li>5. Able to apply different methods of analysis for project resource management and safety norms to the construction project.</li> <li>6. Able to evaluate conditions for project appraisal and preparation of project feasibility report as well as detailed project report.</li> </ol>
19	<p><b><u>STRUCTURAL DESIGN II</u></b>  <b><u>[301010]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to distinguish different design philosophies of design of R.C structures and analyze the limitations and advantages of each</li> <li>2. Able to apply different limit states for singly and doubly reinforced, balanced beam section and to design one way slabs</li> <li>3. Able to design two way slabs and staircases</li> <li>4. Able to design flexural members.</li> <li>5. Able to design flexural members for shear, bond, torsion and design continuous beam with concept of redistribution of moments</li> <li>6. Able to design column and column footing</li> </ol>
20	<p><b><u>ENVIRONMENTAL ENGINEERING I</u></b>  <b><u>[301011]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to explain effects and measurements of noise and air pollution , describe treatment and disposal of municipal solid waste</li> <li>2. Able to explain component of water supply scheme, quantity and quality of water</li> <li>3. Able to describe and design Aeration and Sedimentation processes</li> <li>4. Able to describe and design Coagulation, Flocculation and Filtration processes</li> <li>5. Able to describe disinfection, water softening methods , demineralization along with fluoridation and defluoridation techniques</li> <li>6. Able to describe water distribution systems, Rain water harvesting and packaged Water treatment plant.</li> </ol>
21	<p><b><u>FOUNDATION ENGINEERING</u></b>  <b><u>[301009]</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to plan, supervise and implement a site investigation program, suggest a laboratory testing program with suitable sampling and sampler, analyze the information obtained.</li> <li>2. Ability to calculate the various types of bearing capacities of all type of</li> </ol>

		<p>foundations and soil conditions.</p> <p>3. Proficient in principles to analyze elastic, consolidation and time rate settlements and able to recognize basic consolidation theory and damages.</p> <p>4. Able to identify different types of piles, their uses and calculating the bearing capacity of piles.</p> <p>5. Able to describe sheet piles and characterization of BC soil, remedial measures to be cultivated for foundations.</p> <p>6. Ability to evaluation of liquefaction potential and suggest the preventive measures and able to explain Geosynthetics and its application.</p>
22	<p><b><u>SEMINAR &amp; TECHNICAL COMMUNICATION</u></b> [301012]</p>	<p>1. Perform close and critical readings of the literature of topic of interest</p> <p>2. Evaluate, credit, and synthesize sources of the selected seminar topic</p> <p>3. Identify the disciplinary context for different kinds of writing, including both informal writing (like scientific note taking) and formal writing (like report writing)</p> <p>4. Construct a report consistent with expectations of the discipline, including an appropriate organization, style, voice, and tone</p> <p>5. Perform critical readings of their own writing and proofreading.</p> <p>6. Demonstrate an understanding of the unique demands of oral presentation and ability to follow discussions and oral arguments.</p>
23	<p><b><u>BE-SEM. VII ENVIRONMENTAL ENGINEERING II</u></b> [401001]</p>	<p>1. Able to characterize sewage, design a sewage collection system and describe stream sanitation.</p> <p>2. Able to design of preliminary and primary treatment of sewage.</p> <p>3. Able to analyze and design secondary (biological) sewage treatment units for STP.</p> <p>4. Able to analyze and design low cost sewage treatment methods.</p> <p>5. Able to analyze onsite Sanitation and package Sewage Treatment Plant and design anaerobic treatment units.</p> <p>6. Able to explain 'Industrial waste water treatment methods' and 'Recycle and reuse of treated waste water'</p>
24	<p><b><u>TRANSPORTATION</u></b></p>	<p>1. Able to describe transport flow process and analyze travel demand modelling and forecasting.</p>

	<b><u>ENGINEERING</u></b> <b><u>[401002]</u></b>	<ol style="list-style-type: none"> <li>2. Able to explain urban transport technology and concept of integrated model transit system.</li> <li>3. Able to evaluate the transportation project and explain the highway financing methods</li> <li>4. Able to conduct traffic studies, analyze traffic data, estimate basic characteristics of traffic stream and signal design</li> <li>5. Able to design flexible pavement and explain the distresses in pavements.</li> <li>6. Able to design rigid pavements and overlays</li> </ol>
25	<b><u>STRUCTURAL DESIGN III</u></b> <b><u>[401003]</u></b>	<ol style="list-style-type: none"> <li>1. Able to describe various systems of prestressing and analyze member strength.</li> <li>2. Able to design Prestressed member for flexure and shear.</li> <li>3. Able to analyse and design of prestressed flat slab..</li> <li>4. Able to design and detailing of different of types of retaining wall.</li> <li>5. Able to analyse and design of ground resting water tank.</li> <li>6. Able to do load transfer calculations and load phenomenon of structure for different load combinations. Calculate seismic loads and understand basic concepts of structural dynamics.</li> </ol>
26	<b><u>ELECTIVE I ARCHITECTURE AND TOWN PLANNING</u></b> <b><u>[401004]</u></b>	<ol style="list-style-type: none"> <li>1. Able to identify the role of urban planner and architect in planning and designing and landscaping..</li> <li>2. Able to analyze importance of built environment, urban design and renewal for quality of life and livability</li> <li>3. Able to identify importance of Sustainable development</li> <li>4. Able to define stages of town planning and development through study of planning of new towns.</li> <li>5. Able to explain the importance of surveys and hierarchy of planning.</li> <li>6. Able to apply the acts related to the planning of a region and a town</li> </ol>
27	<b><u>ELECTIVE II: ADVANCED CONCRETE TECHNOLOGY</u></b> <b><u>[401005]</u></b>	<ol style="list-style-type: none"> <li>1 Able to decide which type of cement and aggregate to be used to improve the overall quality of concrete and study various properties of concrete</li> <li>2: Able to know special types of concrete and their properties.</li> <li>3: Able to design special types of concrete mix of specified strength and able to perform and evaluate various non destructive tests</li> </ol>

		<p>4: Able to understand Different types of fibers and various properties of Fibers.</p> <p>5: Able to know properties of harden fibers and study of GFRC, SFRC and SIFCON.</p> <p>6: Able to know fibrocement and Analysis and design of prefabricated concrete structural elements.</p>
28	<p><b><u>TQM AND MIS</u></b>  <b><u>IN CIVIL</u></b>  <b><u>ENGINEERING</u></b>  <b><u>401005</u></b></p>	<ol style="list-style-type: none"> <li>1. Able to explain the various definition of quality and its interpretations important of quality in construction</li> <li>2. Able to explain concept of TQM ,Six Sigma and Defects in constructions.</li> <li>3. Able to explain ISO 9001 principles ,Quality manual and Corrective and Preventive actions, Conformity and NC reports.</li> <li>4. Able to explain Benchmarking in TQM, Kaizen in TQM, Quality Circle, Categories of cost of Quality, CONQAS, CIDC-CQRA certifications</li> <li>5. Able to explain Techniques in TQM Implementation and awards.</li> <li>6. Able to explain Management Information systems (MIS) and decision support system.</li> </ol>
29	<p><b><u>PROJECT</u></b>  <b><u>WORK</u></b>  <b><u>[401006]</u></b></p>	<ol style="list-style-type: none"> <li>1. Convert an open ended problem statement into a statement of proposed work</li> <li>2. Decompose problem/task into subtasks and establish a methodology and process by which progress may be evaluated</li> <li>3. Select and apply appropriate methods/models, or mathematical simulations of the real world and analyzes the data to provide information for decisions</li> <li>4. Perform feasibility analysis and evaluates quality of solutions to select the best one</li> <li>5. Produce usable documents of record regarding the design process</li> <li>6. Collaborate with team members to achieve a common goal</li> <li>7. Enhance awareness and critical self-examination of one's own values, and to appreciate the relevance of personal values in the business/workplace and develop skills which recognizes and resolves ethical issues while working</li> </ol>

30	<u>BE-SEM. VIII</u>  <u>DAMS AND</u> <u>HYDRAULICS</u> <u>STRUCTURES</u> <u>[401007]</u>	<ol style="list-style-type: none"> <li>1. Able to analyse data ,design gravity and earthen dam and check its stability</li> <li>2. Able to explain information regarding dams as general.</li> <li>3. Able to design hydraulic structure i. spillway, gates, energy dissipator or canal, cross drainage work, diversion head work</li> <li>4. Learn river training methods and design of guide bund</li> <li>5. Able to understand hydropower engineering. i.e. components and its function .</li> </ol>
31	<u>QUANTITY</u> <u>SURVEYING,</u> <u>CONTRACTS</u> <u>AND TENDERS</u> <u>[401008]</u>	<ol style="list-style-type: none"> <li>1. Able to understand the meaning of important terms in estimating and importance of approximate estimate</li> <li>2. Able to take out quantities of various items of works from drawings, make abstract of the same.</li> <li>3. Able to draft suitable specifications to meet expectations of client and prepare a rate analysis of various items of works.</li> <li>4. Able to choose suitable method of valuation of property and assess the value of a property.</li> <li>5. Able to execute works in PWD &amp; prepare documents required for a tender.</li> <li>6. Able to identify various facts of contract including its meaning, validity, the conditions of contract, measures to solve disputes law of contract etc.</li> </ol>
32	<u>ELECTIVE III</u> <u>CONSTRUCTION</u> <u>MANAGEMENT</u> <u>T</u> <u>[401010]</u>	<ol style="list-style-type: none"> <li>1. Able to explain the basics of construction industry, role of infrastructure in national economy, basics of construction management, importance of PMC.</li> <li>2. Able to apply basic procedures of work study, work measurement, time and motion studies.</li> <li>3. Able to explain Need and importance of labour laws, workman's compensation act 1923, child labour act. Able to identify the investment opportunities in construction sector.</li> <li>4. Able to identify risks involved in projects, analyse the risks and control the risks using mathematical models. Able to perform value analysis.</li> <li>5. Able to explain material management in construction, role of supply management in construction, role of ERP in material management</li> </ol>

		<p>and human resource management.</p> <p>6. Able to explain basic terminologies and applications of artificial intelligence in civil engineering.</p>
33	<p><b><u>ADVANCED</u></b>  <b><u>TRANSPORTA</u></b>  <b><u>TION</u></b>  <b><u>ENGINEERING</u></b>  <b><u>[401010]</u></b></p>	<ol style="list-style-type: none"> <li>1. Describe transport flow process and analyze travel demand modeling and forecasting.</li> <li>2. Explain urban transport technology and concept of integrated model transit system.</li> <li>3. Evaluate the transportation project and explain the highway financing methods</li> <li>4. Conduct traffic studies, analyze traffic data, estimate basic characteristics of traffic stream and signal design</li> <li>5. Design flexible pavement and explain the distresses in pavements.</li> <li>6. Design rigid pavements and overlays</li> </ol>



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## Department of Electrical Engineering

### Programme Specific Outcomes of the Department

**PSO1:** To inculcate student's professional and ethical attitude, effective communication skills, teamwork abilities, multidisciplinary approach and capability to relate engineering issues to broader social context.

**PSO2:** To train the electrical engineering students with good scientific and engineering intricacy so as to comprehend, analyze, design, and create novel products and give solutions for the real-life problems.

**PSO3:** To prepare electrical engineering students to be capable of solving the problems related to industries with strong mathematics foundation and domain proficiency.



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## Department of Electrical Engineering

### Program Outcomes

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Course Outcomes

Sr	Course	Course Outcomes
1	<b><u>SE-SEM. I</u></b> <b><u>ENGINEERING</u></b> <b><u>MATHEMATIC</u></b> <b><u>S-III (SE SEM-I)</u></b>	<ol style="list-style-type: none"> <li>1. Apply knowledge of higher order linear differential equations to LCR circuits.</li> <li>2. Use Laplace Transform techniques to solve differential equations involved in circuit theory and control system.</li> <li>3. Find Fourier Transform, Inverse Fourier Transform. Find Z transform and Inverse Z transform and apply them to solve difference equations in Linear time invariant system.</li> <li>4. Apply concept of vector differential calculus to Electromagnetic field and various other engineering applications</li> <li>5. Apply knowledge of vector integral calculus to Electromagnetic field, transmission system and various other engineering applications.</li> <li>6. Apply knowledge of Cauchy's Integral Formula to evaluate complex line integrals and to evaluate real definite integrals by Residue Theorem and also understand the concept of conformal mapping.</li> </ol>
2	<b><u>POWER</u></b> <b><u>GENERATION</u></b> <b><u>TECHNOLOGI</u></b> <b><u>ES (SE SEM-I)</u></b>	<ol style="list-style-type: none"> <li>1. Identify operations of thermal power plant with all accessories and cycles.</li> <li>2. Be aware of the principle of operation, components, layout, location, environment and social issue of nuclear, diesel and gas power plant.</li> <li>3. Identify and demonstrate the components of hydro power plant and calculation of turbine required based on catchment area.</li> <li>4. Find the importance of wind-based energy generation along with its design, analysis and comparison.</li> <li>5. Apply solar energy in thermal and electrical power generation considering energy crisis, environmental and social benefits.</li> <li>6. Understand the operation of electrical energy generation using biomass, tidal, geothermal, hydel plants, fuel cell and interconnection with grid.</li> </ol>
3	<b><u>ANALOG AND</u></b> <b><u>DIGITAL</u></b> <b><u>ELECTRONICS</u></b>	<ol style="list-style-type: none"> <li>1. Understand conversions of number system, perform binary arithmetic and reduce Boolean expressions by K- Map.</li> </ol>

	<b><u>(SE SEM-I)</u></b>	<ol style="list-style-type: none"> <li>2. Demonstrate basics of various types of Flip flops, design registers and counter.</li> <li>3. Analyze parameter of Op-amp and its applications.</li> <li>4. Apply the knowledge of Op-amp as wave form generators &amp; filters.</li> <li>5. Use BJT as amplifier with various configurations.</li> <li>6. Analyze performance of uncontrolled and precision rectifiers.</li> </ol>
4	<b><u>MATERIAL SCIENCE (SE SEM-I)</u></b>	<ol style="list-style-type: none"> <li>1. Explain dielectric and optical properties of materials.</li> <li>2. Summarize various properties of insulating materials.</li> <li>3. Explain various properties of magnetic materials and classify different materials from Electrical Engineering applications point of view.</li> <li>4. Explain various properties of conducting materials and Choose materials for application in various electrical equipment.</li> <li>5. Explain and describe knowledge of nanotechnology, batteries and solar cell materials.</li> <li>6. Test different classes of materials as per IS.</li> </ol>
5	<b><u>ELECTRICAL MEASUREMENT AND INSTRUMENTATION (SE SEM-I)</u></b>	<ol style="list-style-type: none"> <li>1. Understand various characteristics of measuring instruments, their classification and range extension technique.</li> <li>2. Classify resistance, apply measurement techniques for measurement of resistance, inductance.</li> <li>3. Explain construction, working principle and use of dynamometer type wattmeter for measurement of power under balance and unbalance condition.</li> <li>4. Explain Construction, working principle of 1-phase and 3-phase induction, static energy meter and calibration procedures.</li> <li>5. Use of CRO for measurement of various electrical parameters, importance of transducers, their classification, selection criterion and various applications.</li> <li>6. Measurement of various physical parameters using transducers.</li> </ol>
6	<b><u>NETWORK ANALYSIS (SE SEM-II)</u></b>	<ol style="list-style-type: none"> <li>1. Explain basics of Network and Graph Theory</li> <li>2. Apply various theorems for simplification of networks.</li> <li>3. Understand the behavior of the network by analyzing its transient response by Classical Methods.</li> </ol>

