SR. NO	PO's	PROGRAM OUTCOMES PO's	DESCRIPTION
1	PO 1	ENGINEERING KNOWLEDGE	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2	PO 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	PO 3	DESIGN & DEVELOPMENT OF SOLUTION	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	PO 4	CONDUCT INVESTIGATION OF COMPLEX PROBLEM	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	PO 5	MODERN TOOL USAGE	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6	PO 6	THE ENGINEER & SOCIETY	Apply reasoning informed by the contextual knowledge to assesssocietal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
7	PO 7	ENVIRONMENT & 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	PO 8	ETHICS	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9	PO 9	INDIVIDUAL & TEAM WORK	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10	PO 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	PO 11	PROJECT MANAGEMNET & 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	PO 12	LIFELONG 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

Sr. No.	PSO's	Description
1	PSO 1	**Competence in Civil Engineering:** Educating students with fundamental mathematical, scientific, and engineering knowledge to have a significant and positive long-term impact on the field of civil engineering.
2	PSO 2	**Usage of Cutting Edge Technology:** Inspiring students and preparing them for successful professional careers using appropriate techniques, resources and modern attitudes and modeling to complex engineering activities and research.
3	PSO 3	**Ability to Coordinate and communicate in groups:** Emphasizing the importance of working in a team effectively and to communicate properly within the team to achieve the desired outcome.
4	PSO 4	**Continuous improvement:** Motivate students in learning to learn and the ability to keep learning for a lifetime to increase their professionalism, update and deepen their knowledge through the development of the profession.
5	PSO 5	**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.

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PSO's Of All Department's
DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

Sr. No.	PSO's	Description
1	PSO 1	The students will be able to demonstrate skills in designing algorithms and implement them in a suitable programming language by selecting appropriate data structures.
2	PSO 2	The students will be able to demonstrate basic knowlegde in the areas such as Database System,Software Engineering,Computer Networking ,Web Technology and Operating System for building IT applications.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Sr. No.	PSO's	Description
1	PSO 1	Acquaintance of social and environmental awareness with ethical responsibilities to have a successful career in real-world applications by keeping abreast of the technological changes
2	PSO 2	Design, Implement and analyze of various functional modes of communication systems and signal processing.

Sr. No.	PSO's	Description
1	PSO 1	Apply the fundamental knowledge of mathematics, science, electrical and electronics engineering to analyse and solve the complex problems in electrical, electronics and allied interdisciplinary areas.
2	PSO 2	To develop acquaintance and conceptual knowledge in students supported with practical exposure in the area of non conventional energy sources and utilization.

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PSO's Of All Department's
DEPARTMENT OF ELECTRONICS ENGINEERING

Sr. No.	PSO's	Description
1	PSO 1	The ability to absorb and apply fundamental knowledge of core Electronics for designing a variety of components and systems for applications including signal processing, Image processing, Communication, Networking, Embedded systems, VLSI and control system
2	PSO 2	Acquaintance of social and environmental awareness with ethical responsibilities to have a successful career in real-world applications by keeping abreast of the technological changes

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ENGINEERING,NAGPUR
CO's Of All Department's
DEPARTMENT OF CIVIL ENGINEERING
III SEMESTER

Sr. No.	Subject Name & Course Code		CO's
			A student will be able to
1	BECVE301 APPLIED MATHEMATICS-III	CO1-	Evaluate Fourier series of function in different intervaL
		CO2-	Solve P.D.E and apply it for initial value problems and boundary value problems
		CO3-	Evaluate extremal of functional using Euler's equation.
		CO4-	Extend the concept of matrices to eigen value & eigen vector and use it to solve various engineering problem.
		CO5-	Evaluate numerical solution of algebraic, simultaneous & first order D.E
		CO6-	Translate business problem to mathematical form and can find optimal solution by graphical or simplex method.
2	BECVE302 STRENGTH OF MATERIALS	CO1-	Understand the behaviour of materials under different stress and strain conditions.
		CO2-	Draw bending moment, shear force diagram, for beams under the different conditions of loading
		CO3-	Draw bending stress and shear stress distribution for beams under the different conditions of loading and sections
		CO4-	Calculate the maximum torque and power transmission of the shaft
		CO5-	Calculate the deflection of beams under the different conditions of loading
		CO6-	Understand the principle stress and strain and location of principle plane
3	BECVE 303 ENVIRONMENTAL ENGINEERING-I	CO1-	Understand the necessity and importance of water supply and determine the capacity of water treatment scheme
		CO2-	Equipped with basic knowledge related to design of water supply system and knowledge of conveyance system.
		CO3-	The knowledge of characteristics of water as physical,chemical and Biological
		CO4-	Design of various units of conventional water treatment plant.
		CO5-	Understand the purpose of disinfection and distribution system.
		CO6-	Understand the Knowledge and treatment of solid waste management.

Sr. No.	Subject Name & Course Code		CO's
4	BECVE 304 ENGINEERING GEOLOGY	CO1-	To study the origin, development and ultimate fate of various surface features of the earth.
		CO2-	To make the students to understand Mineralogy and various types of rocks
		CO3-	To provide civil Engg. Students with background and tools to identify the basic behavior of rock in underground openings.
		CO4-	To make the students understand various geological problems during construction of massive structure, earthquakes etc.
		CO5-	To make the students understand various underground water conditions.
		CO6-	To understand the various aspects of geology and its application to engineering for the purpose of new constructions.
5	BECVE 305 CONCRETE TECHNOLOGY	CO1-	To Prepare the students to understand constitutents of concrete and their effect on quality of concrete.
		CO2-	The course will prepare students to apply basic rules for manufacture of plastic concrete and its mechanization.
		CO3-	To Prepare students to apply various methods for testing of plastic concrete and hard concrete.
		CO4-	To Prepare students to analyze and Design various basic concrete building component.
		CO5-	To Understand the various modern and special type of concrete.
		CO6-	To Prepare Students to analyze behaviour of concrete structure under different environmental conditions.

IV SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	BECVE 401 STRUCTURAL ANALYSIS -I	CO1-	The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in beams, frames, trusses and columns under various loading conditions using different analysis methods.
		CO2-	The students would be able to perform ILD analysis of determinate beams and trusses.
		CO3-	The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in frames and columns under various loading conditions using different analysis methods.
		CO4-	The student would be able to apply knowledge to analyse concept of deflection, bending moment and shear force diagram in trusses under various loading conditions using different analysis methods.
		CO5-	The student would be able to apply knowledge to determine forces in determinate structures by the force and matrix method.
		CO6-	The student would be able to apply knowledge to determine forces in indeterminate structures by the force and matrix method.
2	BECVE 402 GEOTECHNICAL ENGINEERING-I	CO1-	Students would be able to determine the index and engineering properties of the soil.
		CO2-	Students would be able to determine the suitability of foundation for a particular type of soil.
		CO3-	Students will be able to classify the soils.
		CO4-	Students would be able to evaluate the stresses in the soil mass.
		CO5-	Students would be able to understand compaction & consolidation process.
		CO6-	Students would be able to determine shear strength of soil.

3	**BECVE 403 TRANSPORTATION ENGINEERING-I**	**CO1-**	The student will be able to understand history of highway engineering in India
		CO2-	A person with broad vision and complete knowledge of design and construction practices in highway engineering and pavement
		CO3-	The student will be able to test highway materials and concept of pavement design
		CO4-	The student will be able to undertake Traffic studies.
		CO5-	The student will be able understand bridge engineering its loading,stresses and flood discharge.
		CO6-	The student shall be able to know substructure and super structure of bridge.
4	**BECVE 404 SURVEYING -I**	**CO1-**	The students would be able to do temporary and permanent adjustments
		CO2-	The students would be able to measure distances and angles.
		CO3-	The students would be able to orient and draw the various maps
		CO4-	The students would be able to calculate areas and volumes of the Civil Engg. work
		CO5-	The student would be able to undertake various civil engineering surveys work
		CO6-	The student would be able to understand advance surveying technology
5	**BECVE 405 BUILDING CONSTRUCTION MATERIAL**	**CO1-**	The students are able to identify components of a building.
		CO2-	The students are able to differentiate and identify types of building materials.
		CO3-	The students are able to select appropriate material for building construction.
		CO4-	The students are able to plan various construction related activities and their qualityControl
		CO5-	The students are able to know the different scaffolding at various situation.
		CO6-	The students shall be understand the different techniques of plastering, pointing and painting.

Sr. No.	Subject Name & Course Code	CO's — A student will be able to	
1	**BECVE 501 STRUCTURAL ANALYSIS -II**	CO1-	To make students learn Kani's method of structural analysis, for analysis of beams and frames
		CO2-	To make student learn Moment distribution method of structural analysis, for analysis of beams and frames.
		CO3-	To make students learn Stiffness matrix method of structural analysis. To Formulation of stiffness matrix, transformation matrix, load matrix for Truss for analysis purposes.
		CO4-	To make students learn Stiffness matrix method of structural analysis. To Formulation of stiffness matrix, transformation matrix, load matrix for Beam for analysis purposes
		CO5-	To make students learn Stiffness matrix method of structural analysis. To Formulation of stiffness matrix, transformation matrix, load matrix for Frame for analysis purposes.
		CO6-	To make students learn the basics of finite element method in the analysis of structural components. To get students introduced with basic concepts related to structural dynamics.
2	**BECVE502 REINFORCED CEMENT CONCRETE**	CO1-	Understand the basic concepts of structural design Methods of RCC to the practical problem
		CO2-	Apply the concepts and applications of prestressed concrete in real problems.
		CO3-	Use the knowledge of the structural properties of materials i.e. steel and concrete in assessing the strength
		CO4-	Understand the composite action of reinforced steel and concrete in reinforced concrete structural members
		CO5-	Use the knowledge of shear strength of steel and concrete in assessing the strength
		CO6-	Use the knowledge in structural planning and design of various components of buildings.
3	**BECVE503 FLUID MECHANICS-I**	CO1-	Measure and determine fluid pressures.
		CO2-	Apply the principles of hydrostatics and determine the forces.
		CO3-	Measure and determine forces on plates/surfaces, pipe bends, etc
		CO4-	Apply the Bernoulli's equation to solve the problems in fluid.
		CO5-	Understand the basic concepts related to laminar and turbulent flow
		CO6-	Understand the concepts of dimensional analysis use the dimensionless number suitably.
4	**BECVE504 GEOTECHNICAL ENGINEERING-II**	CO1-	Use the knowledge of different soil exploration techniques to ascertain the properties of soil
		CO2-	To analyze the stability of natural slopes, safety & sustainability of the slopes
		CO3-	Design of retaining structures, reinforced earth walls, et
		CO4-	Practice Ground Improvement Techniques
		CO5-	Design the shallow foundation.
		CO6-	Design the deep foundation.