		<ol style="list-style-type: none"> <li>4. Solve network by analyzing its transient response by Laplace Transform Method.</li> <li>5. Demonstrate operation of two port network.</li> <li>6. Select values of resistance, inductor &amp; capacitor for filter.</li> </ol>
7	<b><u>FUNDAMENTALS OF MICROCONTROLLER &amp; APPLICATIONS (SE SEM-II)</u></b>	<ol style="list-style-type: none"> <li>1. To understand the differences between microcontrollers &amp; microprocessor, learn architecture &amp; describe features of a typical microcontroller.</li> <li>2. To use the 8051 addressing modes &amp; instruction set &amp; apply knowledge to perform programs, arithmetic &amp; logic operations, data &amp; control transfer operations, I/O operation.</li> <li>3. To define the protocol for serial communication &amp; understand microcontroller development systems.</li> <li>4. To build &amp; test a microcontroller-based system.</li> <li>5. To interface the system to switches, keypads, display, A/D converter &amp; D/C converters.</li> <li>6. To provide student with the help concept &amp; techniques required in designing computer hardware interfaces embedded software for microcontroller &amp; measurement of various parameters.</li> </ol>
8	<b><u>NUMERICAL METHODS AND COMPUTER PROGRAMMING (SE SEM-II)</u></b>	<ol style="list-style-type: none"> <li>1. Develop algorithms and implement programs using C language for various numerical methods.</li> <li>2. Demonstrate types of errors in computation and their causes of occurrence.</li> <li>3. Identify various types of equations and apply appropriate numerical method to solve.</li> <li>4. Apply different numerical methods for interpolation, differentiation and numerical integration.</li> <li>5. Apply and compare various numerical methods to solve first and second order.</li> <li>6. Apply and compare various numerical methods to solve linear simultaneous equations.</li> </ol>

<p><b>9</b></p>	<p><b><u>ELECTRICAL MACHINES-I (SE SEM-II)</u></b></p>	<ol style="list-style-type: none"> <li>1. Estimate the equivalent circuit parameters, losses, efficiency and regulation of transformer.</li> <li>2. Demonstrate types of errors in computation and their causes of occurrence.</li> <li>3. Identify various types of equations and apply appropriate numerical method to solve.</li> <li>4. Apply different numerical methods for interpolation, differentiation and numerical integration.</li> <li>5. Apply and compare various numerical methods to solve first and second order.</li> <li>6. Apply and compare various numerical methods to solve linear simultaneous equations.</li> </ol>
<p><b>10</b></p>	<p><b><u>POWER SYSTEM-I (SE SEM-II)</u></b></p>	<ol style="list-style-type: none"> <li>1. Recognize different patterns of load curve, calculate different factors associated with it and tariff structure for LT and HT consumers.</li> <li>2. Aware of features, ratings, application of different electrical equipment in power station and selection of overhead line insulators.</li> <li>3. Analyze and apply the knowledge of electrical and mechanical design of transmission lines.</li> <li>4. Calculate resistance and inductance of transmission lines.</li> <li>5. Calculate capacitance of transmission lines.</li> <li>6. Identify and analyze the performance of transmission lines.</li> </ol>



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# **RajarshiShahu College of Engineering**

## **Department of Computer Engineering**

### **❑ VISION**

To create quality computer professional through excellent academic environment.

### **❑ MISSION**

M1: To empower students with fundamental of Computer Engineering to be successful professional.

M2: To impart quality education to enable the students for higher studies, research and entrepreneurship.

M3: To cater for the service to society.



JSPM's

# RajarshiShahu College of Engineering

## Department of Computer Engineering

### Programme Specific Outcomes of the Department

- PSO1: Professional Skills**-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, data science, and networking for efficient design of computer-based systems.
- PSO2: Problem-Solving Skills**- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver advanced computing systems.
- PSO3: Professional Career and Entrepreneurship**- The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies and research.



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## Course Outcomes

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1	<b><u>SE-SEM. I</u></b> <b><u>DISCRETE</u></b> <b><u>MATHEMATICS</u></b> <b><u>[CODE:210241]</u></b>	<ol style="list-style-type: none"> <li>1. Illustrate concept of set theory, proposition &amp; mathematical induction.</li> <li>2. Explain relation and functions.</li> <li>3. Explain possible outcomes of elementary combinatorial processes such as permutation, combination</li> <li>4. Explain concept in graph theory &amp; apply algorithm to find shortest path.</li> <li>5. Illustrate basic terminology in trees &amp; apply algorithms to find minimum spanning tree.</li> <li>6. Describe different types group and ring.</li> </ol>
2	<b><u>DATA</u></b> <b><u>STRUCTURE</u></b>	<ol style="list-style-type: none"> <li>1. Design and implement solutions for different problems on tree</li> <li>2. Apply different data structures to solve problems on graphs</li> <li>3. Describe and implement the hash function and concepts of collision and its resolution methods</li> <li>4. Compare and design static trees and dynamic trees</li> <li>5. Construct heap and multiway trees</li> <li>6. Explain and apply various file organizations</li> </ol>
3	<b><u>DIGITAL</u></b> <b><u>ELECTRONICS</u></b> <b><u>AND LOGIC</u></b> <b><u>DESIGN</u></b>	<ol style="list-style-type: none"> <li>1. Design and Implement Combinational circuits.</li> <li>2. Design and Implement Sequential circuits.</li> <li>3. Develop the programs for digital circuits using VHDL.</li> <li>4. Design digital circuit using programmable logic devices</li> <li>5. Discuss Standard TTL and CMOS Characteristics and its Interfacing.</li> <li>6. Explain the architecture, programming model and interfacing of 8051 Microcontroller.</li> </ol>
4	<b><u>OBJECT</u></b> <b><u>ORIENTED</u></b> <b><u>PROGRAMING</u></b> <b><u>[210245]</u></b>	<ol style="list-style-type: none"> <li>1. Summarize needs and basic concepts of object oriented programming and C++ Programming.</li> <li>2. Illustrate use of operator overloading and inheritance.</li> <li>3. Illustrate need and use of Virtual Functions and pointers.</li> <li>4. Describe Templates and Exception Handling.</li> <li>5. Describe Files and Streams handling with their solutions.</li> </ol>

		6. Discuss various Standard Template Libraries (STL).
5	<b><u>COMPUTER ORGANIZATION AND ARCHITECTURE</u></b>	<ol style="list-style-type: none"> <li>1. Describe evolution of computers, number operations</li> <li>2. Illustrate basics of memory.</li> <li>3. Describe input output organization.</li> <li>4. Summarize instruction sets and its types</li> <li>5. Explain basics of processor organization.</li> <li>6. Illustrate roles of basic processing unit.</li> </ol>
6	<b><u>SOFT SKILLS</u></b> <b>[201010]</b>	<ol style="list-style-type: none"> <li>1. Perform his/her SWOT Analysis and design the goals (personal &amp; career, long term and short term)</li> <li>2. Apply verbal and non- verbal communication skills.</li> <li>3. Implement corporate etiquettes and ethics in day to day life.</li> <li>4. Demonstrate interpersonal skills through GD's and team building activities.</li> <li>5. Discover leadership qualities.</li> </ol>
7	<b><u>ENGINEERING MATHEMATICS III</u></b> <b>[207001]</b>	<ol style="list-style-type: none"> <li>1. Able to build quantitative logical &amp; analytical Thinking ability.</li> <li>2. Able to collect numerical data, analyze and give conclusion.</li> <li>3. Able to help with organization and problem solving skills.</li> <li>4. Able to apply concepts of geometry &amp; trigonometry.</li> <li>5. Able to apply differential equations to calculate bending of beams.</li> <li>6. Able to solve complicated differential equations &amp; integrations arising from real life problems by numerical methods.</li> </ol>
8	<b><u>COMPUTER GRAPHICS CODE</u></b>	<ol style="list-style-type: none"> <li>1. Apply mathematics and logic to develop Computer programs for primitive graphic operations.</li> <li>2. Implement polygon filling, windowing and clipping algorithms.</li> <li>3. Implement various 2D and 3D graphical transformations.</li> <li>4. Illustrate the concepts related to Segment and computer vision.</li> <li>5. Apply techniques of hidden surfaces, light effects and shading in construction of natural object.</li> <li>6. To summarize and demonstrate advanced animation and gaming techniques by using modern graphics tools</li> </ol>

9	<b><u>ADVANCE DATA STRUCTURE CODE</u></b>	<ol style="list-style-type: none"> <li>1. Design and implement solutions for different problems on tree.</li> <li>2. Apply different data structures to solve problems on graphs.</li> <li>3. Describe and implement the hash function and concepts of collision and its resolution methods.</li> <li>4. Compare and design static trees and dynamic trees.</li> <li>5. Construct heap and multi way trees.</li> <li>6. Explain and apply various file organizations.</li> </ol>
10	<b><u>MICRO PROCESSOR] CODE</u></b>	<ol style="list-style-type: none"> <li>1. Apply assembly language programming to develop real life applications.</li> <li>2. Understand and compare Architecture of advanced processors and its Resources</li> <li>3. Evaluate the performance of 80386DX for multitasking</li> <li>4. Analyze different I/O protection methods</li> <li>5. Compare different processor configurations</li> <li>6. Understand parallel processing and math Co-processor</li> </ol>
11	<b><u>PRINCIPAL OF PROGRAMMING LANGUAGES</u></b>	<ol style="list-style-type: none"> <li>1. To explain the software development process and concept of syntax and semantics of language.</li> <li>2. To classify the different data types and construct the structure of computation.</li> <li>3. To infer different programming paradigm.</li> <li>4. To summarize the basic of Object Oriented Programming Language.</li> <li>5. To demonstrate the principles of Object Oriented Programming using Java.</li> <li>6. To use the concept of exception handling and develop a program using applet.</li> </ol>
12	<b><u>TE-SEM. V THEORY OF COMPUTATION</u></b>	<ol style="list-style-type: none"> <li>1. Design, manipulate, and reasoning about formal computational models such as automata and Turing machines.</li> <li>2. Identify relations between classes of computational problems, formal languages, and computational models</li> <li>3. Apply mathematical knowledge and logic in solving problems of grammar.</li> </ol>

		<ol style="list-style-type: none"> <li>4. Illustrate various Turing machine and related hypotheses and try to solve undividable problem.</li> <li>5. Analyze deeper and broader concepts of parsing and push down automata.</li> <li>6. Apply NP-completeness concepts to create proofs regarding the computational complexity of novel problems.</li> </ol>
13	<p><b><u>DATA BASE MANAGEMENT SYSTEM</u></b>  <b><u>CODE: 310242</u></b></p>	<ol style="list-style-type: none"> <li>1. Demonstrate E-R Model for given requirements and convert the same into database tables</li> <li>2. Demonstrate database techniques such as SQL &amp; PL/SQL.</li> <li>3. Apply database normalization techniques to for relational database design.</li> <li>4. Explain transaction Management in relational database System.</li> <li>5. Describe different database architecture and analyses the use of appropriate architecture in real time environment.</li> <li>6. Use modern database techniques such as NOSQL and Hadoop.</li> </ol>
14	<p><b><u>SOFTWARE ENGINEERING &amp; PROJECT MANAGEMENT</u></b></p>	<ol style="list-style-type: none"> <li>1. Describe ,Compare and Decide on a process model for a developing a software project</li> <li>2. Analyze and model software requirement.</li> <li>3. Design and Model software system.</li> <li>4. Plan, schedule and execute a project considering the risk management</li> <li>5. Apply quality attributes in software development life cycle.</li> <li>6. Describe various Software Testing strategies</li> </ol>
15	<p><b><u>INFORMATION SYSTEM &amp; ENGINEERING ECONOMICS</u></b>  <b><u>CODE: 310244</u></b></p>	<ol style="list-style-type: none"> <li>1. Describe the need, usage and importance of an Information System to an organization.</li> <li>2. Explain concepts, methodologies, and technologies behind various Information System solutions like ERP, CRM, Data warehouses.</li> <li>3. Summarize information systems development and project management.</li> <li>4. Explain engineering economic decisions, time value of money and money management.</li> <li>5. Analyze Present worth, Future worth and annual worth on economic equivalence.</li> <li>6. Analyze cash flow and taxes.</li> </ol>

16	<b><u>COMPUTER NETWORKS</u></b> <b><u>CODE:310245</u></b>	<ol style="list-style-type: none"> <li>1. Analyze the requirements for a given organizational structure to select the most appropriate networking architecture, topologies, transmission mediums, and technologies.</li> <li>2. Demonstrate design issues, flow control and error control.</li> <li>3. Illustrate MAC protocols and Ethernet standards.</li> <li>4. Demonstrate different routing algorithms.</li> <li>5. Illustrate Client-Server architectures and transport layer protocols.</li> <li>6. Describe application layer protocols.</li> </ol>
17	<b><u>TE-SEM. VI DESIGN &amp; ANALYSIS OF ALGORITHMS</u></b> <b><u>CODE</u></b>	<ol style="list-style-type: none"> <li>1. To identify the problem, design the algorithm and confirm the correctness of algorithm</li> <li>2. Apply and analyze greedy and dynamic programming algorithmic design techniques</li> <li>3. Apply and analyze Abstract algorithm</li> <li>4. Analyze the asymptotic performance of algorithms</li> <li>5. Analyze the amortized algorithms.</li> <li>6. Analyze the multithreaded and distributed algorithms.</li> </ol>
18	<b><u>SOFTWARE MODELING AND DESIGN</u></b> <b><u>CODE:310253</u></b>	<ol style="list-style-type: none"> <li>1. Understand and apply object oriented concept for designing oo based Model/application.</li> <li>2. Transform requirement document in to appropriate design</li> <li>3. Analyze dynamic modeling aspect wrt UML diagrams like sequence diagram, Timing diagram State Machine diagram etc..</li> <li>4. Design component and deployment diagrams for given system.</li> <li>5. Describe design patterns.</li> <li>6. Describe different types of software testing.</li> </ol>
19	<b><u>EMBEDED SYSTEM AND IOT</u></b> <b><u>(CODE:310252)</u></b>	<ol style="list-style-type: none"> <li>1. Describe the architecture of IoT.</li> <li>2. Implement an architectural design for IoT for specified requirement.</li> <li>3. Illustrate interfacing of different peripherals with Raspberry-Pi.</li> <li>4. Identify different protocols and security aspects of IoT.</li> <li>5. Describe the web of things and cloud of things.</li> <li>6. Learn the implementation of IoT based application.</li> </ol>
20	<b><u>SYSTEM PROGRAMING AND OPERATING</u></b>	<ol style="list-style-type: none"> <li>1. Explain basics of Systems programming, analyze and synthesize assembler.</li> </ol>

	<b><u>SYSTEM CODE</u></b>	<ol style="list-style-type: none"> <li>2. Explain data structures used in the design of Macro processor, Linker, Loader as well as analyze and synthesize them.</li> <li>3. Explain role of lexical analysis-parsing, differentiate between Compilation and Interpretation and use LEX and YACC tools.</li> <li>4. Explain process management and deadlocks in operating system.</li> <li>5. Explain Memory management in operating system.</li> <li>6. Explain I/O and file management in operating system.</li> </ol>
21	<b><u>WEB TECHNOLOGY [310254]</u></b>	<ol style="list-style-type: none"> <li>1. Analyze given assignment to select sustainable web development design methodology.</li> <li>2. Develop web based application using suitable client side web technologies.</li> <li>3. Develop web based application using suitable Server side web technologies.</li> <li>4. Develop solution to complex problems using appropriate method, technologies.</li> <li>5. Develop solution to complex problems using appropriate frameworks.</li> <li>6. Develop solution to complex problems using appropriate web services and content management.</li> </ol>
22	<b><u>SEMINAR &amp; TECHNICAL COMMUNICATIO N</u></b>	<ol style="list-style-type: none"> <li>1. Perform close and critical readings of the literature of topic of interest.</li> <li>2. Evaluate, credit, and synthesize sources of the selected seminar topic.</li> <li>3. Identify the disciplinary context for different kinds of writing, including both informal writing (like scientific note taking) and formal writing (like report writing).</li> <li>4. Construct a report consistent with expectations of the discipline, including an appropriate organization, style, voice, and tone.</li> <li>5. Perform critical readings of their own writing and proofreading.</li> <li>6. Demonstrate an understanding of the unique demands of oral presentation and ability to follow discussions and oral arguments.</li> </ol>
23	<b><u>HIGH PERFORMANCE COMPUTING</u></b>	<ol style="list-style-type: none"> <li>1. Introduction of basic concepts of parallel computing.</li> <li>2. Describe principles of parallel programming</li> <li>3. Understand concept of communication in parallel computing</li> <li>4. Demonstrate analytical models of parallel programming</li> <li>5. Demonstrate parallel algorithm</li> </ol>

		6. Demonstrate Parallel Programming using CUDA.
24	<b><u>ARTIFICIAL INTELLIGENCE</u></b>	<ol style="list-style-type: none"> <li>1. Compare various searching algorithms related to searching, reasoning, machine learning, and language processing</li> <li>2. Discuss the core concepts and algorithms of advanced AI, including informed searching and CSP</li> <li>3. Understand realising aspects of intelligent behaviour in computer systems using logic and cognitive sciences.</li> <li>4. Describe some of the more advanced topics of AI such as learning, natural language processing and ANN.</li> <li>5. Discuss history, concept development and key components of robotics technologies.</li> <li>6 Illustrate and analyze the problems in spatial coordinate representation, robot locomotion design, localization and mapping, navigation and path planning.</li> </ol>
25	<b><u>DATA ANALYTICS</u></b>	<ol style="list-style-type: none"> <li>1. Interpret Data Analytics Life cycle for Big data.</li> <li>2. Apply statistical methods for evaluation.</li> <li>3. Apply clustering, association rule, regression and classification techniques to solve real life problem.</li> <li>4. Selecting appropriate data visualizations to clearly communicate analytic insights.</li> <li>5. Identify analytics for unstructured data.</li> </ol>
26	<b><u>ELECTIVE I DATA MINING &amp; WAREHOUSE</u></b>	<ol style="list-style-type: none"> <li>1. Comprehend basic concepts of data mining.</li> <li>2. Illustrate concepts of data warehousing.</li> <li>3. Apply methods for measuring data similarity and dissimilarity.</li> <li>4. Comprehend basics of frequent patterns and implement association rule.</li> <li>5. Implement and compare classification techniques.</li> <li>6. Illustrate Multiclass classification, Evaluate classifier using different metrics.</li> </ol>
27	<b><u>ELECTIVE II: SOFTWARE TESTING &amp; QUALITY</u></b>	<ol style="list-style-type: none"> <li>1. Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.</li> <li>2. Design and develop project test plan, design test cases, test data, and</li> </ol>

	<b><u>ASSURANCE</u></b>	<p>conduct test operations.</p> <ol style="list-style-type: none"> <li>3. Apply test automation tool for various software testing for testing software.</li> <li>4. Apply recent automation tool for various software testing for testing software.</li> <li>5. Apply different approaches of quality management, assurance, and quality standard to software system.</li> <li>6. Apply and analyze effectiveness Software Quality Tools.</li> </ol>
<b>28</b>	<b><u>MACHINE LEARNING CODE</u></b>	<ol style="list-style-type: none"> <li>1. Explain fundamentals of Machine learning.</li> <li>2. Apply different preprocessing methods to prepare training data set for machine learning.</li> <li>3. Design and implement different regression techniques.</li> <li>4. Analyze Naïve Bayes and Support Vector machine classifier</li> <li>5. Design and implement decision tree and learn fundamentals of clustering, ensemble learning.</li> <li>6. Design and Implement clustering techniques and outline recommendation systems, deep learning.</li> </ol>
<b>29</b>	<b><u>INFORMATION &amp; CYBER SECURITY</u></b>	<ol style="list-style-type: none"> <li>1. Critical understanding of basic characteristics, components and policies of information security.</li> <li>2. Analyze and select the appropriate encryption technique and security standard for addressing the problems.</li> <li>3. Analyze public key cryptography, key management to design, implement authentication services</li> <li>4. Able to analyze advanced security requirements, issues and technologies</li> <li>5. Master the characteristic of intrusion detection system and firewall tools.</li> <li>6. Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.</li> </ol>
<b>30</b>	<b><u>ELECTIVE III ERTOS</u></b>	<ol style="list-style-type: none"> <li>1. Recognize and classify embedded and real time system.</li> <li>2. Explain communication bus protocols used for embedded and real-time</li> </ol>

		<p>systems.</p> <ol style="list-style-type: none"> <li>3. Classify and exemplify scheduling algorithms.</li> <li>4. Apply software development process to a given RTOS application.</li> <li>5. Design a given RTOS based application concept of virtualization.</li> <li>6. Discuss futures of RTOS based application.</li> </ol>
<b>31</b>	<b><u>ELECTIVE IV</u></b> <b><u>CLOUD</u></b> <b><u>COMPUTING</u></b>	<ol style="list-style-type: none"> <li>1. Describe the need, usage and importance of cloud computing.</li> <li>2. Explain concepts, types of file system.</li> <li>3. Describe concept of virtualization.</li> <li>4. Explain applications of cloud computing like AWS.</li> <li>5. Analyze future trends of IOT in cloud computing.</li> <li>6. Discuss features of Cloud computing.</li> </ol>
<b>32</b>	<b><u>PROJECT</u></b> <b><u>CODE</u></b>	<ol style="list-style-type: none"> <li>1. Problem Solving Skills: Analyze alternative approaches, apply and use most appropriate one for feasible solution exhibiting project management skills.</li> <li>2. Communication: Demonstrate effective communication at various levels and write precise reports and technical documents in a nutshell.</li> <li>3. Collaboration: Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work, Inter-personal relationships, conflict management and leadership quality.</li> <li>4. Ethics: Provide solution to problems considering social, safety, environmental, ethical and legal issues.</li> </ol>



JSPM's

# RajarshiShahu College of Engineering

## Department of Mechanical Engineering

### Programme Specific Outcomes of the Department

**PSO1:** An ability to design solution for thermal, hydraulic systems, design components and production processes that meet the specified needs with team work and management skills for safety, societal and environmental aspects through lifelong learning.

**PSO2:** An ability to use Modeling and Analysis tools and technologies necessary for obtaining effective, economical and accurate solutions of engineering problems.

**PSO3:** An ability to design electromechanical and automation systems in multidisciplinary environments through better communication.



JSPM's

# Rajarshi Shahu College of Engineering

## Department of Mechanical Engineering

### Program Outcomes

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Course Outcomes

Sr	Course	Course Outcomes
1	<b><u>ENGINEERING MATHEMATICS – III</u></b>	<ol style="list-style-type: none"> <li>1. Solve higher order linear differential equations and its applications to modeling of mass spring systems with free and forced Damped and Un-damped systems.</li> <li>2. Apply the knowledge of numerical methods which is essential as when analytical methods fail to give the solution of system of linear equations and differential equations.</li> <li>3. Apply statistical methods and regression analysis in analyzing and interpreting experimental data, testing of hypothesis and probability distributions.</li> <li>4. Apply concept of vector differential calculus to fluid mechanics and various engineering applications.</li> <li>5. Apply knowledge of vector integral calculus to fluid mechanics and various engineering applications.</li> <li>6. Solve various partial differential equations like one dimensional diffusion and wave equations, one and two dimensional heat equations.</li> </ol>
2	<b><u>MANUFACTURING PROCESS-I</u></b>	<ol style="list-style-type: none"> <li>1. Understand and analyze foundry practices like pattern making, mold making, Core making and Inspection of defects.</li> <li>2. Understand and analyze Hot and Cold Working, Rolling, Forging, Extrusion and Drawing Processes.</li> <li>3. Understand and describe different plastic molding processes, Extrusion of Plastic and Thermoforming.</li> <li>4. Understand different Welding and joining processes and its defects.</li> <li>5. Understand, Design and Analyze different sheet metal working processes.</li> <li>6. Understand the constructional details and Working of Centre Lathe.</li> </ol>
3	<b><u>COMPUTER AIDED MACHINE DRAWING</u></b>	<ol style="list-style-type: none"> <li>1. List the different solid modeling software like CATIA, PRO/E (CREO) and use GUI to develop 3D model.</li> <li>2. Produce 2D sketch using with parametric modeling, geometry</li> </ol>

		<p>constraint and then transform into 3D model. Complete all features of geometry of model by applying feature operation.</p> <ol style="list-style-type: none"> <li>3. Produce complex 3D model with freeform (surface) modeling, feature based modeling.</li> <li>4. List the geometric dimensioning &amp; tolerancing terms</li> <li>5. Generate assemblies of mechanical components using appropriate constraints.</li> <li>6. Produce engineering production drawing sheet using geometrical dimensioning and tolerancing.</li> </ol>
4	<b><u>THERMODYNAMICS</u></b>	<ol style="list-style-type: none"> <li>1. Apply various laws of thermodynamics to various processes and real systems.</li> <li>2. Apply the concept of Entropy, Calculate heat, work and other important thermodynamic properties for various ideal gas processes.</li> <li>3. Estimate performance of various Thermodynamic gas power cycles and gas refrigeration cycle and availability in each case.</li> <li>4. Estimate the condition of steam and performance of vapour power cycle and vapour compression cycle.</li> <li>5. Estimate stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants.</li> <li>6. Use Psychrometric charts and estimate various essential properties related to Psychrometry and processes.</li> </ol>
5	<b><u>MATERIAL SCIENCE</u></b>	<ol style="list-style-type: none"> <li>1. Understand the various crystal structure of metals and materials, their classification and indexing of lattice planes and direction.</li> <li>2. Evaluate the relation between the crystal structure and mechanical properties and deformation phenomena.</li> <li>3. Identify the importance of material testing methods to evaluate the properties of engineering materials using destructive testing methods.</li> <li>4. Evaluate the different types of corrosion taking place under various corrosive environment and identify preventive measures.</li> <li>5. Understand the importance of various modern techniques of surface modification for advanced engineering application.</li> <li>6. Recognize manufacturing process by powder metallurgy technique for developing various components of engineering applications.</li> </ol>

6	<b><u>STRENGTH OF MATERIALS</u></b>	<ol style="list-style-type: none"> <li>1. Apply knowledge of mathematics, science, for engineering applications.</li> <li>2. Design and conduct experiments, as well as to analyze and interpret data.</li> <li>3. Design a component to meet desired needs within realistic constraints of health and safety.</li> <li>4. To identify, formulate, and solve engineering problems</li> <li>5. An understanding of professional and ethical responsibility.</li> <li>6. Use of techniques, skills, and modern engineering tools necessary for engineering practice.</li> </ol>
7	<b><u>THEORY OF MACHINES – I</u></b>	<ol style="list-style-type: none"> <li>1. Describe different mechanisms with mobility and their inversions.</li> <li>2. Find static and dynamic forces of four-bar and slider crank mechanisms and mass moment of inertia of different m/c parts.</li> <li>3. Explain concept of friction and its applications.</li> <li>4. Find braking torque and power of various friction devices.</li> <li>5. Find displacement, velocity and acceleration of four bar and slider crank mechanism using analytical method.</li> <li>6. Compare velocity and acceleration of simple and complex mechanisms using graphical methods like Relative Velocity and Acceleration method,ICR method and Klein’s construction.</li> </ol>
8	<b><u>ENGINEERING METALLURGY</u></b>	<ol style="list-style-type: none"> <li>1. Learn the basic concept of Metallurgy &amp; Construct the Equilibrium Diagram.</li> <li>2. Demonstrate the sample preparation procedure for Metallography &amp; Understand Macro &amp; Micro structure for various metals for Industrial applications.</li> <li>3. Evaluate &amp; Classify Iron Carbon alloy system and its applications.</li> <li>4. Identify the suitable heat treatment processes for different steels.</li> <li>5. Identify the specific grades of steels and their industrial applications.</li> <li>6. Classify the various Nonferrous metals &amp; their alloys for industrial applications.</li> </ol>
9	<b><u>APPLIED THERMODYNAMICS</u></b>	<ol style="list-style-type: none"> <li>1. Classify IC engine construction and material used, working principle and explain losses encountered in fuel air and actual cycle.</li> </ol>