Sr. No.	Subject Name & Course Code		CO's
5	BECVE505 HYDROLOGY AND WATER RESOURCES	CO1-	Use of knowledge of basics of hydrology in calculating infiltration, evaporation, total runoff
		CO2-	Use the techniques of the Hydrographs to forecast flood discharge at various durations.
		CO3-	Apply the Statistical techniques to analyse the flood occurrence & frequency.
		CO4-	Use the knowledge pertaining to the flood to plan flood routine & emergency plans.
		CO5-	Apply the knowledge of geo-hydrology terms in planning, assessing & computation of ground water potential and its assessment using various technique
		CO6-	Take-up planning of water resources mini project

VI SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	BECVE601 STEEL STRUCTURES	CO1-	Use the knowledge of structural properties of steel structural members
		CO2-	Calculate the strength of steel structural member member for the construction
		CO3-	Apply the knowledge of various techniques in analyzing the steel structural components.
		CO4-	Apply the knowledge of various techniques in designing the steel structural components.
		CO5-	Make use of knowledge of analysis in structural planning of steel structural members
		CO6-	Make use of knowledge of analysis indesign of various components of steel buildings
2	BECVE602 SURVEYING-II	CO1-	Carry forward the concepts of basic surveying techniques
		CO2-	Operate various survey instruments effectively with precision
		CO3-	Use different types of techniques in various surveying problems
		CO4-	Apply the concepts of modern surveying techniques
		CO5-	Apply the concepts of modern surveying instrumentation.
		CO6-	Take – up mini project using different surveying techniques.
3	BECVE603 FLUID MECHANICS-II	CO1-	Understand the concepts related to boundary layer theory and determination of drag and lift forces
		CO2-	Apply the knowledge of theories and equations of pipe flow in analyzing and designing the pipe network systems and its components including water hammer pressures.
		CO3-	Use the concepts of uniform and critical flow through open channels including design of efficient channel sections.
		CO4-	Undertake Gradually Varied Flow analysis and its computation and make use of specific energy concepts in the analysis of open channel flow.
		CO5-	Understand the different techniques of dimensional analysis and its use in model testing.
		CO6-	Understand and apply basics related to Turbines & Pumps in Water Resources planning.

4	**BECVE604 ENVIRONMENTAL ENGINEERING-II**	**CO1-**	Use the concept related to water & its quality, sewage, sewer, storm water, etc in its hydraulic design
		CO2-	Apply the knowledge of different components of sewer in construction, testing & maintenance of sewers,
		CO3-	To test the sample of waste water in the laboratory for physical & chemical characteristics.
		CO4-	Take-up functional planning, layout and design of water treatment plant components.and to take-up functional planning, layout and design of sewage treatment plant components.
		CO5-	Plan for rural sanitation provisions, perform functional design of septic tank and analyze the industrial waste water for its treatment units.
		CO6-	Make use of knowledge & effect of air pollution, solid waste in planning for its prevention and control.

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VII SEMESTER

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Sr. No.	Subject Name & Course Code		CO's
			A student will be able to
1	**BECVE701 ADVANCED CONCRETE STRUCTURES**	**CO1-**	Understand the principles of analysis and design of circular and rectangular water tank
		CO2-	Understand the behavior and failure modes of different concrete member .Analysis and design of columns
		CO3-	Analyze and apply the results in designing of beam.
		CO4-	Design of retaining wall.
		CO5-	Understand the relevant software and use the same in analysis & design of concrete members.
		CO6-	Design of Combine footing.
2	**BECVE702 ESTIMATION AND COSTING**	**CO1-**	Prepare the preliminary estimate for administrative approval & technical sanction for a civil engineering project.
		CO2-	Write the specification of the works to be undertaken, prepare the tender documents, fill the contracts and make use of knowledge of different contract submission & opening in awarding the work
		CO3-	Use the concept of SD, EMD, MAS, Running Bill, Final Bill during the entire project.Schedule the project for its timely completion
		CO4-	Use the technique of Rate analysis in estimating the exact cost of material & manpower and hence the entire project.
		CO5-	Estimate the bill of quantities using different techniques of preliminary & detailed estimation of buildings & roads.
		CO6-	Arrive the exact value of the asset (movable & immovable) using different Valuation techniques.
3	**BECVE 703 EARTHQUAKE RESISTANT DESIGN OF STRUCTURE (ELECTIVE-I)**	**CO1-**	Understand the different aspects related to seismology and terms related to it
		CO2-	Analyze earthquake loading effect on structures.
		CO3-	Perform the analysis and design of structures against earthquake loading.
		CO4-	Analyze multi-storey structure using different methods like Equivalent Static Lateral Load Method and Response Spectrum Method
		CO5-	Understand the different seismic retrofitting techniques and its implementation.
		CO6-	Use the knowledge in practical situation

Sr. No.	Subject Name & Course Code		CO's
4	**BECVE 703 ADVANCED TRAFFIC ENGINEERING (ELECTIVE-I)**	**CO1-**	Measure and determine fluid pressures.
		CO2-	Apply the principles of hydrostatics and determine the forces
		CO3-	Measure and determine forces on plates/surfaces, pipe bends, etc
		CO4-	Apply the Bernoulli's equation to solve the problems in fluid.
		CO5-	Understand the basic concepts related to laminar and turbulent flow.
		CO6-	Understand the concepts of dimensional analysis use the dimensionless number suitably.
5	**BECVE 703 AIR POLLUTION AND SOLID WASTE MANAGEMENT (ELECTIVE-I)**	**CO1-**	Understand different aspects of air pollutants
		CO2-	Understand different aspects of air pollutants sources & effects on man and material etc.
		CO3-	Design controls methods to reduce impact of air pollution on environment
		CO4-	Design controls methods and equipments for air pollution
		CO5-	Understand problems arriving in handling large amount of solid waste generated ,its collection and transportation, processing
		CO6-	Study of design safe collection and disposal methods.
6	**BECVE 703 ADVANCED HYDRAULICS (ELECTIVE-I)**	**CO1-**	Apply the concept of uniform flow
		CO2-	Apply the concept of critical flow in open channels.
		CO3-	Analyze and identify GVF profiles importance in practical aspects.
		CO4-	Study of importance of GVF profiles in practical aspects.
		CO5-	Understand the concept of rigid water column theory and elastic water column theory and apply it to the hydraulic projects.
		CO6-	Understand water hammer theories and problems encountered
7	**BECVE 703 SUSTAINABLE RESOURCE MANAGEMENT IN CIVIL ENGINEERING (ELECTIVE-I)**	**CO1-**	Understand the functions of various elements of railways
		CO2-	Understand the functions of various elements of airports, tunnels and docks and harbor.
		CO3-	Plan and design various elements of railways, airports, tunnels and docks and harbor
		CO4-	Understand the various principles traffic control in railways, airports, tunnels and docks and harbor.
		CO5-	Understand layout, design and construction permanent way, runway, taxiways, tunnels, births and jetty.
		CO6-	Understand the maintenance of various elements of railways, airports, tunnels and docks and harbor.

VIII SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	**BECVE801 IRRIGATION ENGINEERING**	**CO1-**	Understand the importance and scope of irrigation engineering
		CO2-	Understand fully the methods and efficiencies of irrigation, crop water requirement.
		CO3-	Understand the planning, design and operation of storage reservoir and make use of it in the practical situation.
		CO4-	Understand the basic profile of dams and use the knowledge in checking stability of Gravity dams and Earth dams.
		CO5-	Understand the theories of Canal design and apply the concept to design lined and unlined canals and detail out the cross sections.
		CO6-	Understand water logging and provide the solution to such problem
2	**BECVE 802 ADVANCED STRUCTURAL ANALYSIS (ELECTIVE-II)**	**CO1-**	Analysis of Symmetrical & Unsymmetrical plane frames
		CO2-	Analysis of Symmetrical & Unsymmetrical , plane Grids
		CO3-	Analysis of Symmetrical & Unsymmetrical plane space trusses.
		CO4-	Analysis for Free & Forced Damped/ un-damped vibrations for SDOF
		CO5-	Analysis for Free & Forced un-damped vibrations for SDOF
		CO6-	Perform the earthquake Analysis of structures using IS:1893.

3	**BECVE 802 PRE-STRESS CONCRETE (ELECTIVE-II)**	**CO1-**	Gaining the thorough knowledge of the basic theories of pre-stressed concrete
		CO2-	Gaining the thorough knowledge of the fundamental behavior of pre-stressed concrete
		CO3-	Perform the analysis of pre-stress elements
		CO4-	Perform design of pre-stress elements
		CO5-	Apply the fundamental knowledge to the solution of problems.
		CO6-	Apply the fundamental knowledge to the solution of practical problems.
4	**BECVE 802 PAVEMENT ANALYSIS AND DESIGN (ELECTIVE-II)**	**CO1-**	Analyze and Design pavement and under different loading conditions for highways
		CO2-	Analyze and Design pavement for airfields taking into consideration different characteristics
		CO3-	Propose a pavement management system framework
		CO4-	Design highway appurtenance and highway drainage
		CO5-	Perform different tests considering field conditions
		CO6-	To increase the strength of pavements along with its economy point of view
5	**BECVE 802 WATERSHED MANAGEMENT (ELECTIVE II)**	**CO1-**	Understand the Watershed .
		CO2-	Understand the characteristics of Watershed .
		CO3-	Understand the importance of watershed in terms of drinking water, irrigation water, increasesin ground water
		CO4-	Understand the importance of increases in ground water
		CO5-	Plan and design of Watershed protection, conservation elements
		CO6-	Envisage the management plan of Watershed.
6	**BECVE 802 ENVIRONMENTAL MANAGEMENT SYSTEM (ELECTIVE II)**	**CO1-**	Understand the Environmental issues such as pollution, degradation and its impact.
		CO2-	Understand its impact environmental issues such as pollution, degradation
		CO3-	Understand the environment management system and certification .
		CO4-	Understand the certification of environment management system .
		CO5-	Understand and carry out Environment Impact Analysis of a civil engineering project
		CO6-	Learn to Perform the risk analysis.
7	**BECVE 802 WATER TRANSMISSION AND DISTRIBUTION SYSTEM (ELECTIVE II)**	**CO1-**	Understand concepts of pipes, reservoir.
		CO2-	Understand concepts of pumps and valves.
		CO3-	Analyze water distribution networks.
		CO4-	Analyze water distribution designing process.
		CO5-	Carry out optimal design of water distribution network
		CO6-	Carryout the reliability analysis of water distribution network

8	**BECVE 802 GEOTECHNICAL INVESTIGATION & GROUND IMPROVEMENT TECHNIQUE (ELECTIVE II)**	CO1-	Understand methods of soil exploration .
		CO2-	Understand methods of soil analysis of the results
		CO3-	Understand the methods ground improvement .
		CO4-	Understand the methods ground improvent material used.
		CO5-	Understand methods of soil testing .
		CO6-	Understand the use of geosynthetic materials.
9	**BECVE 802 ADVANCE ENGINEERING GEOLOGY (ELECTIVE- II)**	CO1-	Acquire sufficient knowledge of existing rocks,its failure and its remedial methods.
		CO2-	Acquire sufficient knowledge of failure of existing rocks .
		CO3-	Acquire sufficient knowledge of remedial methods.
		CO4-	Understand the application of Geological fundamentals in various fields of Civil Engineering.
		CO5-	Understand different Geological Hazards on earth .
		CO6-	Understand different plan for the mitigation of such hazards .
10	**BECVE 802 WATER POWER ENGINEERING (ELECTIVE- II)**	CO1-	Understand the significance of water power .
		CO2-	Understand the hydraulic structures related to water power engineering
		CO3-	Apply the knowledge of mathematics, statistics, fluid mechanics, in design
		CO4-	Apply the knowledge of of penstocks, surge tanks and intakes .
		CO5-	Understand concepts of turbines and pumped storage tanks.
		CO6-	Design complete unit of hydro electric power station & its components
11	**BECVE 802 FORENSIC CIVIL ENGINEERING (ELECTIVE II)**	CO1-	Understand various testing methods of Failed Structures
		CO2-	Understand the aspects of failures connected with various structural systems and materials.
		CO3-	Understand the aspects of failures connected with materials.
		CO4-	Plan the strategic measures against failures.
		CO5-	Can write the legal and technical report of the failure in lucid manner.
		CO6-	Can write the technical report of the failure in lucid manner.
12	**BECVE 802 DISASTER RESPONSE AND MANAGEMENT TECHNIQUES (ELECTIVE II)**	CO1-	Studying the subject, student should be able to understand the nature
		CO2-	Studying the types of disaster, its preparedness
		CO3-	Role of different government & private agencies
		CO4-	Studying the Act & other Statute
		CO5-	Provisions, Management of Disaster.
		CO6-	Studying the Post disaster condition & its management.
13	**BECVE 803 ADVANCED GEOTECHNICAL ENGINEERING (ELECTIVE-III)**	CO1-	Understand the properties of clay
		CO2-	Know the swelling .
		CO3-	Know the shrinkage characteristics of soil.
		CO4-	Understand the basics of deep foundation
		CO5-	Understand the basics of pile foundation
		CO6-	Understand the basics of shallow foundation
14	**BECVE 803 ADVANCED REINFORCED CEMENT CONCRETE DESIGN (ELECTIVE-III)**	CO1-	Understand the principles of analysis of special RC structures viz bridge, deck, ESR, shell etc
		CO2-	Understand the design of special RC structures viz bridge, deck, ESR, shell etc
		CO3-	Understand the behavior of special RC structure under different loading conditions such as IRC, dynamic etc. as per the code provision.
		CO4-	Analysis and design of multistoried frame structure incorporating seismic forces.
		CO5-	Design of cylindrical shells.
		CO6-	Analysis of cylindrical shells.