		<ol style="list-style-type: none"> <li>2. Analyze requirements of carburetion, stages of combustion in SI engine theory of abnormal combustion and combustion chambers for SI Engine.</li> <li>3. Evaluate fuel injection system, stages of combustion in CI engine theory of abnormal combustion and combustion chambers for the engine.</li> <li>4. Evaluate performance of IC engines and result of the tests</li> <li>5. Explain system necessary for efficient operation of IC engine and get familiar with emission, norms and controlling techniques</li> <li>6. Explain the classification and working of air compressors and evaluate the performance of reciprocating air compressor.</li> </ol>
10	<b><u>ELECTRICAL AND ELECTRONICS ENGINEERING</u></b>	<ol style="list-style-type: none"> <li>1. To understand &amp; develop the capability to identify and select suitable DC motor /generator &amp; its speed control method for given industrial application.</li> <li>2. To understand &amp; develop the capability to identify and select suitable 3 phase induction motor and its speed control method for given industrial application.</li> <li>3. To understand &amp; develop the capability to identify and select suitable special purpose motor and its speed control method for given industrial application.</li> <li>4. To understand the basics of Arduino controller &amp; Program Arduino IDE using conditional statements.</li> <li>5. Interfacing peripheral with Arduino IDE like LED, LCD and keypad, serial communication.</li> <li>6. Interfacing sensors with Arduino IDE like temperature sensor (LM35), LVDT, strain gauge, accelerometer &amp; DC motor interface using PWM.</li> </ol>
11	<b><u>HEAT TRANSFER</u></b>	<ol style="list-style-type: none"> <li>1. Identify and understand failure modes for mechanical elements and design of machine elements based on strength.</li> <li>2. Design shafts, Keys and Coupling for industrial applications.</li> <li>3. Design machine elements subjected to fluctuating loads.</li> <li>4. Design Power Screws for various applications.</li> <li>5. Design fasteners and welded joints subjected to different loading</li> </ol>

		<p>conditions.</p> <p>6. Design various Springs for strength and stiffness.</p>
12	<b><u>THEORY OF MACHINE- II</u></b>	<ol style="list-style-type: none"> <li>1. Explain Spur gear theory which will be the prerequisite for gear design</li> <li>2. Find center distance, virtual number of teeth, Efficiency, tooth forces, torque transmitted of helical gear, Bevel Gear &amp; Worm and worm wheel.</li> <li>3. Find torque transmitting capacity in gear trains which will be the prerequisite for gear box design.</li> <li>4. Compare cam profiles for different follower motions.</li> <li>5. Explain Synthesis of the mechanism</li> <li>6. Explain step-less regulations.</li> </ol>
13	<b><u>TURBO MACHINE</u></b>	<ol style="list-style-type: none"> <li>1. Apply thermodynamics and kinematics principles to turbo machines.</li> <li>2. Explain the construction, working and analysis of impulse water turbine along with its performance characteristics, selection and governing mechanism.</li> <li>3. Interpret the classification, construction, working and analysis of reaction water turbine along with its performance characteristics, selection and governing mechanism.</li> <li>4. Interpret the classification, construction, working and analysis of steam turbines along with its performance characteristics and governing mechanism.</li> <li>5. Explain the classification, construction, working and analysis of centrifugal pumps along with its performance characteristics, selection and operational limitations.</li> <li>6. Describe the classification, construction and working of compressors along with its performance analysis and operational limitations.</li> </ol>
14	<b><u>METEOROLOGY &amp; QUALITY CONTROL</u></b>	<ol style="list-style-type: none"> <li>1. Explain selection of tool and techniques for measurement, calibration procedure and gauge design.</li> <li>2. Implement the knowledge of various comparators, thread and gear geometry used in engineering applications.</li> <li>3. Interpreting and carrying out various advanced measurement tools used in metrology.</li> </ol>

		<ol style="list-style-type: none"> <li>4. Explaining quality and quality tools used for quality control.</li> <li>5. Interpreting and detecting data for statistical quality control using various control charts and sampling methods.</li> <li>6. Recognizing various Total Quality Management tools and its applications in engineering industries</li> </ol>
15	<b><u>NUMERICAL METHOD &amp; OPTIMIZATION</u></b>	<ol style="list-style-type: none"> <li>1. Explain analytical method to estimate roots of equation in engineering application</li> <li>2. Apply analytical &amp; iterative approach to solve system of linear simultaneous equations using suitable technique along with development of a base for programming.</li> <li>3. Formulate the problem in standard format &amp; apply suitable method to optimize the outcome in lieu with modern optimization techniques.</li> <li>4. Explain Distinguish between and apply implicit &amp; explicit methods; and single step &amp; multistep methods to Solve ODE &amp; PDE using suitable numerical method.</li> <li>5. Apply the least square method for curve fitting.</li> <li>6. Understand various engineering problems using suitable open or closed numerical integration techniques.</li> </ol>
16	<b><u>DESIGN OF MACHINE ELEMENTS II</u></b>	<ol style="list-style-type: none"> <li>1. Design the spur gear for different mechanical power transmission systems.</li> <li>2. Design helical gear as well as bevel gear for different applications</li> <li>3. Analyze rolling contact bearing and selection from manufactures catalogue.</li> <li>4. Design the worm gear for different applications.</li> <li>5. Design of belt chain and rope drives for different industrial application</li> <li>6. Design and analyze sliding contact bearing.</li> </ol>
17	<b><u>REFRIGERATION &amp; AIR CONDITIONING</u></b>	<ol style="list-style-type: none"> <li>1. Describe fundamental principles and applications of refrigeration and air conditioning.</li> <li>2. Explain various refrigerant and vapor compression refrigeration cycles.</li> <li>3. Describe cascade refrigeration systems and vapor absorption systems.</li> </ol>

		<ol style="list-style-type: none"> <li>4. Interpret air conditioning processes and its applications in Human comfort.</li> <li>5. Explain various equipment-operating principles, operating and safety controls employed in refrigeration &amp; air conditioning systems.</li> <li>6. Describe air handling unit and fan coil unit of Air conditioning system.</li> </ol>
18	<b><u>MECHATRONICS</u></b>	<ol style="list-style-type: none"> <li>1. Identification of key elements of Mechatronics system and its representation in terms of block diagram engines.</li> <li>2. Represent the Mechatronics system in terms of block diagram and calculate the overall transfer function of the system.</li> <li>3. Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital I/O Interfacing of Sensors, Actuators using appropriate DAQ micro-controller.</li> <li>4. Development of PLC ladder programming and implementation of real life system.</li> <li>5. Discuss and develop the system modeling and analysis in Time and Frequency domain analysis of system model (for control application).</li> <li>6. Understand control actions such as Proportional, derivative and integral and study its significance in industrial applications. PID control implementation on real time systems.</li> </ol>
19	<b><u>MANUFACTURING PROCESS II</u></b>	<ol style="list-style-type: none"> <li>1. Describe various machine tools with their Classification, constructional features, applications and cutting tools.</li> <li>2. Identifying various grinding operation &amp; various types of super finishing processes.</li> <li>3. Analyzing different types of cutting forces in metal cutting.</li> <li>4. Evaluating the effect of various process parameters on process characteristics for advanced machining processes.</li> <li>5. Constructing the part programming for CNC. To select proper codes in programming for CNC and Advanced Manufacturing Processes.</li> <li>6. Executing design principles in jigs and fixtures and their applications.</li> </ol>
20	<b><u>HYDRAULICS AND PNEUMATICS</u></b>	<ol style="list-style-type: none"> <li>1. Understand the working principle of components used in hydraulic &amp; pneumatic systems</li> </ol>

		<ol style="list-style-type: none"> <li>2. Identify various applications of hydraulic &amp; pneumatic systems</li> <li>3. Selection of appropriate components required for hydraulic and pneumatic systems</li> <li>4. Analyse hydraulic and pneumatic systems for industrial/mobile applications</li> <li>5. Design a system according to the requirements</li> <li>6. Develop and apply knowledge to various applications.</li> </ol>
21	<b><u>CAD/CAM AUTOMATION</u></b>	<ol style="list-style-type: none"> <li>1. Apply homogeneous transformation matrix for geometrical transformations of 2D CAD entities for basic geometric transformations</li> <li>2. Use analytical and synthetic curves and surfaces in part modeling.</li> <li>3. Do real times analysis of simple mechanical elements like beams, trusses, etc. and comment on safety of engineering components using analysis software.</li> <li>4. Generate CNC program for Turning / Milling and generate tool path using CAM software.</li> <li>5. Demonstrate understanding of various rapid manufacturing techniques and develop competency in designing and developing products using rapid manufacturing technology.</li> <li>6. Understand the robot systems and their applications in manufacturing industries.</li> </ol>
22	<b><u>DYNAMICS OF MACHINERY</u></b>	<ol style="list-style-type: none"> <li>1. Express the fundamentals of vibrations and estimate natural frequencies for single DOF un damped &amp; damped free vibratory systems.</li> <li>2. Develop analytical competency to judge the response to forced vibrations due to harmonic excitation, base excitation &amp; excitation due to reciprocating &amp; rotary unbalance</li> <li>3. Develop mathematical model and Estimate natural frequencies, mode shapes [Eigen values &amp; Eigen vectors] for 2 DOF un damped free longitudinal &amp; tensional vibratory systems.</li> <li>4. Use balancing technique to complete balancing of rotating &amp; reciprocating masses in multi cylinder inline &amp; radial engines.</li> <li>5. Use suitable vibration measuring instrument for industrial / real life</li> </ol>

		applications and select suitable method for vibration control.
23	<b><u>ELECTIVE – I</u></b> <b><u>FINITE ELEMENT</u></b> <b><u>ANALYSIS</u></b>	<ol style="list-style-type: none"> <li>1. Understand the different techniques used to solve mechanical engineering problems.</li> <li>2. Derive and use 1-D and 2-D element stiffness matrices and load vectors from various methods to solve for displacements and stresses.</li> <li>3. Explain the inner workings of a finite element code for linear stress, displacement, temperature and modal analysis.</li> <li>4. Use commercial finite element analysis software to solve complex problems in solid mechanics and heat transfer.</li> <li>5. Interpret the results of finite element analyses and make an assessment of the results in terms of modeling (physics assumptions) errors, discretization (mesh density and refinement toward convergence) errors, and numerical (round-off) errors.</li> </ol>
24	<b><u>ELECTIVE- II</u></b> <b><u>OPERATION</u></b> <b><u>RESEARCH</u></b>	<ol style="list-style-type: none"> <li>1. Understand &amp; Learn how to define and solve Linear Programming models by using various techniques.</li> <li>2. Understand and solve problems involving transporting products from several sources to several destinations.</li> <li>3. Apply the most widely used quantitative techniques in decision making</li> <li>4. Apply &amp; Learn how to build and solve the Network models using “CPM and PERT” techniques.</li> <li>5. Understand queuing theory. Find the Solution of sequencing problems.</li> <li>6. Learn and understand simulation techniques.</li> </ol>
25	<b><u>ELECTIVE – II</u></b> <b><u>AUTOMOBILE</u></b> <b><u>ENGINEERING</u></b>	<ol style="list-style-type: none"> <li>1. To compare and select the proper automotive system for the vehicle.</li> <li>2. To analyze the performance of the vehicle.</li> <li>3. To diagnose the faults of automobile vehicles</li> <li>4. To apply the knowledge of EVs, HEVs and solar vehicles</li> </ol>
26	<b><u>ELECTIVE – II</u></b> <b><u>ENERGY AUDIT</u></b> <b><u>AND</u></b> <b><u>MANAGEMENT</u></b>	<ol style="list-style-type: none"> <li>1. Compare energy scenario of India and World.</li> <li>2. Carry out Energy Audit of the Residence / Institute/ Organization.</li> <li>3. Evaluate the project using financial techniques</li> </ol>

		<ol style="list-style-type: none"> <li>4. Identify and evaluate energy conservation opportunities in Thermal Utilities.</li> <li>5. Identify and evaluate energy conservation opportunities in Electrical Utilities.</li> <li>6. Identify the feasibility of Cogeneration and WHR Use a CFD tool effectively for practical problems and research.</li> </ol>
27	<b><u>ENERGY ENGINEERING</u></b>	<ol style="list-style-type: none"> <li>1. Describe the power generation scenario, the layout components of thermal power plant and analyze the improved Rankin cycle, Cogeneration cycle</li> <li>2. Analyze the steam condensers, recognize an environmental impacts of thermal power plant and method to control the same</li> <li>3. Recognize the layout, component details of hydroelectric power plant and nuclear power plant</li> <li>4. Realize the details of diesel power plant, gas power plant and analyze gas turbine power cycle</li> <li>5. Emphasize the fundamentals of non-conventional power plants.</li> <li>6. Describe the different power plant electrical instruments and basic principles of economics of power generation.</li> </ol>
28	<b><u>MECHANICAL SYSTEM DESIGN</u></b>	<ol style="list-style-type: none"> <li>1. Understand the difference between component level design and system level design.</li> <li>2. Design various mechanical systems like pressure vessels, machine tool gear boxes, material handling systems, etc. for the specifications stated/formulated.</li> <li>3. Learn optimum design principles and apply it to mechanical components.</li> <li>4. Handle system level projects from concept to product.</li> </ol>
29	<b><u>ELECTIVE – III INDUSTRIAL ENGINEERING</u></b>	<ol style="list-style-type: none"> <li>1. Apply the Industrial Engineering Concept</li> <li>2. Understand, analyze and implement different concept involved in method study</li> <li>3. Design and develop different aspects of work system and facilities</li> <li>4. Understand and apply industrial safety standards, financial management practices.</li> <li>5. Understand project work based on modeling &amp; simulation area.</li> </ol>

		6. Understand and apply facility design techniques.
30	<b><u>ELECTIVE – III</u></b> <b><u>ROBOTICS</u></b>	<ol style="list-style-type: none"> <li>1. Identify different type of robot configuration with relevant terminology.</li> <li>2. Select suitable sensors, actuators and drives for robotic systems.</li> <li>3. Understand kinematics in robotic systems.</li> <li>4. Design robot with desired motion with suitable trajectory planning</li> <li>5. Select appropriate robot programming for given application.</li> <li>6. Understand need of IoT, machine learning, simulation in robotics.</li> </ol>
31	<b><u>ELECTIVE – IV</u></b> <b><u>PRODUCT</u></b> <b><u>DESIGN AND</u></b> <b><u>DEVELOPMENT</u></b>	<ol style="list-style-type: none"> <li>1. Understand essential factors for product design</li> <li>2. Design product as per customer needs and satisfaction</li> <li>3. Understand Processes and concepts during product development</li> <li>4. Understand methods and processes of Forward and Reverse engineering</li> <li>5. Carry various design processes as DFA, DFMEA, design for safety</li> <li>6. Understand the product life cycle and product data management.</li> </ol>
32	<b><u>ELECTIVE – IV</u></b> <b><u>ADVANCED</u></b> <b><u>MANUFACTURIN</u></b> <b><u>G PROCESSES</u></b>	<ol style="list-style-type: none"> <li>1. Classify and analyze special forming processes</li> <li>2. Analyze and identify applicability of advanced joining processes</li> <li>3. Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques</li> <li>4. Select appropriate micro and nano fabrication techniques for engineering applications</li> <li>5. Understand and apply various additive manufacturing technology for product development.</li> <li>6. Understand material characterization techniques to analyze effects of chemical composition, composition variation, crystal structure, etc.</li> </ol>



JSPM's

# RajarshiShahu College of Engineering

## Department of IT Engineering

### Programme Specific Outcomes of the Department

**PSO1:** Demonstrate the ability to apply discrete principles of mathematics along with programming paradigms to expedite solution building in the IT domain.