15	**BECVE 803 APPLIED REMOTE SENSING AND GIS (ELECTIVE-III)**	**CO1-**	Develop skills and knowledge regarding basic principles of GIS
		CO2-	Apply knowledge of remote sensing and GIS in various fields of civil engineering
		CO3-	Understand fundamental knowledge of principles of ariel photography
		CO4-	Understand fundamental knowledge of remote sensing.
		CO5-	Remote Sensing and GIS for mapping and monitoring land cover and land use changes
		CO6-	Remote Sensing and GIS approach in the monitoring and evaluation of rapid urban growth for sustainable development
16	**BECVE 804 CONSTRUCTION ECONOMICS AND FINANCE**	**CO1-**	Acquaint with various economic and financial aspects of construction industry
		CO2-	Understand the tools and techniques of economic analysis for improving their decision making skills
		CO3-	Understand the knowledge of economics and finance with special reference to construction industry
		CO4-	Understand the knowledge of finance with special reference to construction industry
		CO5-	Understand the concept of IRR, turnkey construction projects
		CO6-	Apply knowledge of inflation, recession, financial ratios

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CO's Of All Department's
DEPARTMENT OF COMPUTER SCIENCE ENGINEERING
III SEMESTER

Sr. No.	Subject Name & Course Code	CO's A student will be able to	
1	**BECSE201T Applied Mathematics III**	CO1-	Perform operations on various discrete structures such as sets, functions, relations, and sequences.
		CO2-	Ability to solve problems using Counting techniques, Permutation and Combination,Recursion and generating functions.
		CO3-	Apply algorithms and use of graphs and trees as tools to visualize and simplify Problems.
		CO4-	Use of K-Maps and Truth Tables to construct and verify correctness of a Boolean expression.
		CO5-	Understand the various properties of algebraic systems like Rings, Monoids and Groups.
		CO6-	Probabilitytheory and it fir analysis of data.understand the basic concepts of probablity,random variables,probablity distribution,and joint probablity distribution.
2	**BECSE202T Advance C programming and Logic Design**	CO1-	Analyze small problems, and design and create C programs to solve them, which lend themselves to a programming solution using any of the following techniques/ technologies: robust user input validation, formatted program output, single-dimensional arrays and sequential
		CO2-	Make student able to understand, analyze and utilize language component for simple and complex problem solving.
		CO3-	Trace the execution of program logic, to determine what a program does, or to validate the correctness of a program through experimentation.
		CO4-	Adhere to structured programming principles, including single-entry/single-exit logic, modularity and localization of variables, when writing program code
		CO5-	To demonstrate knowledge and understanding of fundamental principles in computer graphics, and apply them to the design of algorithms for graphics applications.
		CO6-	Understand different models of computation, basics of functional programming.
3	**BECSE203T Digital Circuits & Fund. of Microprocessor**	CO1-	To understand the combinational circuits using Logic Gates.
		CO2-	To design arithmetic and logical Circuits.
		CO3-	To understand the concept of sequential circuits using memory elements.
		CO4-	To design various sequential circuits like register, counter and sequence generator.
		CO5-	To design various sequential circuits like register, counter and sequence generator.
		CO6-	To understand the basic fundamentals of 8085 microprocessor.

Sr. No.	Subject Name & Course Code		CO's
4	**BECSE204T Ethics in IT**	CO1-	Describe the systems of ethics related to computing technology.
		CO2-	Identify various perpetrators, exploits, cybercrimes and analyse them along with risk management.
		CO3-	Identify privacy related issues that arise in the application of computing technology.
		CO4-	Analyse intellectual property rights related to computing, software engineering, and data communications issues Apply ethical considerations to IT scenarios.
		CO5-	Understand ethics in IT organizations.
		CO6-	Understand and analyse impact of Information Technology on society and ethical issues related to it. non-classroom activities, such as service learning, internships, and field work
5	**BECSE205T Computer Architecture and Organization**	CO1-	Understand the basic components of a computer, and the execution of complete instruction and design of control unit.
		CO2-	Ability to perform computer mathematical operations on arithmetic and floating point numbers.
		CO3-	Understand the cost performance tradeoff in designing memory hierarchy and instruction sets.
		CO4-	Understand the concept of input/output and their organization.
		CO5-	Ability to conceptualize instruction level parallelism.
		CO6-	To understand the multi- core, vector and array processor.

IV SEMESTER

Sr. No.	Subject Name & Course Code		CO's	A
			student will be able to	
1	**BECSE208T Discrete Mathematics & Graph Theory**	CO1-	Know various methods of proof and applications of set theory.	
		CO2-	Know thw uses and applications of mathematicals relations and functions.	
		CO3-	Demonstrate the properties of monoids and groups.	
		CO4-	Understand the structure and types of proofs in mathematics	
		CO5-	Demonstrate graps and its subtypes	
		CO6-	Solve the problems based on permutation and combination.	
2	**BECSE209T Data Structures & Program Design**	CO1-	Understand the basic data structures	
		CO2-	Understand basic search and sort algorithms	
		CO3-	Estimate and analyze complexity of algorithms	
		CO4-	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms	
		CO5-	Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.	
		CO6-	Write programs that use arrays,records,linke,structures,stacks,queues,trees.	
3	**BECSE210T Operating System**	CO1-	Able to understand the differences between different types of modern Operating System,virtual machines and their structure of implementation and application.	
		CO2-	Able to understand the file system and how they can be access by various methods and also able to understand how disk are schedule by various algorithm	
		CO3-	Able to understand the difference between process and user & kernel thread and also issue of scheduling of user level process /thread and their issues.	
		CO4-	Able to understand the design and management concepts along with issue of main memory and virtual memory.	
		CO5-	Able to understand the issues of use of locks, semaphores, monitors for synchronization various operating system.	
		CO6-	Able to understand the concepts of deadlock in OS so,that they can managed & avoided and also provide solution for protection and security faced by OS.	

4	**BECSE211T Theoretical Foundations of Computer Science**	**CO1-** Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design	
		CO2- Be able to design FAs, NFAs, RE, Grammars, languages modeling, small compilers basics	
		CO3- Describe the formal relationships among machines,language s and grammars	
		CO4- Be able to classify languages into their types	
		CO5- Have a clear understanding of the Automata theory concepts such as REs, DFAs, NFAs, Stacks, Turing machines, and Grammars	
		CO6- Have a good knowledge of formal computation and its relationship to languages	
5	**BECSE212T System Programming**	**CO1-** To understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger.	
		CO2- Describe the various concepts of assemblers and macroprocessors.	
		CO3- To understand the various phases of compiler and compare its working with assembler.	
		CO4- To understand how linker and loader create an executable program from an object module created by assembler and compiler.	
		CO5- To know various editors and debugging techniques	
		CO6- Understand the various algorithms for debugging.	

V SEMESTER

Sr. No.	Subject Name & Course Code	CO's student will be able to	A
1	**BECSE301T Data Communication**	**CO1-** Use the knowledge of signals and communication between various signals.	
		CO2- Apply the knowledge of various waves in different techniques.	
		CO3- To provide the knowledge to students regarding different types of communication.	
		CO4- Understand a typical graphics pipeline.	
		CO5- To define the fundamentals of animation.	
		CO6- To define the fundamentals virtual reality and its related technologies.	
2	**BECSE302T Object Oriented Programming**	**CO1-** Differentiate between structures oriented programming and object oriented programming.	
		CO2- Identify and analyze the role of Classes & Objects, constructors & destructors in program	
		CO3- Design & implement various forms of inheritance and analyze how base class constructors are called.	
		CO4- Evaluate operator overloading, runtime polymorphism and examples.	
		CO5- Explore I/O operations in handling file operations.	
		CO6- Explore exception handling and various Concepts of Template Generic Programming through examples.	
3	**BECSE303T Database Management System**	**CO1-** To learn the basic concepts of DBMS.	
		CO2- To explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.	
		CO3- To improve the database design by normalization and to become familiar with basic database storage structures and access techniques: file organizations, indexing methods including B tree, B+ Trees and hashing.	
		CO4- To understand techniques of query processing and query optimization.	
		CO5- To understand the basic issues of multiple transaction processing and concurrency controls.	
		CO6- To understand recovery techniques in DBMS.	
4	**BECSE304T Computer Graphics**	**CO1-** Have a basic understanding of the core concepts of computer graphics.	
		CO2- To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.	
		CO3- Use OpenGL to create interactive computer graphics.	
		CO4- Make pictures with their computer.	
		CO5- Understand a typical graphics pipeline.	
		CO6- To define the fundamentals of animation, virtual reality and its related technologies.	

5	BECSE305T Design & Analysis of Algorithms lab	CO1-	Argue the correctness of algorithms using inductive proofs and invariants.
		CO2-	Analyze worst-case running times of algorithms using asymptotic analysis.
		CO3-	Derive and solve recurrence relations
		CO4-	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
		CO5-	Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
		CO6-	Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.

VI SEMESTER

Sr. No.	Subject Name & Course Code		CO's student will be able to	A
1	BECSE306T Artificial Intelligence	CO1-	To create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.	
		CO2-	To introduce the concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems	
		CO3-	To review the different stages of development of the AI field from human like behavior to Rational Agents.	
		CO4-	To impart basic proficiency in representing difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing.	
		CO5-	To create an understanding of the basic issues of knowledge representation and Logic and blind and heuristic search, as well as an understanding of other topics such as minimal, resolution, etc. that play an important role in AI programs	
		CO6-	To introduce advanced topics of AI such as planning, Bayes networks.	
2	BECSE307T Design Patterns	CO1-	Understands the logic of object-oriented programming.	
		CO2-	Understands the concept of pattern based analysis and design.	
		CO3-	Understands the pattern based design principle.	
		CO4-	Understands how to apply the pattern based analysis and design to the software to be developed.	
		CO5-	Understans the structure of design patterns.	
		CO6-	Learns that design patterns are solutions, and they can solve many problems that can be encountered in the future.	
3	BECSE308T Communication Skill	CO1-	Recognize their ethical responsibilities to their community, society, discipline, and profession based on various perspectives and associated standards of ethical communication.	
		CO2-	Demonstrate ability to consume communication critically.	
		CO3-	Demonstrate intercultural sensitivity.	
		CO4-	Demonstrate a strategy for using communication skills over an extended period of time	
		CO5-	Monitor and critically reflect on these communication skills, adapting the strategy as necessary, to produce the quality of outcomes required	
		CO6-	Evaluate this overall strategy and present outcomes.	
4	BECSE309T Software Engineering & Project Management	CO1-	Plan a software engineering process life cycle , including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements	
		CO2-	Able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project	
		CO3-	Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.	
		CO4-	Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.	
		CO5-	Able to use modern engineering tools necessary for software project management, time management and software reuse.	
		CO6-	Able to track the progress of a project using Openproj tool.	