**PSO2:** Apply computational techniques using core aspects of network and system programming to deliver secured application in the arena of analytics and computing.

**PSO3:** Demonstrate project management skills to handle multidisciplinary complex tasks proficiently and utilize these skills for entrepreneurship.



JSPM's

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## Department of IT Engineering

### Program Outcomes

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- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Course Outcomes

Sr	Course	Course Outcomes
1	<b><u>DS</u></b>	<ol style="list-style-type: none"> <li>1. Use appropriate set, function, or relation models to analyze practical examples, interpret the associated operations and terminology.</li> <li>2. Apply formal proof techniques, and explain their reasoning clearly.</li> <li>3. Produce group codes by identifying relations between algebraic structures, such as homomorphism and group actions</li> <li>4. Apply basic terminology and model problems in Information Technology Engineering using graphs and trees</li> <li>5. Recognize probabilities and discrete distributions for simple combinatorial processes; calculate expectations</li> <li>6. 6. Apply graph theory models of data structures and state machines to solve problems of connectivity and constraint satisfaction using tree algorithms for e.g. finding shortest path .</li> </ol>
2.	<b><u>COA</u></b>	<ol style="list-style-type: none"> <li>1. Describe the structure, function and characteristics of computer systems, Solve problems based on computer arithmetic.</li> <li>2. Explain the functions of ALU and its addressing modes.</li> <li>3. Explain methods of Control unit design and list out corresponding control signals for given instruction.</li> <li>4. Describe the memory organization, uses for cache memory, virtual memory and secondary storage.</li> <li>5. Describe instruction level parallelism.</li> <li>6. Explain parallel organization of multiprocessors &amp; multi core systems.</li> </ol>
3.	<b><u>DELD</u></b>	<ol style="list-style-type: none"> <li>1. Spectacle an awareness and apply knowledge of number systems, codes, Boolean algebra and use necessary A.C, D.C Loading characteristics as well as functioning while designing with logic gates.</li> <li>2. Use logic function representation for simplification with K -Maps and analyze as well as design Combinational logic circuits using SSI &amp; MSI chips</li> <li>3. Analyze Sequential circuits like Flip - Flops (Truth Table, Excitation</li> </ol>

		<p>table), their conversion</p> <ol style="list-style-type: none"> <li>4. Design of Sequential Circuits like Shift Register, Sequence Generator, Sequence Detector and implementation of Moore and Mealy Machine.</li> <li>5. Identify the Digital Circuits, Input/Outputs to replace by FPGA</li> <li>6. Use VHDL programming technique with different modeling styles for any digital circuits</li> </ol>
4.	<b><u>FDS</u></b>	<ol style="list-style-type: none"> <li>1. To apply appropriate constructs of C language, coding standards for application development</li> <li>2. To select and use appropriate data structures for problem solving and programming.</li> <li>3. To use algorithmic foundations for solving problems and programming.</li> <li>4. To select and implement appropriate searching and/or sorting techniques for application development.</li> <li>5. To Implement linear Data Structures using Sequential Organization.</li> <li>6. To Implement linear Data Structures using Linked Organization.</li> </ol>
5.	<b><u>PL</u></b>	<ol style="list-style-type: none"> <li>1. Implement concept of control structures, arrays, 2-D array, structure, functions and pointers.</li> <li>2. Apply concepts of sorting, searching and file related operations.</li> <li>3. Implement the concept of sequential organization using sparse matrix.</li> <li>4. Implement the concept of linked organization in SLL,DLL,CLL</li> <li>5. Develop algorithms for solving problems by using modular programming concepts</li> <li>6. Build object models and design software solutions using object-oriented principles and strategies</li> </ol>
6.	<b><u>PSOOP</u></b>	<ol style="list-style-type: none"> <li>1. Develop algorithms for solving problems by using modular programming concepts</li> <li>2. Build object models and design software solutions using object-oriented principles and strategies</li> <li>3. Discover, explore and apply tools and best practices in object-oriented programming.</li> </ol>

		<ol style="list-style-type: none"> <li>4. Develop programs that appropriately utilize key object-oriented concepts</li> <li>5. Understand exception handling and use of Standard Template Library (STL)</li> </ol>
7.	<b><u>DSF</u></b>	<ol style="list-style-type: none"> <li>1. Apply stack and queue data structure in various real life applications.</li> <li>2. Use the concept of tree data structure in different applications.</li> <li>3. Apply the concept of graph for real world applications.</li> <li>4. Use the concept of tables, heap tree, and different hashing technique.</li> <li>5. Illustrate the concept of advance trees and analyze its use in various applications.</li> <li>6. Implement different types of file organizations.</li> </ol>
8.	<b><u>DSFL</u></b>	<ol style="list-style-type: none"> <li>1. Implement concept of stack and Queue in different applications.</li> <li>2. Implement different types of trees.</li> <li>3. Apply the concept of graph on different real time applications.</li> <li>4. Implement the concept of Hash Table, Heap Sort and Files.</li> </ol>
9.	<b><u>PAI</u></b>	<ol style="list-style-type: none"> <li>1. Illustrate the architecture of 80386 microprocessor along with timing diagram and implement Assembly language programs.</li> <li>2. Explain pin diagram of 80386 and memory segmentation/paging</li> <li>3. Develop assembly language program for 80386 processor in various modes and analyze the address translation in paging and segmentation.</li> <li>4. Illustrate the architecture of microcontroller 8051 and develop Timer/Counter programming.</li> <li>5. Design and implement I/O port, Serial port programming.</li> <li>6. Analyze different peripheral devices such as ADC, DAC and design interfacing of 8051 with RAM.</li> </ol>
10.	<b><u>CG</u></b>	<ol style="list-style-type: none"> <li>1. To demonstrate concept of plotting primitives, line drawing and circle drawing algorithms for computer graphics.</li> <li>2. To analyze and develop drawings that demonstrates computer graphics concepts and 2D transformations</li> <li>3. Design and develop 3D transformations and projections of objects using computer graphics.</li> </ol>

		<ol style="list-style-type: none"> <li>4. Describe segments, windowing and polygon clipping concepts in computer graphics.</li> <li>5. Design and develop animations, games using computer graphics.</li> <li>6. Describe use of curves and fractals in computer graphics</li> </ol>
11.	<b><u>FCCN</u></b>	<ol style="list-style-type: none"> <li>1. Understand data/signal transmission over communication media</li> <li>2. Recognize usage of various modulation techniques in communication</li> <li>3. Analyze various spread spectrum and multiplexing techniques</li> <li>4. Use concepts of data communication to solve various related problems</li> <li>5. Understand error correction and detection techniques.</li> <li>6. Acquaint with transmission media and their standards</li> </ol>
12.	<b><u>OS</u></b>	<ol style="list-style-type: none"> <li>1. Explain different types of OS and their roles. Also apply basic shell script with shell commands.</li> <li>2. Apply the concept of a process, thread and scheduling algorithms.</li> <li>3. Apply the concepts of process synchronization, describe the concept of deadlock and different ways to handle it, write code for deadlock handling.</li> <li>4. Apply and evaluate main &amp; virtual memory management techniques.</li> <li>5. Describe the concept of I/O management and File system.</li> <li>6. Explain Linux operating system in detail</li> </ol>
13.	<b><u>SEPM</u></b>	<ol style="list-style-type: none"> <li>1. Define the unique features of various software application domains and classify software Applications and also apply appropriate lifecycle model of software development.</li> <li>2. Choose and apply appropriate lifecycle model of software development.</li> <li>3. Describe IT project management through life cycle of the project and future trends in IT Project Management.</li> <li>4. Describe principles of agile development, discuss the SCRUM process and distinguish agile process model from other process models.</li> <li>5. Analyze software quality assurance techniques and apply various techniques for project quality improvement</li> <li>6. Describe Emerging software engineering trends and Project</li> </ol>

		Management trends
14.	<u>SL-III</u>	<ol style="list-style-type: none"> <li>1. Design and Develop web page using html layout tag and use CSS properties.</li> <li>2. Design and develop database for web pages using PHP</li> <li>3. Design and apply various web technologies like java servlet.</li> <li>4. Construct web site using HTML5 ,PHP, CSS/Bootstrap ,Javascript,web</li> </ol>
15.	<u>DBMS</u>	<ol style="list-style-type: none"> <li>1. Describe the basic design concepts of RDBMS and design and implement a database schema for a given problem domain by analyzing database model and entity relationship model</li> <li>2. Analyze, Populate and write query for a database using SQL's DML/DDL commands; Apply the concept of PL/SQL including stored procedures, stored functions, cursors and packages</li> <li>3. Describe the concept of transaction processing with serialization, analyze concurrency control for transactions and use of Recovery processes.</li> <li>4. Analyze and draw basic Database architecture, parallel and distributed database architecture; Describe the Connectivity using Mongo databases.</li> <li>5. Analyze the impact of big data on the information industry using data services like XML, Hadoop, JSON.</li> <li>6. Describe the concept of data warehousing and data mining along with Emerging Database Technologies.</li> </ol>
16.	<u>TOC</u>	<ol style="list-style-type: none"> <li>1. To construct finite state machines to solve problems in computing</li> <li>2. To write mathematical expressions for the formal languages</li> <li>3. To apply well defined rules for syntax verification.</li> <li>4. To construct and analyze Push Down, Post and Turing Machine for formal languages</li> <li>5. To express the understanding of the decidability and decidability problems</li> <li>6. To express the understanding of computational complexity.</li> </ol>

17.	<b><u>HCI</u></b>	<ol style="list-style-type: none"> <li>1. To explain importance of HCI study and principles of user-centered design (UCD) approach.</li> <li>2. To develop understanding of human factors in HCI design.</li> <li>3. To develop understanding of models, paradigms and context of interactions.</li> <li>4. To design effective user-interfaces following a structured and organized UCD process.</li> <li>5. To evaluate usability of a user-interface design.</li> <li>6. To apply cognitive models for predicting human-computer-interactions.</li> </ol>
18.	<b><u>SP</u></b>	<ol style="list-style-type: none"> <li>1. To learn independently modern software development tools and creates novel solutions for language processing applications.</li> <li>2. To design and implement assemblers and macro processors.</li> <li>3. To use tool LEX for generation of Lexical Analyzer.</li> <li>4. To use YACC tool for generation of syntax analyzer.</li> <li>5. To generate output for all the phases of compiler.</li> <li>6. To apply code optimization in the compilation process.</li> </ol>
19	<b><u>DAA</u></b>	<ol style="list-style-type: none"> <li>1. To calculate computational complexity using asymptotic notations for various algorithms.</li> <li>2. To apply Divide &amp; Conquer as well as Greedy approach to design algorithms</li> <li>3. To practice principle of optimality.</li> <li>4. To illustrate different problems using Backtracking.</li> <li>5. To compare different methods of Branch and Bound strategy.</li> <li>6. To explore the concept of P, NP, NP-complete, NP-Hard and parallel algorithms.</li> </ol>
20	<b><u>DSBDA</u></b>	<ol style="list-style-type: none"> <li>1. Apply Big Data primitives for applications.</li> <li>2. Apply different mathematical models for Big Data</li> <li>3. Design and develop research applications using Big Data learning skills</li> <li>4. Develop algorithm approach using learning model and apply them for different datasets</li> <li>5. Explain techniques for big data visualization.</li> </ol>

		<ol style="list-style-type: none"> <li>6. Design and Develop application using different programming platforms for big data analytics.</li> </ol>
21	<u>CC</u>	<ol style="list-style-type: none"> <li>1. To understand the need of Cloud based solutions.</li> <li>2. To understand Security Mechanisms and issues in various Cloud Applications</li> <li>3. To explore effective techniques to program Cloud Systems.</li> <li>4. To understand current challenges and trade-offs in Cloud Computing</li> <li>5. To find challenges in cloud computing and delve into it to effective solutions</li> <li>6. To understand emerging trends in cloud computing</li> </ol>
22	<u>CNT</u>	<ol style="list-style-type: none"> <li>1. Describe the network layer and its layer responsibilities in detail and also the implementation of routing algorithms</li> <li>2. Describe the Transport layer duties and functionalities, application expectations and IP delivery semantics</li> <li>3. Describe the working principle of client/server application with respect to application layer protocols</li> <li>4. Analyze &amp; apply thorough knowledge of various Wireless technologies and their protocols</li> <li>5. Define the Ad-Hoc Networks And Sensor Networks and construct the sensor node architecture and their applications</li> <li>6. Define various routing protocols and techniques and its related management issues at large</li> </ol>
23	<u>SL-IV</u>	<ol style="list-style-type: none"> <li>1. To design and implement two pass assembler for hypothetical machine instructions.</li> <li>2. To use the compile generation tools such as "Lex" and "YACC".</li> <li>3. To apply algorithmic strategies for solving various problems.</li> <li>4. To compare various algorithmic strategies.</li> <li>5. To analyze the solution using recurrence relation</li> </ol>
24	<u>ICS</u>	<ol style="list-style-type: none"> <li>1. Apply methods for authentication, access control, intrusion detection and prevention</li> <li>2. To apply the scientific method to digital forensics and perform forensic investigations.</li> </ol>