Sr. No.	Subject Name & Course Code		CO's
5	BECSE310T Computer Networks	CO1-	Understand computer network basics, network architecture, TCP/IP and OSI reference models.
		CO2-	Identify and understand various techniques and modes of transmission
		CO3-	Describe data link protocols, multi-channel access protocols and IEEE 802 standards for LAN
		CO4-	Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme
		CO5-	Discuss the elements and protocols of transport layer
		CO6-	Understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

VII SEMESTER

Sr. No.	Subject Name & Course Code		CO's student will be able to	A
1	BECSE401T Data Warehousing & Mining	CO1-	To understand the basic concepts of Data Warehouse and Data Mining techniques.	
		CO2-	Examine the types of the data to be mined and apply preprocessing methods on raw data.	
		CO3-	Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of algorithms.	
		CO4-	Process raw data to make it suitable for various data mining algorithms	
		CO5-	Discover and measure interesting patterns from different kinds of databases.	
		CO6-	Apply the techniques of clustering, classification, association finding, and visualization to real world data.	
2	BECSE402T Language Processor	CO1-	Apply the knowledge of lex tool & yacc tool to develop a scanner & parser.	
		CO2-	Design and conduct experiments for intermediate code generation in compiler.	
		CO3-	Design and implement a software system for backend of the compiler.	
		CO4-	Deal with different translators.	
		CO5-	Develop program to solve complex problem in compiler.	
		CO6-	Learn the new code optimization techniques to improve the performance of a program in terms of speed and space.	
3	BECSE403T TCP/IP ELECTIVE-I	CO1-	Demonstrate various networking models and technologies.	
		CO2-	Classify classless and classful addressing systems.	
		CO3-	Analyze the working and functioning of various routing protocols.	
		CO4-	Demonstrate the working of TCP/IP suite in transport layer.	
		CO5-	Differentiate various aspects of Traffic Engineering.	
		CO6-	Know the transition of Internet Protocol from version 4 to version 6.	
4	BECSE403T Big data analysis and Business intelligence ELECTIVE-I	CO1-	To learn the basic concepts of DBMS.	
		CO2-	To explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.	
		CO3-	To improve the database design by normalization and to become familiar with basic database storage structures and access techniques: file organizations, indexing methods including B tree, B+ Trees and hashing.	
		CO4-	To understand techniques of query processing and query optimization.	
		CO5-	To understand the basic issues of multiple transaction processing and concurrency controls.	
		CO6-	To understand recovery techniques in DBMS.	
5	ELECTIVE-II Mobile Computing BECSE405T	CO1-	Understand the basics of wireless communication,Knowledge of 2G mobile standards.	
		CO2-	Understand the basics of wireless communication,Knowledge of 2G mobile standards.	
		CO3-	Understanding GSM its architecture ,network structure and protocols.	
		CO4-	Understanding Mobile IP ,DHCP and TCP over wireless network.	
		CO5-	Mobile Ad hoc Network (MANETs),security in MANETS and routing algorithms.	
		CO6-	Understand concept of protocols,wireless LANS and J2ME.	
6	ELECTIVE-II BECSE405T	CO1-	Define, construct and run programs on a mainframe operating system	
		CO2-	Application of knowledge and skills:	
		CO3-	Demonstrate initiative and judgement to apply mainframe technologies and techniques to unique and diverse business contexts;	
		CO4-	Relate and interpret emerging technologies of large computing systems to ever increasing business needs Values and Graduate Attributes.	
		CO5-	To analyze the various components of mainframe technology and its business perspective.	
		CO6-	To analyze a range of case studies to derive the best practice model to apply when developing and deploying mainframe technology applications.	

VIII SEMESTER

Sr. No.	Subject Name & Course Code	CO's — student will be able to		A
1	BECSE406T Distributed Operating system	CO1-	Understand basic principles of Distributed System	
		CO2-	Understand various DS concepts like RPC, RMI	
		CO3-	Learn file system and memory management concept used in DS	
		CO4-	Understand the importance and various methods of fault tolerance in DS environment	
		CO5-	Distinguish hardware and software concepts of distributed operating systems, various design issues like transparency, flexibility etc., and communication and synchronization in distributed operating systems.	
		CO6-	Apply scheduling in distributed operating systems, learn fault tolerance in real-time distributed systems, and designing of distributed file systems.	
2	BECSE407T Information & Cyber Security	CO1-	This course builds on the overview about information security, which includes an overview of public and secret key cryptosystems.	
		CO2-	Comprehend and apply authentication services and mechanisms	
		CO3-	On completion of this course students will be able to apply the knowledge and skills obtained to study further concepts in information security.	
		CO4-	Evaluate the computer network and information security needs of an organization.	
		CO5-	Assess cybersecurity risk management policies in order to adequately protect an organization's critical information and assets.	
		CO6-	Implement continuous network monitoring and provide real-time security solutions.	
3	BECSE408T ELECTIVE-III	CO1-	Basics of cloud computing.	
		CO2-	Key concepts of virtualization.	
		CO3-	Different Cloud Computing services	
		CO4-	Cloud Implementation, Programming and Mobile cloud computing	
		CO5-	Key components of Amazon Web Services	
		CO6-	Cloud Backup and solutions	
4	BECSE409T ELECTIVE-IV	CO1-	Students will be able to understand the potential of digital devices and seizure issues in Digital Forensics.	
		CO2-	Students will be able to know the developmental model of digital system.	
		CO3-	Students will be able to know how the computer forensic use in law enforcement, human resources and employment etc.	
		CO4-	Students will be able to understand the different methods for recovering data from cyber crime	
		CO5-	Students will be able to know security system for cyber crime	
		CO6-	Students will be able to understand advanced computer forensic system and future directions.	

LOKMANYA TILAK JANKALYAN SHIKSHAN SANSTHAS
PRIYADARSHINI INDIRA GANDHI COLLEGE OF
ENGINEERING,NAGPUR
<u>**CO's Of All Department's**</u>
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
<u>**III SEMESTER**</u>

Sr. No.	Subject Name & Course Code	CO's A student will be able to	
1	**BEECE301T APPLIED MATHEMATICS-III**	CO1-	Students can identify Laplace transforms & inverse Laplace transforms of various types of function, its properties and apply it to solve differential equation and are able to use in engineering Problems
		CO2-	Students are competent to work out the Fourier series representation of a periodic function in both exponential and sine-cosine forms and to solve partial differential equation and use Fourier transforms and its inverse in practical applications.
		CO3-	Students can find extreme values of functional using Euler's eq. and also apply knowledge to solve Isoperimetric problems and boundary value problems.
		CO4-	Students understand analytic function of a complex variable and are able to apply Cauchy integral theorem and residue theorem to solve contour integrations
		CO5-	Students are able to solve Lagrange's form and linear Homogeneous equation of Higher orderwith constant coefficient. They can apply method of separation of variable for solving P.D.E. Invarious engineering problems and also in Laplace transforms
		CO6-	Students can determine eigen values and eigen vectors and the solution of linear differential equation using matrix method and student apply concept of matrices and its application for solving engineering problem
2	**BEECE302T Electronic Devices & Circuits**	CO1-	Student will able to understand PN junction diode , Rectifier and filter circuit.
		CO2-	Student will able to understand the BJT , Biasing circuit and transistor as an amplifiers
		CO3-	Student will able to analyze transistor amplifier , Negative feedback amplifiers
		CO4-	Student will able to understand Positive feedback , various oscillators, Multi-vibrators
		CO5-	Student will able to understand power amplifier, and cross over distortion
		CO6-	Student will able to understand the FET, various circuits using FET.
3	**BEECE303T Electronics Measurement & Instrumentation**	CO1-	Explain basic concepts and definitions in measurement.
		CO2-	Explain the operation and design of electronic instruments.
		CO3-	Explain the operation and design of electronic instruments for parameter measurement
		CO4-	Explain the operation of different Transducers.
		CO5-	Explain the operation of oscilloscopes and the basic circuit blocks in the design of an oscilloscope.
		CO6-	Explain the circuitry, design of various function generators and the concept of DAS.
4	**BEECE304T Object Oriented Programming and Data Structure**	CO1-	To implement the concept of object oriented programming in any programming language
		CO2-	Explain the basic data structures and algorithms for manipulating them.
		CO3-	Implement these data structures and algorithms in the C++ language.
		CO4-	Integrate these data structures and algorithms in larger programs.
		CO5-	Code and test well structured programs of moderate size using the C++ language.
		CO6-	Apply principles of good program design to the C++ language.

Sr. No.	Subject Name & Course Code		CO's
5	BEECE305T Network Analysis & Synthesis	CO1-	Students will be able to analyze the various electrical and electronic networks using the techniques they learn
		CO2-	Students will be able to understand the theorems used in electrical circuits.
		CO3-	Analyze the series resonant and parallel resonant circuit
		CO4-	Design attenuators, filters and understand the basics of transmission lines.
		CO5-	Students will be able to analyze the steady state and transient response of simple electric circuits.
		CO6-	Evaluate two-port network parameters of any network

IV SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	BEECE401T Applied Mathematics –IV	CO1-	To understand numerical method to solve algebraic, transcendental simultaneous linear equation and to solve differential equation and Matrix by numerical method.
		CO2-	To find the Z- Transform, inverse Z- Transforms of identify its region of convergence and develop an ability to solve problems in various branches of Engineering.
		CO3-	To understand solution of differential equation by using series solution
		CO4-	To understand Probability Theory and use it for analysis of data. Understand the basic concepts of probability, random variables, probability distribution, and joint probability distribution. Also apply probability theory via Bayes' Rule.
		CO5-	To calculate the mean, median, mode, range, and standard deviation for a given data set and also use method of moments and moment generating functions
		CO6-	To Collect, analyze the data statistically and to describe sampling distributions of sample means and sample proportions using the appropriate distribution, e.g. normal, binomial, etc. Also understand the central limit theorem.
2	BEECE402T Power Devices & Machines	CO1-	Understand the basics of different components used in Power Electronics.
		CO2-	Understand the working and characteristics of different power devices along with their applications in Electronic circuits.
		CO3-	Understand the concept of AC-DC converters which are widely used in industries.
		CO4-	Understand the concept of Choppers which are widely used in industries.
		CO5-	Understand the concept of Inverters which are widely used in industries.
		CO6-	Understand the different AC/DC machines and their speed control methods.
3	BEECE403T Electromagnetic Field 4	CO1-	Understand the different coordinate system for mathematical analysis of Electromagnetic Engineering to understand the concept of Electric, Magnetic and Electromagnetic fields
		CO2-	Understand the concepts of magnetic field required to understand the concepts of Electronic Communication.
		CO3-	Understand the different theorems and their use in Electromagnetic field.
		CO4-	Understand the concept of Electromagnetic waves.
		CO5-	Understand the use of waveguides for the transmission of electromagnetic waves at higher frequencies.
		CO6-	Understand the basic concepts of Radiation and Elements used for radiation along with the basic terminologies.
4	BEECE404T Digital Circuits And Fundamental Of Microprocessor	CO1-	To understand the Combinational Circuits using Logic Gates
		CO2-	To design Arithmetic and Logical Circuits.
		CO3-	To understand the Sequential Logic Circuits using Flip-Flop..
		CO4-	To Design a Sequential Circuits such as Register, Counter and Sequence Generator .
		CO5-	To understand the Digital Logic Family.
		CO6-	To understand the Basic Fundamentals of 8085 Microprocessor.
5	BEECE405T Signals & Systems	CO1-	Describe the different Communication types Systems and of to signals apply and Fourier systems series and used in Fourier transform to obtain feature extraction of different Electronic signals.
		CO2-	Apply the concept of probability theory pertaining to communication system.
		CO3-	Describe different line coding schemes and related errors mainly Inter Symbol Interference.
		CO4-	Describe the different analog and digital modulation schemes and calculate different parameters related to them.
		CO5-	Compare different Digital Carrier Systems and get the knowldge about matched filter detection of signals and calculation of related parameters.
		CO6-	Describe the basics of information theory and describe different Source and Channel Coding schemes and able to apply selective coding scheme for the application needed

Sr. No.	Subject Name & Course Code		CO's
6	BEECE406T Environmental Studies	CO1-	Understand role of an Environmental studies in day to day life.
		CO2-	Know about natural resources & their importance of conservation.
		CO3-	Know about concept of various ecosystem.
		CO4-	Know about social, ethical, moral, aesthetic value of Biodiversity.
		CO5-	Understand the types,causes,effects and prevention of pollution
		CO6-	Unsustainable to sustainable development,rthics,social issues,climate change,environment act.Global population growth,Environment and human health,human rights,value education.

V SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	BEECE501T Antenna & Wave Propagation	CO1-	Describe transmission line characteristics.
		CO2-	Analyze wire antennas (monopoles, dipoles, and loops)
		CO3-	Analyze and design antenna arrays., Calculate antenna parameters (radiation pattern, beam width, lobes, directivity, gain, impedance, efficiency, polarization)
		CO4-	Analyze and design Microstrip antennas.
		CO5-	Describe the operation of aperture and reflector antennas.
		CO6-	Study of Antenna Measurments
2	BEECE502T Microprocessor & Microcontroller	CO1-	Describe internal organization of 8086/8088, addressing modes and instruction set.
		CO2-	To program 8086, the concept of interrupts and interface 8086 with keyboard/display using 8255 & 8279.
		CO3-	To understand the concept and interfacing of timer/counter, interrupts and Serial and parallel data communication.
		CO4-	Describe 8087 Numeric Coprocessor & DMA controller
		CO5-	To understand 8051 microcontroller in detail
		CO6-	To understand programming of 8051 and interfacing with various devices

3	**BEECE503T Analog Circuits & Design**	**CO1-**	Describe the basic differential amplifier using transistor and its operation & characteristics.
		CO2-	Design linear Op-Amp circuits such as Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier circuits for various practical applications.
		CO3-	Design non-linear Op-Amp such as Comparators, Comparator IC such as LM 339, Schmitt trigger, multivibrator circuits for various practical applications using IC555.
		CO4-	Analyze & design regulated power supply.
		CO5-	Analyze & design oscillator circuit.
		CO6-	Design of Filters, Drivers, stepper motor control circuit and Design of Dc servo motor control circuit.
4	**BEECE504T Communication Electronics**	**CO1-**	Demonstrate a basic understanding of the term Bandwidth and its application in communications.Describe the Amplitude Modulation & compute modulation Index.
		CO2-	Describe the Angle Modulation (FM, PM) process & compute modulation Index.
		CO3-	Describe and analyze Pulse Modulation techchniques, quantizing and PCM signals, bandwidth and bit rate calculations
		CO4-	To provide the students the knowledge regarding the various types of Noises in Communication Systems, related parameters and calculations.
		CO5-	Describe the fundamentals and charecteristics of AM and FM (Radio) Receivers and Calculation of related parameters.
		CO6-	Describe different types of Communication Links and Multiplexing Techniques required in communication electronics.
5	**BEECE505T Industrial Economics &Enterpreneurship Development**	**CO1-**	Understand the types of business structure and business integration.
		CO2-	Understand the market structure and pricing strategy.
		CO3-	Understand the functions of central and commercial banks.
		CO4-	Understand the entrepreneurship and project preparation.
		CO5-	Understand the protectionism vs free trade.
		CO6-	Understand the dynamics of SSI.

VI SEMESTER

Sr. No.	Subject Name & Course Code	CO's	A student will be able to
1	**BEECE601T Telecommunication SwitchingSystems**	**CO1-**	Describe the need for switching systems and their evolution from analogue to digital.
		CO2-	Describe the Public Switched Telephone Network.
		CO3-	Describe private networks.
		CO4-	Describe integrated networks.
		CO5-	Describe local switching networks.
		CO6-	Describe manual switching networks.
2	**BEECE602T Digital Signal processing**	**CO1-**	To Study fundamentals of DSP.
		CO2-	To study and analize Z transform and its application to DSP
		CO3-	To study and analize Discrete and Fast Fourier Transforms and its application to DSP
		CO4-	Design and implement digital filter (IIR) for various applications.
		CO5-	Design and implement digital filter (FIR)for various applications.
		CO6-	Describe the concept of multi rate signal processing and how to apply it for the wavelet transform

Sr. No.	Subject Name & Course Code		CO's
3	**BEECE603T Control System Engg.**	CO1-	Analyze various control systems
		CO2-	Represent the mathematical model of a system.
		CO3-	Determine the response of different order systems for various step inputs.
		CO4-	Analyze the stability of the system using Root locus. Bode plot, Nyquist plot.
		CO5-	Obtain transfer function of systems using signal flow graph.
		CO6-	Apply the state variable approach in design.
4	**BEECE604T Digital Communication**	CO1-	Describe the digital communication system & Analogy between vectors & Signal spaces.
		CO2-	Explain receiver techniques for detection of a signal in AWGN channel.
		CO3-	Demonstrate the concept of Source coding and decoding techniques.
		CO4-	Describe digital modulation techniques.
		CO5-	Demonstrate the concept of Waveform coding and decoding techniques.
		CO6-	Describe spread spectrum analysis.

VII SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	**BEECE701T DSP Processor & Architecture**	CO1-	To describe the detailed architecture, addressing mode, and basics of DSP Processors
		CO2-	To write program of DSP processor.
		CO3-	To describe the addressing mode and instruction sets of TMS320C5X
		CO4-	To design & implement DSP algorithm using code composer studio
		CO5-	To Develop programming examples and pipelining structures.
		CO6-	To design decimation filter and interpolation filter
2	**BEECE702T Television & Video Engineering**	CO1-	Analyze and understand colour tv system.
		CO2-	Understand advanece T.V technologies
		CO3-	Understand different video recording, display and it's consumer application
		CO4-	Understand advanece audio recording technologies.
		CO5-	Analyze and understand hdtv system.
		CO6-	Understand advanece digital tv technologies.
3	**BEECE703T Optical Communication (Th)**	CO1-	To learn the basic elements of optical fiber communication and related calculations.
		CO2-	To understand the different kinds of losses, signal distortion in optical wave guides & other signal degradation factors and to gain knowldge about different fiber materials and manufacturing methods.
		CO3-	To classify various optical source materials;LED structures, LASER diodes and Joints in optical fibers and related calculations.
		CO4-	To learn the fiber optical detectors such as PIN, APD diodes, receiver operation & performance and related calculations.
		CO5-	To understand the difference between Analog and Digital Link and their parameters and related calculations.
		CO6-	To understand the operational principal of WDM, SONET, measurement/calculations of attenuation, dispersion, and refractive index profile in optical fibers
4	**BEECE704T Advanced Digital System Design**	CO1-	Design and model digital circuits with HDL at behavioral, structural, and RTL.
		CO2-	Design and optimize complex Combinational and sequential circuits.
		CO3-	Design digital systems that are reconfigurable for testing.
		CO4-	Design examples on finite state machines.
		CO5-	Simulate and synthesize programming models for digital circuits using ISE and Quartus tools.
		CO6-	Experimentation on Hardware / software co-design (FPGA design)

Sr. No.	Subject Name & Course Code		CO's
5	BEECE705T - FUZZY LOGIC & NEURAL NETWORKElective-I	CO1-	Understand the adequate knowledge about feedback neural networks.
		CO2-	Understand the concept fuzzy logic control to real time systems.
		CO3-	Provide adequate knowledge about fuzzy set theory.
		CO4-	Provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic
		CO5-	Study and understand defuzzification techniques.
		CO6-	Understand and design genetic fuzzy controller.
6	BEECE705T MICROELECTRO MECHANICAL SYSTEMS AND SYSTEM ON CHIPElective-I	CO1-	Understand the working principal of currently available microsensors
		CO2-	Recent advancement in the field of mems and devices
		CO3-	Understand standard microfabrication technique and the issues surrounding them.
		CO4-	Understand advanece micro-cantilever technologies.
		CO5-	Analyze and understand packeging system.
		CO6-	Understand advanece overview mems technologies.
7	BEECE705T DATA COMPRESSION & ENCRYPTION Elective-I	CO1-	Implement various text, audio technique.
		CO2-	Provide various authentication using digital communication.
		CO3-	Gain the knowledge of encryption techniques
		CO4-	Implement various video technique.
		CO5-	Implement various compression technique.
		CO6-	Gain the knowledge of digital communication.
8	BEECE705T VLSI SIGNAL PROCESSING Elective-I	CO1-	Learn various methodologies to optimize power delay and area of VLSI design
		CO2-	Build Real Time processing system using Retiming
		CO3-	Creating Unfolding Transformation on DSP Program
		CO4-	Learn the Techniques of Unfolding and parallel processing
		CO5-	Design of algorithm structure for DSP algorithms based on algorithm transformation.
		CO6-	Design of fast convolution algorithms for implementing DSP algorithms.