		<ol style="list-style-type: none"> <li>3. To develop computer forensics awareness.</li> <li>4. Ability to use computer forensics tools.</li> <li>5. To identify different types of attacks and identifying methods for their prevention</li> <li>6. Illustrate machine learning problems, distinguish between training and testing and describe various machine learning models.</li> <li>7. Apply classification methods to predict the categorical label for given data also apply regression methods to analyze the correlation of several variables and measure the performance and accuracy.</li> <li>8. Demonstrate linear models; apply kernel methods for non-linearity.</li> <li>9. To illustrate logic based models, rule based models and solves problems based on this.</li> <li>10. Describe probabilistic models and solve problems on probabilistic model.</li> <li>11. Tackle real world problems in the domain of Data Mining, Information Retrieval, Computer vision, Linguistics and Bioinformatics.</li> </ol>
25	<b><u>SDM</u></b>	<ol style="list-style-type: none"> <li>1. Apply object oriented methodologies, basics of Unified Modeling Language (UML).</li> <li>2. Utilize analysis process, use case modeling, domain/class modeling</li> <li>3. Describe interaction and behavior modeling</li> <li>4. Apply process and business, access and view layer of class design</li> <li>5. Design GRASP principles and GoF design patterns.</li> <li>6. Apply architectural design principles and guidelines in the various type of application development.</li> </ol>
26	<b><u>STOA</u></b>	<ol style="list-style-type: none"> <li>1. Test the software by applying testing techniques to deliver a product free from bugs.</li> <li>2. Investigate the scenario and to select the proper testing technique.</li> <li>3. Explore the test automation concepts and tools and estimation of cost, schedule based on standard metrics.</li> <li>4. Detect, classify, prevent and remove defects.</li> <li>5. Apply appropriate quality assurance models and develop quality.</li> <li>6. Conduct formal inspections, record and evaluate results of</li> </ol>

		inspections.
<b>27</b>	<b><u>DS</u></b>	<ol style="list-style-type: none"> <li>1. Describe fundamentals and architectures of distributed systems with its desired properties, challenges , goals and different system models used in designing the distributed application</li> <li>2. Design the interface for the different distributed applications using message passing communication techniques like RPC , RMI</li> <li>3. implement replication and fault tolerance in distributed system</li> <li>4. Draw and explain various distribute file system architectures and concepts used for data storage including multimedia data</li> <li>5. Draw and describe protocols and techniques used in web based applications</li> <li>6. List and describe different attacks , security level and security y solutions related to distributed systems</li> </ol>
<b>28</b>	<b><u>UC</u></b>	<ol style="list-style-type: none"> <li>1. Demonstrate the knowledge of design of Ubicomp and its applications.</li> <li>2. Explain smart devices and services used Ubicomp.</li> <li>3. Describe the significance of actuators and controllers in real time application design.</li> <li>4. Use the concept of HCI to understand the design of automation applications.</li> <li>5. Classify Ubicomp privacy and explain the challenges associated with Ubicomp privacy.</li> <li>6. Get the knowledge of ubiquitous and service oriented networks along with Ubicomp management.</li> </ol>
<b>29</b>	<b><u>IOT</u></b>	<ol style="list-style-type: none"> <li>1. Explain what is internet of things.</li> <li>2. Explain architecture and design of IoT.</li> <li>3. Describe the objects connected in IoT.</li> <li>4. Understand the underlying Technologies</li> <li>5. Understand the platforms in IoT.</li> <li>6. Understand cloud interface to IoT</li> </ol>

<b>30</b>	<b><u>SMA</u></b>	<ol style="list-style-type: none"><li>1. Explains the basics of Social Media Analytics.</li><li>2. Explain the significance of Data mining in Social media.</li><li>3. Demonstrate the algorithms used for text mining.</li><li>4. Apply network measures for social media data.</li><li>5. Explain Behavior Analytics techniques used for social media data</li><li>6. Apply social media analytics for Face book and Twitter kind of applications.</li></ol>
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JSPM's

# RajarshiShahu College of Engineering

## Department of E&TC Engineering

### Programme Specific Outcomes of the Department

- PSO1:** Graduate will demonstrate the ability to apply knowledge of Electronics and Telecommunication to identify, formulate and solve Engineering problems useful to society.
- PSO2:** Graduate will demonstrate an ability to design, implement and analyze various functional elements of Electronics and Telecommunication domain, interpret data and work with multidisciplinary approach.
- PSO3:** Graduate will demonstrate the analytical and managerial skills with a virtue of continued learning; carry out the professional and entrepreneurial responsibilities in Electronics and Telecommunication Engineering field considering environmental issues.



JSPM's

# Rajarshi Shahu College of Engineering

## Department of E&TC Engineering

### Program Outcomes

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Course Outcomes

Sr	Course	Course Outcomes
1.	<b><u>SIGNALS &amp; SYSTEMS</u></b>	<ol style="list-style-type: none"> <li>1. Describe the basic signals, classify and perform operations on signals. Identify the Systems based on their properties</li> <li>2. Categorize and analyze the systems based on their properties in terms of impulse response and Illustrate convolution integral, convolution sum.</li> <li>3. Analyze the signals in frequency domain using Fourier series .Construct amplitude spectrum, phase spectrum of the various signals.</li> <li>4. Resolve the signals in frequency domain using Fourier Transform. Construct amplitude spectrum, phase spectrum of the various signals.</li> <li>5. Analyze the signals in complex frequency domain using Laplace Transform.</li> <li>6. Interpret the basic concept of probability, random variables and random signals. Evaluate statistical parameters. Develop the ability to find correlation, CDF, PDF and probability of a given event.</li> </ol>
2.	<b><u>ELECTRONIC DEVICES &amp; CIRCUITS</u></b>	<ol style="list-style-type: none"> <li>1. Design an adjustable voltage regulator circuits.</li> <li>2. Implement circuit and test the performance.</li> <li>3. Analyze small signal model of FET and MOSFET</li> <li>4. Explain behavior of FET at low frequency.</li> <li>5. Design an adjustable voltage regulator circuits.</li> </ol>
3.	<b><u>ELECTRICAL CIRCUITS AND MACHINES</u></b>	<ol style="list-style-type: none"> <li>1. Analyze basic AC &amp; DC circuit for voltage, current and power by using KVL, KCL, and network theorems.</li> <li>2. Explain the working principle of different electrical machines.</li> <li>3. Select proper electrical motor for given application.</li> <li>4. Design and analyze transformers.</li> </ol>
4.	<b><u>DATA STRUCTURES AND ALGORITHMS</u></b>	<ol style="list-style-type: none"> <li>1. Identify various data structures to develop an algorithm and estimate time and space complexity</li> <li>2. Summarize the concept of strings, pointers and structures in C and implement different sorting algorithms</li> <li>3. Explain the concept of linked list to overcome the limitations of array</li> </ol>

		<p>and implement different types of linked list.</p> <ol style="list-style-type: none"> <li>4. Implement stack and queue and develop applications of stack and queue.</li> <li>5. Implement tree and develop different operations on tree.</li> <li>6. Implement graph and develop different traversing operation on graph.</li> </ol>
5.	<b><u>DIGITAL ELECTRONICS</u></b>	<ol style="list-style-type: none"> <li>1. Design combinational circuits using the logical functions.</li> <li>2. Use the logical functions for designing sequential circuits</li> <li>3. Explain finite state machines for various applications.</li> <li>4. Describe various parameters and structures of digital logic families</li> <li>5. Describe the fundamentals of memories and design combinational circuits using PLDs</li> <li>6. Describe the complete architecture and implement basic concept of microcontroller -8051.</li> </ol>
6.	<b><u>ELECTRONIC MEASURING INSTRUMENTS &amp; TOOLS</u></b>	<ol style="list-style-type: none"> <li>1. Design combinational circuits using the logical functions.</li> <li>2. Use the logical functions for designing sequential circuits.</li> <li>3. Explain finite state machines for various applications.</li> <li>4. Describe various parameters and structures of digital logic families.</li> <li>5. Describe the fundamentals of memories and design combinational circuits using PLDs.</li> <li>6. Describe the complete architecture and implement basic concept of microcontroller -8051.</li> </ol>
7.	<b><u>ENGINEERING MATHEMATICS III</u></b>	<ol style="list-style-type: none"> <li>1. Apply knowledge of higher order linear differential equations to electrical circuits.</li> <li>2. Analyze the data to fit an interpolating polynomial and evaluate numerical differentiation and integration. Find numerical solutions of differential equations.</li> <li>3. Apply concept of vector differential calculus to Electromagnetic field and various other engineering applications.</li> <li>4. Apply knowledge of vector integral calculus in Electromagnetic field and various engineering applications.</li> <li>5. Apply knowledge of vector integral calculus in Electromagnetic field and various engineering applications.</li> </ol>

		<p>6. Apply knowledge of Cauchy's theorem, Cauchy's Integral Formula and Cauchy's Residue theorem to evaluate contour integrals and real definite integrals. Also, understand the concept of conformal mapping.</p>
8.	<b><u>INTEGRATED CIRCUITS</u></b>	<ol style="list-style-type: none"> <li>1. Explain basic building blocks of op-am and identify closed loop configurations of op amp.</li> <li>2. Design and analyze linear and non linear application of op amp.</li> <li>3. Design and Compare various convertors using op amp.</li> <li>4. Apply functionalities of PLL to various applications.</li> </ol>
9.	<b><u>CONTROL SYSTEMS</u></b>	<ol style="list-style-type: none"> <li>1. Model a physical and electrical system and visualize its input-output relationships by means of block diagrams and Signal flow graph.</li> <li>2. Analyze a linear control system in time and frequency domain using graphical methods.</li> <li>3. Model and analyze the control system using state space analysis.</li> <li>4. Visualize the concept of PLC and PID controllers and analyze, digital control system using transfer function.</li> </ol>
10.	<b><u>ANALOG COMMUNICATION</u></b>	<ol style="list-style-type: none"> <li>1. Explain the various components of electronics communication system and describe the various amplitude modulation techniques.</li> <li>2. Analyze the AM radio receiver and evaluate the radio receiver performance parameters.</li> <li>3. Describe the mathematical analysis of FM with frequency spectrum.</li> <li>4. Demonstrate the FM radio receiver and describe the detection techniques.</li> <li>5. Explain signal to noise ratio , noise figure, noise temperature for single and cascaded stages in communication system.</li> <li>6. Explain the techniques to convert analog signal to digital format and describe the PCM technique.</li> </ol>
11.	<b><u>OBJECT ORIENTED PROGRAMMING</u></b>	<ol style="list-style-type: none"> <li>1. Describe the principal of OOP</li> <li>2. Apply the concepts of data encapsulation, inheritance in C++.</li> <li>3. Understand basic program constructs in Java</li> <li>4. Apply the concepts of classes, methods and inheritance to write programs Java.</li> </ol>

		<ol style="list-style-type: none"> <li>5. Use arrays, vectors and strings concepts and interfaces to write programs in Java.</li> <li>6. Describe and use the concepts in Java to develop user friendly program.</li> </ol>
12.	<b><u>EMPLOYABILITY SKILL DEVELOPMENT</u></b>	<ol style="list-style-type: none"> <li>1. Make use of the skills for aptitude tests</li> <li>2. Adapt essential communication skills (writing, verbal and non-verbal)</li> <li>3. Develop the presentation skill and will be ready for facing interviews</li> <li>4. Build team and lead it for problem solving.</li> </ol>
13.	<b><u>DIGITAL COMMUNICATION</u></b>	<ol style="list-style-type: none"> <li>1. Explain and analyze building block of digital communication system and A to D conversion in presence of noise using modern tool.</li> <li>2. Discriminate and select line code in terms of BW and bit rate and able to apply concept of synchronization, scrambler and ISI in application.</li> <li>3. Discriminate different random processes and apply its knowledge in research work for designing digital communication system.</li> <li>4. Describe different detection theory and evaluate error performance of a digital receiver in presence of noise</li> <li>5. Design and analyze different coherent and non coherent passband transmission system in terms of Probability of error and power spectrum.</li> <li>6. Describe the concept of spread spectrum techniques and apply DSSS and FHSS in communication systems.</li> </ol>
14.	<b><u>DIGITAL SIGNAL PROCESSING</u></b>	<ol style="list-style-type: none"> <li>1. Understand use of different transforms and analyze the discrete time signals and systems</li> <li>2. Understand use of Discrete Fourier transforms and analyze the discrete time signals</li> <li>3. Explain the use of Z transforms and analyze the discrete time signals and systems</li> <li>4. Realize the use of LTI filters for filtering different real world signals.</li> <li>5. Capable to calibrate and resolving different frequencies existing in any signal.</li> </ol>

		6. Design and implement multistage sampling rate converter and Basic element of DSP.
15	<b><u>ELECTROMAGNETICS</u></b>	<ol style="list-style-type: none"> <li>1. Evaluate Electrostatic field laws &amp; illustrate the laws for field applications</li> <li>2. Evaluate &amp; Analyze boundary conditions of Electric field for different medium.</li> <li>3. Evaluate Magneto static field laws &amp; Analyze boundary conditions of magnetic field for different medium.</li> <li>4. Analyze &amp; Implement Maxwell's Equation for time varying electromagnetic field.</li> </ol>
16	<b><u>MICRO CONTROLLER</u></b>	<ol style="list-style-type: none"> <li>1. Describe the complete structure, functioning and details of 8051 microcontroller with the design of timer and serial communication.</li> <li>2. Illustrate various applications using the concepts of serial communication and interface different peripheral devices using 8051</li> <li>3. Identify the difference between 8051 and PIC microcontroller and also explain the complete architecture of the same</li> <li>4. Discuss and implement various protocols like I2C, SPI for communication, sensor interfacing and different motors for PIC microcontroller.</li> </ol>
17	<b><u>MECHATRONICS</u></b>	<ol style="list-style-type: none"> <li>1. Identification of key elements of mechatronics system and its representation in terms of block diagram.</li> <li>2. Understanding basic principal of Sensors and Transducer.</li> <li>3. Explain the classification of Hydraulic Actuators.</li> <li>4. Explain the Pneumatic Systems and different case studies.</li> <li>5. Describe the Electrical Actuation system.</li> <li>6. Understand case studies of Automobile system.</li> </ol>
18	<b><u>ELECTRONICS SYSTEM DESIGN</u></b>	<ol style="list-style-type: none"> <li>1. Apply fundamental concept to design electronics system</li> <li>2. Interpret datasheets and select appropriate components and devices</li> <li>3. Select appropriate transducer to design data acquisition system</li> <li>4. Create and Manage database using suitable tools.</li> </ol>

19	<b><u>POWER ELECTRONICS</u></b>	<ol style="list-style-type: none"> <li>1. Explain the concept of power devices and triggering circuits.</li> <li>2. Analyze different AC- DC Controlled converters.</li> <li>3. Apply the concept of power electronics to the various application such as UPS, AC drives and DC drives.</li> <li>4. Compare the performance of ZVS and ZCS resonant converter.</li> </ol>
20	<b><u>INFORMATION THEORY, CODING AND COMMUNICATION NETWORKS</u></b>	<ol style="list-style-type: none"> <li>1. Infer source coding theorem, employ source coding techniques in data compression and evaluate entropy, loss of information in channel.</li> <li>2. Define channel capacity, identify error correcting and detecting capabilities and perform error correction using different block codes.</li> <li>3. Describe Galois field and related basics, explain and evaluate cyclic codes and design encoder-decoder circuit.</li> <li>4. Design multiple error correcting codes such as, BCH and RS, explain error control coding techniques and further relate RS coding with CD recording application and CRC code for Ethernet LAN.</li> <li>5. Understand and apply fundamental principles of data communication and networking.</li> <li>6. Apply flow and error control techniques in communication networks.</li> </ol>
21	<b><u>BUSINESS MANAGEMENT</u></b>	<ol style="list-style-type: none"> <li>1. Describe fundamentals of Management thoughts, vital for understanding the conceptual frame work of Management as a discipline.</li> <li>2. Understand concept of quality management, financial management and project management.</li> <li>3. Explain the concept of human Resource Management and development with real time application.</li> <li>4. Recognize the development, impact of manpower on internal and external environment to promote entrepreneurship and marketing.</li> </ol>

22	<b><u>ADVANCED PROCESSORS</u></b>	<ol style="list-style-type: none"> <li>1. Outline the need and application of ARM Microprocessors &amp; TIVA Launch boards in embedded system.</li> <li>2. Interpret the architecture, features instructions of ARM7 Processor and implement programming in assembly language.</li> <li>3. Analyze and implement many applications by interfacing ARM7 processor</li> <li>4. Explain architecture, features of DSP Processors and IDE required for DSP processors.</li> </ol>
23	<b><u>SYSTEM PROGRAMMING AND OPERATING SYSTEMS</u></b>	<ol style="list-style-type: none"> <li>1. Understand the system software components for implementation of assembler and macro processor</li> <li>2. Implement the system software concepts as linker, loader and compilers.</li> <li>3. Interpret the different types of OS fundamentals &amp; Process management.</li> <li>4. Acquire and state different concurrency controls in OS.</li> <li>5. Illustrate and evaluate different memory management methods</li> <li>6. Demonstrate the IO devices of OS and file management policies.</li> </ol>
24	<b><u>EMPLOYABILITY SKILLS AND MINI PROJECT</u></b>	<ol style="list-style-type: none"> <li>1. Understand, plan and execute a Mini Project with team.</li> <li>2. Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.</li> <li>3. Prepare a technical report based on the Mini project.</li> <li>4. Deliver technical seminar based on the Mini Project work carried out.</li> </ol>
25	<b><u>VLSI DESIGN &amp; TECHNOLOGY</u></b>	<ol style="list-style-type: none"> <li>1. Write effective HDL coding for digital design.</li> <li>2. Apply knowledge of real time issues in digital design.</li> <li>3. Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.</li> <li>4. Design CMOS circuits for specified applications.</li> <li>5. Analyze various issues and constraints in design of an ASIC.</li> <li>6. Apply knowledge of testability in design and build self test circuit.</li> </ol>

26	<b><u>COMPUTER NETWORKS</u></b>	<ol style="list-style-type: none"> <li>1. To understand state-of-the-art in network protocols, architectures, and applications.</li> <li>2. To provide students with a theoretical and practical base in computer networks issues.</li> <li>3. To outline the basic network configurations.</li> <li>4. To understand the transmission methods underlying LAN and WAN technologies.</li> <li>5. To understand security issues involved in LAN and Internet.</li> </ol>
27	<b><u>RADIATION &amp; MICROWAVE TECHNIQUES</u></b>	<ol style="list-style-type: none"> <li>1. Differentiate various performance parameters of radiating elements.</li> <li>2. Analyse different radiating elements and arrays.</li> <li>3. Describe Transmission lines and Waveguide fundamentals.</li> <li>4. Formulate &amp; analyze the scattering matrix for different microwave components.</li> <li>5. Explain the working principle of microwave solid state devices for microwave applications.</li> <li>6. Identify &amp; Choose suitable microwave measurement techniques for required microwave measurements.</li> </ol>
28	<b><u>ELECTIVE I (ESRTOS)</u></b>	<ol style="list-style-type: none"> <li>1. Interpret the design metrics of embedded systems to design real time applications to match recent trends in technology.</li> <li>2. Explain the concept of real time operating system and the services provided by operating system with practical implementation.</li> <li>3. Apply the knowledge of operating system and identify the features and services of MUCOS OS.</li> <li>4. Gain knowledge of importance of embedded Linux distribution, and identify the tools, debugger and utilities.</li> <li>5. Describe Linux kernel construction, device driver using ARM 9 processors and concept of Linux file system.</li> <li>6. Analyze the hardware – software co design issues and testing methodology for embedded system.</li> </ol>

29	<b><u>ELECTIVE II (ELECTRONICS IN AGRICULTURE)</u></b>	<ol style="list-style-type: none"> <li>1. Understand Role of computers &amp; virtual instrumentation</li> <li>2. Provide communication solution for interpreting environmental parameters with Electronics systems.</li> <li>3. Describe Instrument technology used in agriculture</li> <li>4. Understand role of precision farming</li> <li>5. Apply knowledge of Electronics in Agriculture</li> <li>6. Understand Greenhouse Technology &amp; Role of Electronics Governance</li> </ol>
30	<b><u>PROJECT PHASE I</u></b>	<ol style="list-style-type: none"> <li>1. Convert an open ended problem statement into a statement of proposed work</li> <li>2. Decompose problem/task into sub-tasks and establish a methodology and process by which progress may be evaluated</li> <li>3. Select and apply appropriate methods/models, or mathematical simulations of the real world and analyzes the data to provide information for decisions</li> <li>4. Perform feasibility analysis and evaluate quality of solutions to select the best one</li> <li>5. Produce usable documents of record regarding the design process</li> <li>6. Collaborate with team members to achieve a common goal</li> <li>7. Enhance awareness and critical self-examination of one's own values, and to appreciate the relevance of personal values in the Business/workplace and develop skills which recognizes and resolves ethical issues while working</li> </ol>
31	<b><u>MOBILE COMMUNICATI ON</u></b>	<ol style="list-style-type: none"> <li>1. Understand switching techniques for voice and data traffic.</li> <li>2. Nurture students with knowledge of traffic engineering to design networks.</li> <li>3. Realize importance of cellular concepts and its propagation mechanism.</li> <li>4. Understand architecture of GSM system.</li> <li>5. Describe GSM network aspects.</li> <li>6. Overview 4G LTE and 5G technologies.</li> </ol>

32	<b><u>BROADBAND COMMUNICATION SYSTEMS</u></b>	<ol style="list-style-type: none"> <li>1. Carry out Link power budget and Rise Time Budget by proper selection of components and check its viability.</li> <li>2. Carry out Satellite Link design for Up Link and Down Link.</li> </ol>
33	<b><u>ELECTIVE III AVE</u></b>	<ol style="list-style-type: none"> <li>1. Explain the concept of colour Television along with fault finding and servicing equipments and describe different standards.</li> <li>2. Describe the digital TV in detail along with different types of display devices.</li> <li>3. Explain the HDTV in detail along with different types CCTV, CATV.</li> <li>4. Describe modern TV systems like IPTV, mobile TV.</li> <li>5. Describe audio recording systems such CD/DVD recording, Audio Standards.</li> <li>6. Describe the concept of Acoustics, reverberation and types of speakers.</li> </ol>
34	<b><u>ELECTIVE IV WSN</u></b>	<ol style="list-style-type: none"> <li>1. Explain various concepts and terminologies used in WSN</li> <li>2. Describe importance and use of radio communication and link management in WSN</li> <li>3. Explain various wireless standards and protocols associated with WSN</li> <li>4. Recognize importance of localization and routing techniques used in WSN</li> <li>5. Understand techniques of data aggregation and importance of security in WSN</li> <li>6. Understand techniques of data aggregation and importance of security in WSN</li> </ol>
35	<b><u>PROJECT PHASE II</u></b>	<ol style="list-style-type: none"> <li>1. Convert an open ended problem statement into a statement of proposed work</li> <li>2. Decompose problem/task into sub-tasks and establish a methodology and process by which progress may be evaluated</li> <li>3. Select and apply appropriate methods/models, or mathematical simulations of the real world and analyzes the data to provide information for decisions</li> <li>4. Perform feasibility analysis and evaluate quality of solutions to select</li> </ol>

		<p>the best one</p> <ol style="list-style-type: none"><li>5. Produce usable documents of record regarding the design process</li><li>6. Collaborate with team members to achieve a common goal</li><li>7. Enhance awareness and critical self-examination of one's own values, and to appreciate the relevance of personal values in the Business/workplace and develop skills which recognizes and resolves ethical issues while working</li></ol>
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JSPM's

# RajarshiShahu College of Engineering

## Department of MBA

### Programme Specific Outcomes of the Department

**PSO 1:** To guide and channelize the transformation process of every management graduate by providing in-depth knowledge of business management for strategic decision making and execution.

**PSO 2:** To inculcate entrepreneurial culture embedded with ethics and a sense of social commitment for economic and social development.

**PSO 3:** To imbibe multidisciplinary approach for problem solving, critical analysis and decision making by giving due importance for lateral thinking.



JSPM's

# Rajarshi Shahu College of Engineering

## Department of MBA

### Program Outcomes

- 1. A student will apply knowledge of administration and management to tactfully manage the business organization.**

**POa1:** To apply management fundamentals to solve routine administrative issues.

**POa2:** To apply knowledge of Behavioral Sciences- Economics, Statistics, Accounting and Law for better administration.

**POa3:** To apply knowledge of Strategic Management for futuristic management.

- 2. A student will demonstrate the ability to design, implement and evaluate a system, process, components and applications to meet desired needs within realistic constraints.**

**POb1:** To design and develop systems used in administration of Business.

**POb2:** To evaluate realistic constraints in the Micro & Macro environment of business.

- 3. A student will investigate, formulate, analyze and provide appropriate solution to simple and complex business challenges.**

**POc1:** To analyze business environment & investigate simple and complex administrative problems.

**POc2:** To analyze, formulate appropriate solution for the problems identified.

- 4. A student will demonstrate the ability to understand and implement modern management techniques like ERP, Six Sigma, Kaizen, Quality Circles etc.**

**POd1:** A graduate student will demonstrate conceptual understanding of implementation of modern management techniques.

- 5. A student will demonstrate the ability to imbibe Entrepreneurial abilities & understand the impact of Entrepreneurship on the economy & society at large.**

**POe1:** To understand and imbibe Entrepreneurial traits

**POe2:** To understand the importance of contribution of an Entrepreneur to the Economy & society at large.

**Poe3:** To be able to conceive innovative business ideas & design business plans,

- 6. A student will be able to acquire right attitude, Business ethics, Soft- Skills Team building abilities, & Leadership traits to provide effective leadership in global environment.**

**POf1:** To demonstrate team spirit & team building abilities along with professional attitude.

**POf2:** To acquire Leadership traits, and inculcate Business Ethics.

- 7. A student will demonstrate the ability of self-learning during the summer internship projects as individuals and also in team assignments for successful implementation of practical aspect of the MBA curriculum.**

**POg1:** To inculcate the ability of self-learning through Projects, Dissertations & Group assignments.

**POg2:** To imbibe team spirit and develop ability to work in formal groups.

- 8. A student will be able to communicate effectively at different technical and administrative levels**

**POh1:** To develop effective interpersonal communication skills both verbal & Non-verbal

**POh2:** To demonstrate positive and effective body language.

**POh3:** To design and draft reports in standard formats.

- 9. A student will demonstrate the ability to keep abreast with advance technologies through lifelong learning.**

**POj1:** To inculcate the habit self-up gradation through exposure to current happenings the management fraternity and also on technological front.

**POj2:** To identify novel business ideas.

**10. A student will be able to inculcate traits of a globally competent management professional by developing global competencies.**

**POk1:** To inculcate global competencies and professional values.

## Course Outcomes

Sr	Course	Course Outcomes
1	<b><u>ACCOUNTING FOR BUSINESS DECISIONS</u></b>	<ol style="list-style-type: none"> <li>1. DESCRIBE the basic concepts related to Accounting, Financial Statements, Cost Accounting, Marginal Costing, Budgetary Control and Standard Costing</li> <li>2. EXPLAIN in detail, all the theoretical concepts taught through the syllabus.</li> <li>3. PERFORM all the necessary calculations through the relevant numerical problems.</li> <li>4. ANALYSE the situation and decide the key financial as well as non-financial elements involved in the situation.</li> <li>5. EVALUATE the financial impact of the decision.</li> </ol>
2	<b><u>ECONOMIC ANALYSES FOR BUSINESS DECISIONS</u></b>	<ol style="list-style-type: none"> <li>1. DEFINE the key terms in economics.</li> <li>2. EXPLAIN the reasons for existence of firms and their decision making goals.</li> <li>3. MAKE USE OF the basic concepts of Demand, Supply, Demand Forecasting, Equilibrium and their determinants.</li> <li>4. ANALYSE cost function and the difference between short-run and long-run cost function and establish the RELATIONSHIP between production function and cost function.</li> <li>5. EXAMINE the effect of non-price factors on products and services of monopolistic and oligopoly firms.</li> <li>6. DESIGN competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products, the market structures and Business Cycles.</li> </ol>
3	<b><u>LEGAL ASPECTS OF BUSINESS</u></b>	<ol style="list-style-type: none"> <li>1. DESCRIBE the key terms involved in each Act.</li> <li>2. SUMMARIZE the key legal provisions of each Act.</li> <li>3. ILLUSTRATE the use of the Acts in common business situations.</li> <li>4. OUTLINE the various facets of basic case laws of each act from a legal and managerial perspective.</li> </ol>