VIII SEMESTER

Sr. No.	Subject Name & Course Code		CO's
			A student will be able to
1	BEECE801T Microwave & Radar Engineering	CO1-	To study the principles of the advanced microwave engineering and to understand the theoretical principles underlying microwave devices and networks.
		CO2-	To study the design of passive and active microwave components like Micro strip line, guided wave device
		CO3-	To study Klystron amplifier and oscillator.
		CO4-	To study magnetron as an oscillator and its working.
		CO5-	To study the high frequency transmission lines and measurement of impedance using smith chart.
		CO6-	Describe the transmission and waveguide characteristics for impedance matching and filter design circuits
2	BEECE802T Computer Communication Network	CO1-	Understand the requirement of theoretical & practical aspect of computer network.
		CO2-	Understand the network traffic in computer network
		CO3-	Describe various protocols used in network.
		CO4-	Describe the concept of computer network security.
		CO5-	Understand the different wired &wireless LAN stds.& Routers.
		CO6-	Understand the concept of security in computer networks

3	**BEECE803T Wireless & Mobile Communication**	CO1-	Design a model of cellular system communication and analyze their operation and performance.
		CO2-	To study and analyse losses in cellular environment and calculations of related parameter
		CO3-	To study and analyse Fundamentals of equalization, diversity and error control coding.
		CO4-	To construct and analyze the GSM system
		CO5-	To Study wireless networking
		CO6-	To Study architecture of wireless LAN and Wireless Application Protocol.
4	**BEECE804T WIRELESS SENSOR NETWORK Elective-II:**	CO1-	Demonstrate advanced knowledge and understanding of the engineering principle of sensor design, signal processing,
		CO2-	Demonstrate a computing science approach, in terms of software techniques, for wireless sensor networking with emphasis on tiny sensors
		CO3-	Demonstrate knowledge of the associated business, legislative, safety and commercial issues;
		CO4-	Demonstrate established digital communications techniques, embedded hardware and software, sensor network architecture, sensor networking principles and protocols.
		CO5-	Demonstrate sensor specific programming languages, RFID technology, embedded architectures, software program design and associated hardware, data fusion.
		CO6-	Demonstrate future technological advances and the way these will impact on the engineering product enterprise process.
5	**BEECE804T EMBEDDED SYSTEMS Elective-II:**	CO1-	Describe the financial issues related to Prototyping & Production of an Embedded System
		CO2-	Describe various types of an Embedded processors (RISC & CISC)
		CO3-	Describe the architecture of ARM7 Core & SoC
		CO4-	To develop program using ARM7 Processor
		CO5-	To describe various communication Protocols used in embedded system
		CO6-	To implement various case studies based on embedded systems
6	**BEECE804T DIGITAL IMAGE PROCESSING Elective-II:**	CO1-	To understand Basics and fundamentals of Digital Image Processing.
		CO2-	To get knowledge of Histogram, Filtering in Enhancement of Image and fundamentals of Colour Image Processing & Models.
		CO3-	To use various Transform Techniques for Image Enhancement.
		CO4-	To understand the Coding and Compression Techniques.
		CO5-	To Analyze the Image by Segmentation, Representation and Description.
		CO6-	To get the knowldge about basics of Image Restoration & Reconstruction Processes and to demonstrate the application of image processing algorithms to real life problems
7	**BEECE804T ARTIFICIAL INTELLIGENCE DElective-II:**	CO1-	Understand the history, development and various applications of artificial intelligence;
		CO2-	Familiarize with propositional and predicate logic and their roles in logic programming;
		CO3-	understand the programming language Prolog and write programs in declarative programming style; .
		CO4-	Learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems;
		CO5-	Understand how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory and possibility theory (fuzzy logic)
		CO6-	Master the skills and techniques in machine learning, such as decision tree induction, artificial neural networks, and genetic algorithm; apply and integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems.

8	**BEECE805T RANDOM SIGNAL THEORY Elective-III**	CO1-	Apply theory of probability in identifying and solving relevant problems.
		CO2-	Define and differentiate random variables and vector through the use of cumulative distribution function (CDF),
		CO3-	Show probability and expectation computations using important discrete and continuous random variable types.
		CO4-	Define and specify random processes
		CO5-	Define and differentiate random variables probability density function (PDF), probability mass function (PMF) as well as joint, marginal and conditional CDF, PDF and PMF.
		CO6-	Determine whether a given process is stationary or wide sense stationary.
9	**BEECE805T ROBOTICS & AUTOMATION Elective-III**	CO1-	Explore 8051 microcontroller architecture
		CO2-	Effectively utilize instruction set for assembly language programming
		CO3-	Interface different on chip peripherals with 8051
		CO4-	Basics of 8051 can be used for robotic applications
		CO5-	Interface off chip peripherals with 8051 using C language
		CO6-	Interface different on chip peripherals with 8051 using C language
10	**BEECE805T SATELLITE COMMUNICATIO N Elective-III**	CO1-	Do research with capabilities in the design, development
		CO2-	Experience real world experience from household appliances to sophisticated satellite communication, from electronic ignition to neural networks and
		CO3-	Able for Acquisition of technical competence in specialized areas of Satellite Communication engineering.
		CO4-	Able to identify, formulate and model problems and find Satellite Communication engineering solutions based on a system approach.
		CO5-	Manufacture of satellite communication systems used in a wide spectrum of applications.
		CO6-	Signal processing chips & to integrate academic discipline with project-based engineering applications, classroom learning theory
11	**BEECE805T CMOS VLSI DESIGN Elective-III**	CO1-	Design PMOS and NMOS transistor.
		CO2-	Implementation different combinational logic circuits.
		CO3-	Design layout for various circuits.
		CO4-	Design CMOS transistor.
		CO5-	Experiment on CMOS logic design.
		CO6-	Detect and correct errors in VLSI Design.

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PRIYADARSHINI INDIRA GANDHI COLLEGE OF
ENGINEERING,NAGPUR
<u>**CO's Of All Department's**</u>
DEPARTMENT OF ELLCTRICAL ENGINEERING
<u>**III SEMESTER**</u>

Sr. No.	Subject Name & Course Code	CO's	
		A student will be able to	
1	3S-EE-01T APPLIED MATHEMATICS-III	CO1-	Evaluate Fourier series of function in different intervaL
		CO2-	Solve P.D.E and apply it for initial value problems and boundary value problems
		CO3-	Evaluate extremal of functional using Euler's equation.
		CO4-	Extend the concept of matrices to eigen value & eigen vector and use it to solve various engineering problem.
		CO5-	Evaluate numerical solution of algebraic, simultaneous & first order D.E
		CO6-	Translate business problem to mathematical form and can find optimal solution by graphical or simplex method.
2	3S-EE-02T NON CONVENTIONAL ENERGY SOURCES	CO1-	Have knowledge about various renewable energy sources and understand the role of solar thermal energy in within the global and regional energy system framework.
		CO2-	Learn fundamentals of solar radiation geometry.
		CO3-	Have the knowledge of application of solar energy
		CO4-	Selection of sites for wind farm, different types of wind generators.
		CO5-	Understand the basic of small hydro, ocean & wave energy.
		CO6-	Knowledge of alternate energy sources and evaluate the newest technological applications in the use of renewable energy resources.
3	3S-EE-03T ELECTRICAL MEASUREMENT AND INSTRUMENTATION	CO1-	Understand the details of different electrical instrument used for electrical measurement And Instrumentation.
		CO2-	Understand the details of different Bridges used for measurement of R, L, C.
		CO3-	Understand the details of different types of potentiometers and CT and PT.
		CO4-	Understand the basic idea about transducer and Measurement of acceleration, velocity Measurement of angular velocity, Torque and Power measurement Torque meter
		CO5-	Understand the basic idea about Measurement of temperature using thermistor, RTD and thermocouple.
		CO6-	Understand the basic idea about two color pyrometers, Optical pyrometer.
4	3S-EE-04T NETWORK ANALYSIS	CO1-	Apply loop (mesh) analysis
		CO2-	Apply Node analysis
		CO3-	Use various network theorems for analysis and design of electric circuits.
		CO4-	Compute initial and final conditions for current and voltage in first and second order circuits.
		CO5-	Determine the response of a circuit excited by a waveform composed of various step and ramp components.
		CO6-	Characterize two – port networks by z, y, t and h parameters.
5	3S-EE-05T ELECTRONIC DEVICES & CIRCUITS	CO1-	To study PN junction diode,its characteristics, Zener diode & Rectifier circuits
		CO2-	To study & understand BJT its characteristic and its various configuration
		CO3-	To study and understand various power amplifier & its applications
		CO4-	To study oscillators, JEET & MOSFET
		CO5-	To study & understand various differential amplifier circuits
		CO6-	To study digital number system& logic gates.

Sr. No.	Subject Name & Course Code	CO's A student will be able to	
1	4S-EE-01T Applied Mathematics –IV	CO1-	To understand numerical method to solve algebraic, transcendental simultaneous linear equation and to solve differential equation and Matrix by numerical method.
		CO2-	To find the Z- Transform, inverse Z- Transforms of identify its region of convergence and develop an ability to solve problems in various branches of Engineering.
		CO3-	To understand solution of differential equation by using series solution
		CO4-	To understand Probability Theory and use it for analysis of data. Understand the basic concepts of probability, random variables, probability distribution, and joint probability distribution. Also apply probability theory via Bayes' Rule.
		CO5-	To calculate the mean, median, mode, range, and standard deviation for a given data set and also use method of moments and moment generating functions
		CO6-	To Collect, analyze the data statistically and to describe sampling distributions of sample means and sample proportions using the appropriate distribution, e.g. normal, binomial, etc. Also understand the central limit theorem.
2	4S-EE-02T ELEMENTS OF ELECTROMAGNETICS	CO1-	Apply various laws in the analysis of electromagnetic systems.
		CO2-	Understand the physical basis for the functioning of circuit elements
		CO3-	Apply Electromagnetic boundary conditions.
		CO4-	Be familiar with the four Maxwell"s equations used to
		CO5-	study time varying electromagnetic or dynamic fields.
		CO6-	Understand the concept of uniform plane-wave propagation and electromagnetic power density flow in lossless medium.
3	4S-EE-03T DIGITAL AND LINEAR ELECTRONIC CIRCUITS	CO1-	Basic fundamentals of logic gates
		CO2-	Introduction to Flip flops, timers.
		CO3-	Sequential circuits,and differential module
		CO4-	Basic Operational amplifier circuits:
		CO5-	Simple linear circuit
		CO6-	Applications of Operational amplifier.Study of Linear ICS
4	4S-EE-04T ELECTRICAL MACHINES-I	CO1-	Principle, construction, connections, vector grouping, operation and testing of 3-phase transformer
		CO2-	conversion of 3-phasse supply to 2-phase supply, parallel operation of 3-ph. Transformers.
		CO3-	Principle of DC machine , types, operation characteristics, armature reaction, commutation methods to improve commutation in dc generators. Principle, types, voltage build up, performance characteristics, torque evaluation in dc motors
		CO4-	Principle andworking of 3ph induction motor,different tests,types, torque development, performance characteristics, tests to determine performance indices & parameters of equivalent circuit of 3-phase
		CO5-	Principle, construction, double cage induction motors, methods of starting, speed control and braking of induction motors.
		CO6-	Revolving and cross field theories, operation, characteristics, types, equivalent circuit & tests.

5	4S-EE-05T COMPUTER PROGRAMMING	CO1-	General information of computers and operating systems
		CO2-	Structure of "C" program, Data types, Storage class, variables, expressions and Operators
		CO3-	Use of arrays and sorting techniques & Pointers and structures.
		CO4-	Basics of strings and arrays. C++ concepts
		CO5-	MATLAB programming
		CO6-	Matrix operation using programming.
6	4S-EE-06 ENVIRONMENTAL STUDIES	CO1-	The student on completion of course will understood the Ecosystem
		CO2-	Environmental issues related with social
		CO3-	Biodiversity
		CO4-	The student on completion of course will understood human population.
		CO5-	The student on completion of course will understood Biodiversity conversion
		CO6-	Student will also learn the effect on environment on social aspects and Human population.

V SEMESTER

Sr. No.	Subject Name & Course Code	CO's A student will be able to	
1	5S-EE-01T ELECTRICAL POWER SYST - I	CO1-	Able to learn basics of fundamentals power system
		CO2-	Modelling and representation of the system component and per unit representation of power system
		CO3-	Able to understand use of cables in distribution network
		CO4-	Concept of designing transmission line parameters
		CO5-	The basic concepts of load flow analysis
		CO6-	Analyze performance of generator and turbine
2	5S-EE-02T UTILIZATION OF ELECTRIC ENERGY	CO1-	To ensure that the knowledge acquired can be applied in various fields such as electric heating, illumination, chemical processes and electric traction.
		CO2-	To make the students aware about the importance of maximizing the energy efficiency by optimum utilization of electrical energy.
		CO3-	To develop ability amongst the students to design heating element for resistance furnaces and design illumination schemes. To develop ability amongst the students to analyze the performance of arc furnaces, electric traction, different sources of light, illumination schemes, electric traction
		CO4-	To provide know how about various Control devices and their use in Refrigeration, Air Conditioning
		CO5-	To provide know about electrochemical processes and applications of these in practical world.
		CO6-	To make the students aware about energy performance evaluation and assessment also energy saving opportunities of fans, blowers, compressor and DG sets.