4	<b><u>BUSINESS RESEARCH METHODS</u></b>	<ol style="list-style-type: none"> <li>1. Enumerate and define various concepts &amp; terms associated with scientific business research.</li> <li>2. Explain the various types of measurement scales &amp; attitude scaling techniques and their application in the context of business research.</li> <li>3. Design a variety of data collection instruments for contemporary business research issues and apply the principles of sampling and sample size determination to contemporary business research problems.</li> <li>4. Analyze and graphically present quantitative data and derive actionable inferences from the same from a decision making perspective.</li> <li>5. Construct different types of testable hypotheses and interpret the statistical test outcomes.</li> <li>6. Formulate alternative research designs for a real-life business research problem and discuss the pros and cons of each design.</li> </ol>
5	<b><u>ORGANIZATIONAL BEHAVIOUR</u></b>	<ol style="list-style-type: none"> <li>1. DESCRIBE the key concepts of organizational behavior.</li> <li>2. UNDERSTAND theories about how managers should behave to motivate and control employees.</li> <li>3. ARTICULATE aspects of organizational culture and interpret cultural diversity.</li> <li>4. BUILD people and leadership skills essential for managerial success.</li> <li>5. ANALYSE causes of conflict and OUTLINE conflict management strategies that managers can use to resolve organizational conflict effectively.</li> <li>6. EXPLAIN group and teams dynamics leading to organizational effectiveness.</li> </ol>
6	<b><u>BASICS OF MARKETING</u></b>	<ol style="list-style-type: none"> <li>1. DEFINE the various concepts, terms in marketing and the various company orientations towards the market place.</li> </ol>

		<ol style="list-style-type: none"> <li>2. CLASSIFY the various components of the marketing environment of a firm and explain the same in detail.</li> <li>3. APPLY principles of segmentation, targeting and positioning to real world marketing offering (commodities, goods, services, e-products/e-services.)</li> <li>4. BREAKDOWN the consumer buying behavior journey into various components and DISTINGUISH between various buying roles for a real world marketing offering (commodities, goods, services, e-products/ e-services.)</li> <li>5. DEVELOP and EXPLAIN the marketing mix for real world marketing offering (commodities, goods, services, e-products/ e-services.)</li> <li>6. ELABORATE on the various types of Product Life Cycles and RELATE them with the marketing mix in the context of real world marketing offering (Commodities, goods, services, e-products/ e-services.).</li> </ol>
7	<p><b><u>MANAGEMENT</u></b>  <b><u>FUNDAMENTALS</u></b></p>	<ol style="list-style-type: none"> <li>1. ENUMERATE various managerial competencies and approaches to management.</li> <li>2. EXPLAIN the role and need of Planning, Organizing, Decision Making and Controlling.</li> <li>3. MAKE USE OF the principles of goal setting and planning for simple as well as complex tasks and small projects.</li> <li>4. COMPARE and CONTRAST various organizational structures of variety of business and not-for-profit entities in a real world context.</li> <li>5. BUILD a list of the decision making criteria used by practicing managers, leaders and entrepreneurs in routine and non-routine decision making situations and EVALUATE and EXPLAIN the same.</li> <li>6. FORMULATE and DISCUSS a basic controlling model in a real life business, start-up and not-for-profit organizational context.</li> </ol>

8	<b><u>MARKETING MANAGEMENT</u></b>	<ol style="list-style-type: none"> <li>1. DESCRIBE the key terms associated with the 4 Ps of marketing.</li> <li>2. COMPARE and CONTRAST various approaches to pricing for a real world marketing offering (commodities, goods, services, e-products/ e-services.)</li> <li>3. DEMONSTRATE an understanding of various channel options for a real world marketing offering (commodities, goods, services, e-products/ e-services.)</li> <li>4. EXAMINE the product line of a real world marketing offering (commodities, goods, services, e-products/ e-services.)</li> <li>5. EXPLAIN the role of various communication mix elements for a real world marketing offering (commodities, goods, services, e-products/ e-services.)</li> <li>6. DESIGN a marketing plan for a real world marketing offering (commodities, goods, services, e-products/ e-services.)</li> </ol>
9	<b><u>FINANCIAL MANAGEMENT</u></b>	<ol style="list-style-type: none"> <li>1. DESCRIBE the basic concepts related to Financial Management, Various techniques of Financial Statement Analysis, Working Capital, Capital Structure, Leverages and Capital Budgeting.</li> <li>2. EXPLAIN in detail all theoretical concepts throughout the syllabus</li> <li>3. PERFORM all the required calculations through relevant numerical problems.</li> <li>4. ANALYZE the situation and <ul style="list-style-type: none"> <li>• Comment on financial position of the firm</li> <li>• Estimate working capital required</li> <li>• Decide ideal capital structure</li> <li>• Evaluate various project proposals</li> </ul> </li> <li>5. EVALUATE impact of business decisions on Financial Statements.</li> </ol>
10	<b><u>HUMAN RESOURCE MANAGEMENT</u></b>	<ol style="list-style-type: none"> <li>1. DESCRIBE the role of Human Resource Function in an Organization.</li> <li>2. ENUMERATE the emerging trends and practices in HRM</li> </ol> <ol style="list-style-type: none"> <li>1. ILLUSTRATE the different methods of HR Acquisition and retention.</li> <li>2. DEMONSTRATE the use of different appraisal and training methods in an Organization.</li> </ol>

		<ol style="list-style-type: none"> <li>3. OUTLINE the compensation strategies of an organization</li> <li>4. INTERPRET the sample job descriptions and job specifications for contemporary entry level roles in real world organizations.</li> </ol>
11	<b><u>OPERATIONS &amp; SUPPLY CHAIN MANAGEMENT</u></b>	<ol style="list-style-type: none"> <li>1. DEFINE basic terms and concepts related to Production, Operations, Services, Supply Chain and Quality Management.</li> <li>2. EXPLAIN the process characteristics and their linkages with process-product matrix in a real world context.</li> <li>3. DESCRIBE the various dimensions of production planning and control and their inter-linkages with forecasting.</li> <li>4. CALCULATE inventory levels and order quantities and make use of various inventory classification methods.</li> <li>5. OUTLINE a typical Supply Chain Model for a product / service and illustrate the linkages with Customer Issues, Logistic and Business Issues in a real world context.</li> </ol>
12	<b><u>MANAGEMENT INFORMATION SYSTEMS</u></b>	<ol style="list-style-type: none"> <li>1. Understanding latest developments in the field of Information Technology and the impact of I.T. in managing a business</li> <li>2. Understanding the significant importance of DBMS and System Analysis and Design in implementation of MIS.</li> <li>3. Analyzing how decision support systems can help management in taking unstructured and semi-structured decisions.</li> <li>4. Understanding MIS model for a digital firm.</li> <li>5. Reflect your understanding in the implementation of information systems in different manufacturing and service oriented organizations.</li> </ol>



JSPM's

# RajarshiShahu College of Engineering

## Department of MCA

### Programme Specific Outcomes of the Department

- PSO1: Professional Skills**-The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, data science, and networking for efficient design of computer-based systems.
- PSO2: Problem-Solving Skills**- The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver advanced computing systems.
- PSO3: Professional Career and Entrepreneurship**- The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies and research.



JSPM's

# Rajarshi Shahu College of Engineering

## Department of MCA

### Program Outcomes

Engineering Graduates will be able to:

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Course Outcomes

Sr	Course	Course Outcomes
1	<b><u>C PROGRAMMING</u></b>	<ol style="list-style-type: none"> <li>1. Design and implement C programs for a given problem.</li> <li>2. Work with existing programs and modify it as per the requirements.</li> <li>3. Identify the errors in a C program.</li> <li>4. Identify the output of a C program without actually executing it.</li> </ol>
2	<b><u>DATABASE MANAGEMENT SYSTEMS</u></b>	<ol style="list-style-type: none"> <li>1. Design and create tables in relational database and query them.</li> <li>2. Know how transaction processing and concurrency control is done.</li> <li>3. Compare different types of databases.</li> </ol>
3	<b><u>DATA STRUCTURES</u></b>	<ol style="list-style-type: none"> <li>1. Describe, explain and use abstract data types including stacks, queues and lists.</li> <li>2. Design and Implement Tree data structures and Sets.</li> <li>3. Implement hashing techniques and heaps for applications.</li> <li>4. Implement a variety of algorithms for sorting.</li> </ol>
4	<b><u>DATA STRUCTURES AND PROGRAMMING LABORATORY</u></b>	<ol style="list-style-type: none"> <li>1. Work with basic data structures that are suitable for the problems to be solved efficiently.</li> <li>2. Design and implement linear, tree, and graph structures and its applications.</li> <li>3. Design various sorting techniques, its algorithm design and analysis.</li> </ol>
5	<b><u>DATABASE MANAGEMENT SYSTEMS LABORATORY</u></b>	<ol style="list-style-type: none"> <li>1. Design and Implement databases.</li> <li>2. Formulate complex queries using SQL.</li> <li>3. Design and Implement applications that have GUI and access databases for backend connectivity.</li> </ol>
6	<b><u>COMPUTER COMMUNICATIONS AND NETWORKS</u></b>	<ol style="list-style-type: none"> <li>1. Explain how communication works in data networks and the Internet</li> <li>2. Explain the role of protocols in data networks</li> <li>3. Describe the importance of addressing and naming schemes at various layers of data networks</li> <li>4. Describe the protocols and services provided by the application layer</li> </ol>

		in the OSI model and describe how this layer operates in sample networks.
7	<b><u>OPERATING SYSTEM CONCEPTS</u></b>	<ol style="list-style-type: none"> <li>1. Discuss on the basics of OS.</li> <li>2. Familiarize the In depth knowledge in process management, memory management and I/O management of various operating systems.</li> </ol>
8	<b><u>SOFTWARE ENGINEERING</u></b>	<ol style="list-style-type: none"> <li>1. Familiarize the basic concepts of Software design and implementation. Perform software testing on various applications.</li> <li>2. Apply various software metrics on software quality products.</li> </ol>
9	<b><u>DESIGN AND ANALYSIS OF ALGORITHMS</u></b>	<ul style="list-style-type: none"> <li>• Analyze the algorithms for time/space complexity</li> <li>• Implement heap sort and quick sort</li> <li>• Design algorithms using dynamic programming and Greedy approaches</li> <li>• Design algorithms using graph structure to solve real-life problems</li> <li>• Analyze problems in terms of polynomial time.</li> </ul>
10	<b><u>OBJECT ORIENTED PROGRAMMING – C++</u></b>	<ol style="list-style-type: none"> <li>1. Design and implement C++ programs for any given problem. Understand an existing program and modify it as per the requirements.</li> <li>2. Identify the errors in a C++ program.</li> <li>3. Identify the output of a C++ program without actually executing it.</li> <li>4. Write generic programs using STL.</li> </ol>
11	<b><u>OOP AND ALGORITHMS LABORATORY</u></b>	<ol style="list-style-type: none"> <li>1. Develop programs in object oriented paradigm.</li> <li>2. Develop applications using various design techniques</li> <li>3. Design and implement various graph algorithms.</li> </ol>
12	<b><u>OBJECT ORIENTED ANALYSIS AND DESIGN</u></b>	<ol style="list-style-type: none"> <li>1. Familiarize with the topics of object oriented System designs.</li> <li>2. Design Patterns using UML.</li> <li>3. Apply design patterns to various applications.</li> </ol>
13	<b><u>WEB TECHNOLOGIES</u></b>	<ul style="list-style-type: none"> <li>• Design and implement web forms and client side validation. Work with XML authoring, Parsing, and related technologies.</li> <li>• Develop object oriented programming using Java.</li> <li>• Design and develop GUI based applications using Swing</li> </ul>

		<p>components.</p> <ul style="list-style-type: none"> <li>• Design and develop servlet and JSP application with database connectivity.</li> </ul>
14	<b><u>WEB TECHNOLOGIES LABORATORY</u></b>	<ol style="list-style-type: none"> <li>1. Make Web site creation and validation.</li> <li>2. Work with XML based technologies.</li> <li>3. Develop simple console application using Java.</li> <li>4. Develop GUI application using Swing and Applet.</li> <li>5. Build web based applications using JDBC, Servlet / JSP.</li> </ol>
15	<b><u>CASE TOOLS LABORATORY</u></b>	<ol style="list-style-type: none"> <li>1. Use open source CASE tools to develop software.</li> <li>2. Analyze and design software requirements in an efficient manner</li> </ol>
16	<b><u>SOFT SKILLS</u></b>	<ol style="list-style-type: none"> <li>1. Develop effective communication skills (spoken and written).</li> <li>2. Develop effective presentation skills.</li> <li>3. Conduct effective business correspondence and prepare business reports which produce results.</li> <li>4. Become self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills.</li> </ol>
17	<b><u>ADVANCED JAVA PROGRAMMING</u></b>	<ol style="list-style-type: none"> <li>1. Work with Java I/O streams, networking and GUI based application development.</li> <li>2. Work with Web application development using Java Server Faces.</li> <li>3. Develop web services using REST/SOAP/JSON.</li> <li>4. Design and develop applications using advanced frameworks.</li> </ol>
18	<b><u>MOBILE COMPUTING</u></b>	<ol style="list-style-type: none"> <li>1. To appreciate the need for rapid progress in mobile application development</li> <li>2. To use the various tools and developments for mobile application development</li> <li>3. To design and implement effective mobile applications in popular mobile development platform</li> <li>4. To deploy GSM network and IEEE 802.11 WLAN.</li> </ol>
19	<b><u>ADVANCED JAVA PROGRAMMING LABORATORY</u></b>	<ol style="list-style-type: none"> <li>1. Become an intermediate or advanced developer of Java.</li> <li>2. Write programs on advanced technologies of Java such as Streaming, Networking, Multithreading and Generic collections.</li> </ol>

		<ol style="list-style-type: none"> <li>3. Develop chat and file transfer applications.</li> <li>4. Implement Server Side Programming and dynamic software components.</li> <li>5. Design and Develop GUI based components and Animations.</li> <li>6. Design and implementation of interactive web sites.</li> <li>7. Create distributed applications using RMI, JAX-WS, and REST based services.</li> <li>8. Create MVC applications using advanced frameworks.</li> </ol>
20	<b><u>SOFTWARE TESTING AND QUALITY CONTROL</u></b>	<ol style="list-style-type: none"> <li>1. Perform automated testing using test tools.</li> <li>2. Document the testing procedures.</li> </ol>
21	<b><u>CLOUD COMPUTING</u></b>	<ol style="list-style-type: none"> <li>1. Articulate the main concepts, key technologies, strengths and limitations of cloud computing.</li> <li>2. Identify the architecture, infrastructure and delivery models of cloud computing.</li> <li>3. Explain the core issues of cloud computing such as security, privacy and interoperability.</li> </ol>
22	<b><u>BIG DATA ANALYTICS</u></b>	<ol style="list-style-type: none"> <li>1. Apply big data concepts practically to overcome business problems.</li> <li>2. Increased use of data analysis and problem solving techniques.</li> <li>3. Implement the big data analysis tools and develop new tools.</li> <li>4. Skill set of big data analysis will be increased.</li> </ol>



  
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