Sr. No.	Subject Name & Course Code		CO's
3	5S-EE-03T ELECTRICAL MACHINE DESIGN	CO1-	To Analyze different materials and their properties used in design of machine
		CO2-	To calculate and understand the core design and main dimension of transformer.
		CO3-	To understand the performance characteristics and cooling of transformer.
		CO4-	To calculate and understand the stator design and main dimension of Induction motor.
		CO5-	To calculate and understand the rotor design and main dimension of Induction motor.
		CO6-	To calculate and understand the stator design and main dimension of Synchronous motor motor.
4	5S-EE-04T MICROPROCESSOR & INTERFACING	CO1-	VLSI circuit concept
		CO2-	Introduction to Intel 8085A architecture
		CO3-	Programming instructions
		CO4-	Interrupts
		CO5-	Methods of data transfer
		CO6-	Hardware and Interface
5	5S-EE-05T ELECTRICAL MACHINES-II	CO1-	The student has understood principle , construction, laying of armature and field windings, types, generation of emf, steady state
		CO2-	Transient behavior, synchronization and parallel operation of synchronous generators
		CO3-	The student has understood principle, construction,
		CO4-	Methods of starting of synchronous motor, its operation with variable load, operation with variable excitation, performance evaluation.
		CO5-	The student has understood special motors ,like Repulsion,
		CO6-	Hysteresis, Reluctance, Universal and Schrage motors.

VI SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	6S-EE-01T POWER STATION PRACTICE	CO1-	understand the concept of load forecasting, solve problems based on load.
		CO2-	understand the thermal station.
		CO3-	understand the Hydro station.
		CO4-	understand the nuclear station.
		CO5-	calculate the tariff for different customers.
		CO6-	the co generation and captive power generation.
2	6S-EE-02T ENGINEERING ECONOMICS & INDUSTRIAL MANAGEMENT	CO1-	To solve numericals on starting, speed control and braking.
		CO2-	To solve numericals on heating and cooling of motors.
		CO3-	It will lay the foundation for studying the advanced subject
		CO4-	Power Semiconductor based drives to be studied in 8th semester.
		CO5-	To work on the drives used in the Industry.
		CO6-	To work with PLC's in the Industry &will gain an insight in the working of drives used in traction.

3	6S-EE-03T ELECT. DRIVES & THEIR CONTROL	CO1-	To solve numericals on starting, speed control and braking.
		CO2-	To solve numericals on heating and cooling of motors.
		CO3-	It will lay the foundation for studying the advanced subject Power Semiconductor based drives to be studied in 8th semester
		CO4-	To work on the drives used in the Industry
		CO5-	To work with PLC's in the Industry
		CO6-	Will gain an insight in the working of drives used in traction.
4	6S-EE-04T POWER ELECTRONICS	CO1-	Understand basic operation of various power semiconductor devices.
		CO2-	Understand the basic principle of switching circuits.
		CO3-	Analyze and design an AC/DC rectifier circuit.
		CO4-	Analyze and design DC/DC converter circuits.
		CO5-	Analyze DC/AC inverter circuit.
		CO6-	Understand the role power electronics play in the improvement of energy usage efficiency and the development of renewable energy technologies.
5	6S-EE-05T CONTROL SYSTEM - I	CO1-	Components specifications through classical and state variable approach
		CO2-	Understand the time response and time response specifications.
		CO3-	Analyze the absolute stability
		CO4-	Analyse the relative stability through root locus method
		CO5-	Frequency response tools like bode plot and nyquist plot
		CO6-	Understand the introductory concepts of state variable approach

VII SEMESTER

Sr. No.	Subject Name & Course Code	CO's A student will be able to	
1	BEELE701T CONTROL SYST - II	CO1-	To impart knowledge of classical controller/compensator design for linear system
		CO2-	To study and design properties of STM
		CO3-	To design state variable feedback
		CO4-	To have idea about optimal and discrete time control system
		CO5-	To understand theory and analysis non linear system
		CO6-	To study sample data control system
2	BEELE702T ELECTRICAL POWER SYST - II	CO1-	Understand the basics of power system.
		CO2-	Analyze and solve problems on symmetrical & unsymmetrical fault
		CO3-	Understanding the different stability of power system and multi-machine stability concept
		CO4-	Learn about voltage stability and reactive power control in power systems.
		CO5-	Learn about control of interconnected power system and economic dispatch
		CO6-	Understand economy of operation and get familiar with types of grounding.
3	BEELE703T FLEXIBLE AC TRANSMISSION SYSTEMS (Elective-I)	CO1-	Understand the importance of interconnection network
		CO2-	Understand the working of different convectors used in FACTS
		CO3-	Ability to understand and identify the problems and constraints with stability of large interconnected system.
		CO4-	Ability to understand different types series of converters, regulators and compensators
		CO5-	Ability to understand different types shunt of converters, regulators and compensators
		CO6-	Ability to understand different types combined(series & shunt) of converters, regulators and compensators

4	**BEELE703T ENERGY MANAGEMENT AND AUDIT (Elective-I)**	CO1-	Know Present energy scenario with need of energy audit and energy conservation.
		CO2-	Understand various aspects of energy audit
		CO3-	Understand the material & energy balance and waste heat recovery processes.
		CO4-	Understand energy conservation activities such as action planning, monitoring, targeting and implementation.
		CO5-	Manage electric and thermal energy in the industry
		CO6-	Understand the energy conservation in boiler, steam turbine & furnaces.
5	**BEELE704T HIGH VOLTAGE ENGINEERING**	CO1-	Breakdown mechanism in solid liquid and gaseous medium
		CO2-	Travelling waves for the high voltage
		CO3-	Lightening and switching over-voltages and insulation coordination
		CO4-	Different methods of generation and measurement of high voltage
		CO5-	Different methods of currents measurement in laboratory
		CO6-	Different methods of non destructive and High Voltage testing of apparatus.
6	**BEELE705T ELECTRICAL INSTALLATION DESIGN**	CO1-	The students will understand concept of load forecasting, solve problems based on regression analysis and also understand construction, types and selection of PVC/ XLPE cables and overhead conductors
		CO2-	Students will be able to determine fault level at various locations in radial networks and be able to find rating and location of series reactors
		CO3-	The students will be able to draw single line diagrams with specifications for electrical distribution networks for residential and commercial installations and design reactive power compensation.
		CO4-	Students shall be able to design 11kV and 33 kV substations for utility and industrial installations and specify the ratings and specifications of apparatus used ans also to understand procedure for receipt, storage, testing and commissioning of transformers along with its accessories viz OTI, WTI, Silica Gel Breather, MOG, Buchholz relay etc
		CO5-	The students will be able to draw single line diagrams with specifications for distribution networks, motor and power control centers for industrial installations.
		CO6-	Students will understand the relevant provisions of IE rules for low medium and high voltage installations and also to understand provisions for system and equipment earthings as per IS 3043

VIII SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	**BEELE801T EHV AC & HVDC TRANSMISSION (Elective-II)**	CO1-	Power handling capacity of different Transmission systems
		CO2-	Electrostatic and electromagnetic fields and corona in EHVAC lines
		CO3-	Voltage control and current control systems for power flow controls in HVDC system.
		CO4-	The knowledge of design parameters of AC filters as well as DC filters and Reactive power compensation
		CO5-	Overall knowledge about the HVDC system such as MTDC,
		CO6-	Protection and substation layout of HVDC power plant.

2	**BEELE802T POWER SEMICONDUCTOR BASED DRIVES (Elective-III)**	**CO1-**	Understand dynamics of Electrical drives
		CO2-	Understand and analysis and motor drive using P.E.
		CO3-	Work with confidence on the various drives used in the Industry.
		CO4-	The students can carry research on the newer Switched Reluctance motor
		CO5-	Understands the traction drives with ac and dc motors.
		CO6-	Students can carry research on the Brushless DC motor.
3	**BEELE802T ELECTRICAL DISTRIBUTION SYSTEM (Elective-III)**	**CO1-**	Calculate different distribution factors,
		CO2-	Understand classification of load, types of load curves.
		CO3-	Understand design concept of distribution system and voltage drop and power loss calculation in distribution system
		CO4-	Control of voltage and reactive power in distribution system
		CO5-	Understand distribution automation
		CO6-	Understand distribution substation layout with associated equipment's.
4	**BEELE803T SWITCH GEAR AND PROTECTION**	**CO1-**	Theory & application of main components used in power system protection.
		CO2-	Protection systems used for electric machines, transformers
		CO3-	Protection systems used for bus bars, transmission lines.
		CO4-	Theory, construction, and applications of main types of circuit breakers.
		CO5-	Design the protection systems needed for each main part of a power system.
		CO6-	Design the protection systems needed for distribution system.
5	**BEELE804T COMPUTER APPLICATIONS IN POWER SYSTEM.**	**CO1-**	Determine Bus Impedance & Admittance matrix (required for Load flow & Short circuit Studies) by graphically,
		CO2-	Determine Bus Impedance & Admittance matrix Inspection & building algorithm.
		CO3-	Load flow study of a power system by Newton-Raphson & Gauss-Seidal Iterative Method.
		CO4-	Short circuit studies.
		CO5-	Transient stability by using Eulers, Modified Eulers
		CO6-	Transient stability by using RK-4 th order differential method.

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ENGINEERING,NAGPUR
<u>**CO's Of All Department's**</u>
DEPARTMENT OF ELECTRONICS ENGINEERING
<u>**III SEMESTER**</u>

Sr. No.	Subject Name & Course Code		CO's
			A student will be able to
1	**BEEN301T APPLIED MATHEMATICS-III**	**CO1-**	Students can identify Laplace transforms & inverse Laplace transforms of various types of function, its properties and apply it to solve differential equation and are able to use in engineering Problems
		CO2-	Students are competent to work out the Fourier series representation of a periodic function in both exponential and sine-cosine forms and to solve partial differential equation and use Fourier transforms and its inverse in practical applications.
		CO3-	Students can find extreme values of functional using Euler's eq. and also apply knowledge to solve Isoperimetric problems and boundary value problems.
		CO4-	Students understand analytic function of a complex variable and are able to apply Cauchy integral theorem and residue theorem to solve contour integrations
		CO5-	Students are able to solve Lagrange's form and linear Homogeneous equation of Higher orderwith constant coefficient. They can apply method of separation of variable for solving P.D.E. Invarious engineering problems and also in Laplace transforms
		CO6-	Students can determine eigen values and eigen vectors and the solution of linear differential equation using matrix method and student apply concept of matrices and its application for solving engineering problem
2	**BEENE302** **ELECTRONIC DEVICES AND CIRCUITS**	**CO1-**	This subject will give an overview of various semiconductor devices.
		CO2-	At the end of this course, the students will be able to analyze and design amplifier circuits, oscillators and filter circuits employing BJT, FET devices.
		CO3-	Analysis of Transistor amplifier circuit using h-parameters
		CO4-	Explain Transistor as a mulitvibrator
		CO5-	Explain Power amplifiers and its efficiency
		CO6-	Explain FET & its characteristic
3	**BEENE303** **ELECTRONICS MEASUREMENT AND INSTRUMENTATION**	**CO1-**	Students will be able to explain basic concepts and definitions in measurement.
		CO2-	Explain the operation and design of electronic instruments for parameter measurement and operation of different Transducers
		CO3-	Explain the operation of oscilloscopes and the basic circuit blocks in the design of an oscilloscope.
		CO4-	Explain the circuitry and design of various function generators
		CO5-	Explain CRO & signal generators.
		CO6-	Explain signal analyzer and data Acquisition system.

Sr. No.	Subject Name & Course Code		CO's
4	**BEENE304** **OBJECT ORIENTED PROGRAMMING & DATA STRUCTURE**	**CO1-**	Be able to implement the concept of object oriented programming in any programming language.
		CO2-	Explain the basic data structures and algorithms for manipulating them.
		CO3-	Implement these data structures and algorithms in the C++ language
		CO4-	Integrate these data structures and algorithms in larger programs.
		CO5-	Code and test well-structured programs of moderate size using the C++ language.
		CO6-	Apply principles of good program design to the C++ language.
5	**BEENE305** **NETWORK ANALYSIS AND SYNTHESIS**	**CO1-**	Students will be able to analyze the various electrical and electronic networks using the techniques they learn .
		CO2-	Students will be able to construct a circuit to suit the need.
		CO3-	Students will be able to explain various frequency selective net woks
		CO4-	Students will be able to filters & attenuators.
		CO5-	Students will be able to basic properties of laplas transform
		CO6-	Students will be able to two port net wok parameters

<div align="center"><u>IV SEMESTER</u></div>

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	**BEENE401** **POWER DEVICES AND MACHINES**	**CO1-**	Students will understand the basics of different components used in Power Electronics.
		CO2-	Understand the working and characteristics of different power devices along with their applications in Electronic circuits.
		CO3-	Understand the concept of AC-DC converters, Choppers, Inverters which are widely used in industries.
		CO4-	Understand the different AC/DC machines & their speed control methods.
		CO5-	Students will understand three phase transformer
		CO6-	Students will understand dc motors
2	**BEENE402** **ELECTROMAGNETIC FIELDS**	**CO1-**	After the completion of this subjects, the students will Understand the concepts of Electric, Magnetic and Electromagnetic fields required to
		CO2-	Understand the concepts of Electronic Communication.
		CO3-	Understand the different coordinate system for mathematical analysis of Electromagnetic Engineering.
		CO4-	Understand the different theorems and their use in Electromagnetic field.
		CO5-	Understand the use of waveguides for the transmission of electromagnetic waves at higher frequencies. Understand the basic concepts of Radiation and Elements used for radiation along with the basic terminologies
		CO6-	Students will understand electric and magnetic fields

Sr. No.	Subject Name & Course Code		CO's
3	**BEENE404 DIGITAL CIRCUITS AND FUNDAMENTAL OF MICROPROCESSOR**	**CO1-**	Student will be able to analyze, design, and evaluate digital circuits of medium complexity, that are based on SSIs, MSIs, and programmable logic devices.
		CO2-	Student will be able to design combitional circuits
		CO3-	Student will be able to design sequential circuit
		CO4-	Student will be able to explain application of flip flops
		CO5-	Student will be able to explain digital logic families
		CO6-	Student will be able to explain funadamentals of microprocessors.
4	**BEENE405 SIGNALS AND SYSTEMS**	**CO1-**	Get knowledge about different types of signals and systems used in communication Electronics.
		CO2-	Understand the concept of probability and its use in communication system.
		CO3-	Be able to embed the use of fourier series and fourier transform for feature extraction of different electronic signals.
		CO4-	Understand different coding schemes and able to apply selective coding scheme for the application needed.
		CO5-	Understand the different analog and digital modulation schemes.
		CO6-	Student will be able to explain information theory.
5	**BEENE406 ENVIRONMENTAL STUDIES**	**CO1-**	Students will be able to recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment.
		CO2-	Develop analytical skills, critical thinking, and demonstrate problem-solving skills using scientific techniques.
		CO3-	Student will be able to explain ecosystem.
		CO4-	Student will be able to explain Bio-diversity
		CO5-	Student will be able to explain pollution
		CO6-	Student will be able to explain social issues and the environment.

V SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	**BEENE 501 SWITCHING THEORY AND AUTOMATA**	**CO1-**	Demonstrate basic tools for the design of digital circuits and fundamental concepts used in the design of digital systems.
		CO2-	Find out structural properties by using Functional Decomposition & Symmetric functions.
		CO3-	Describe designing aspects of logic circuits using threshold elements.
		CO4-	Design combinational logic circuits, sequential logic circuits.
		CO5-	Describe behavior, capabilities and structure of finite state machines and sequential machines.
		CO6-	Describe diagnosis of faults of switching circuits & methods of improving their reliability.
2	**BEENE 502 MICROPROCESSOR AND MICROCONTROLLERS**	**CO1-**	Describe internal organization of 8086/8088 microprocessors & 8051microcontroller
		CO2-	Describe the concept of addressing modes and timing diagram of Microprocessor
		CO3-	Interface 8086 & 8051 with Keyboard/ Display, ADC/DAC, Stepper motor etc.
		CO4-	Demonstrate the concept of interrupts and its use.
		CO5-	Demonstrate the concept of Serial & parallel data communication
		CO6-	Describe Handshaking concept and interfacing with peripheral devices. concept of DMA & Pentium

3	**BEENE 503** **ANALOG CIRCUIT AND DESIGN**	**CO1-**	Describe the basic differential Amplifier using transistor and its operation & characteristic.
		CO2-	Design linear Op-Amp circuits such as Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier circuits for various practical applications.
		CO3-	Design non-linear Op-Amp such as Comparators, Comparator IC such as LM 339, Schmitt trigger, multivibrator circuits for various practical applications using IC555.
		CO4-	Analyze and design amplifier circuits, oscillators, Filter, regulated power supply
		CO5-	Design sinusiodal oscillator
		CO6-	Design filters and drivers
4	**BEENE 504** **COMMUNICATIO N ELECTRONICS**	**CO1-**	At the end of the course the students shall be able to demonstrate a basic understanding of the term bandwidth and its application in communications.
		CO2-	Describe quantizing and PCM signals, bandwidth and bit rate calculations, study amplitude and angle modulation and demodulation of analog signals etc.
		CO3-	Solve the problems involving bandwidth calculation, representation & Generation of an AM sine wave
		CO4-	Compare different modulation techniques of Generation of FM (Direct & Indirect Method)
		CO5-	Identify, formulate & solve communication engineering problems.
		CO6-	Describe types of multiplexing.

VI SEMESTER

Sr. No.	Subject Name & Course Code	CO's A student will be able to	
1	**BEENE 601** **MICROWAVE ENGINEERIN**	**CO1-**	Describe the use of active and passive microwave devices
		CO2-	Analyze different UHF components with the help of scattering parameter
		CO3-	Describe micro strip lines.
		CO4-	Demonstrate the use of different Klystrons, magnetron devices.
		CO5-	Analyze the different power distribution Tees.
		CO6-	Describe the basic communication link design, signal power budget, noise evaluation and link carrier to noise ratio,Describe the transmission and waveguide structures and how they are used as elements in impedance matching and filter circuits.

2	BEENE 602 DIGITAL SIGNAL PROCESSING	CO1-	Represent discrete-time signals analytically and visualize them in the time domain.
		CO2-	Meet the requirement of theoretical and practical aspects of DSP with regard to sampling and reconstruction.
		CO3-	Design and implement digital filter for various applications.
		CO4-	Describe the various transforms for analysis of signals and systems.
		CO5-	Describe the concept of multi rate signal processing and how to apply it for the wavelet
		CO6-	Describe multi rate DSP.
3	BEENE 603 CONTROL SYSTEM ENGINEERING	CO1-	Analyze various control systems.
		CO2-	Represent the mathematical model of a system.
		CO3-	Determine the response of different order systems for various step inputs
		CO4-	Analyze the stability of the system using Root locus. Bode plot, Nyquist plot
		CO5-	Obtain transfer function of systems using signal flow graph.
		CO6-	Apply the state variable approach in design.
4	BEENE 604 DIGITAL COMMUNICATION	CO1-	Explain the working principles of basic building blocks of a digital communication system
		CO2-	Describe a random process in terms of its mean and correlation functions and characterize special Gaussian and Rayleigh distributions.
		CO3-	Explain receiver techniques for detection of a signal in AWGN channel
		CO4-	Describe digital modulation techniques.
		CO5-	Demonstrate the concept of coding and decoding techniques.
		CO6-	Model digital communication systems using appropriate mathematical techniques

VII SEMESTER

Sr. No.	Subject Name & Course Code		CO's
			A student will be able to
1	BEENE 701 DSP PROCESSOR & ARCHITECTURE	CO1-	To describe the detailed architecture, addressing mode, instruction sets of TMS320C5X
		CO2-	To write program of DSP processor.
		CO3-	To design & implement DSP algorithm using code composer studio
		CO4-	To design decimation filter and interpolation filter.
		CO5-	To study implementation of multirate digital signal processing
		CO6-	To study Architectural aspects of TMS 320 C6 X, DSP 56XX processor
2	BEENE 702 EMBEDDED SYSTEM	CO1-	To describe the financial and marketing issues of the prototyping & production of an Embedded System
		CO2-	To describe the architectures and types of an Embedded processors.
		CO3-	To design programs using ARM7 Processor
		CO4-	To describe various communication Protocols used in embedded system
		CO5-	To understand concept of real time operating systems
		CO6-	To design embedded based on RTOS and communication protocols
3	BEENE 703 OPTICAL COMMUNICATION	CO1-	Learn the basic elements of optical fiber.
		CO2-	Understand the different kinds of losses, signal distortion in optical wave guides & other signal degradation factors
		CO3-	Classify various optical source materials, LED structures, LASER diodes.
		CO4-	Learn the fiber optic receivers such as PIN, APD diodes, receiver operation & performance.
		CO5-	Understand the operational principal of WDM, SONET
		CO6-	Measurement of attenuation, dispersion,refractive index profile in optical fibers

Sr. No.	Subject Name & Course Code		CO's
4	BEENE 704 ADVANCED DIGITAL SYSTEM DESIGN	CO1-	Design of Combinational & sequential circuit.
		CO2-	Develop skilled VLSI front end designers.
		CO3-	Implementation of digital system.
		CO4-	Experimentation on Hardware /Software co-design.
		CO5-	Simulate and synthesize programming models for digital circuits using ISE and Quartus tools.
		CO6-	Design digital systems that are reconfigurable for testing.
5	BEENE 705 ELECTIVE 1 - DIGITAL IMAGE PROCESSING	CO1-	To understand Basics and fundamentals of Digital Image Processing.:
		CO2-	To get knowledge of Histogram and Filtering in Enhancement of Image.
		CO3-	To use various Transform Techniques for Image Enhancement
		CO4-	To understand the coding and compression techniques.:
		CO5-	To Analyze the Image by Segmentation, Representation and Description.
		CO6-	To Demonstrate the application of image processing algorithms to real life problems.
6	BEENE 705 ELECTIVE 1 - MOBILE COMMUNICATION	CO1-	Have an introduction to Mobile Communication and able to understand the Cellular Systems
		CO2-	Understand the fading related problems
		CO3-	Understand the the modulation schemes
		CO4-	Understand the signals in mobile channels
		CO5-	Understand the multiplexing schemes
		CO6-	Understand the concept of GSM and their subsystems

VIII SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	BEENE 801 MICROELECTRO MECHANICAL SYSTEMS AND SYSTEMS ON CHIP	CO1-	Understand working principles of currently available microsensors, actuators used in Microsystems.
		CO2-	Apply scaling laws that are used extensively in the conceptual design of micro devices and systems.
		CO3-	Understand the basic principles and applications of micro-fabrication processes, such as photolithography, ion implantation, diffusion, oxidation, CVD, PVD, and etching.
		CO4-	Choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process.
		CO5-	Consider recent advancements in the field of MEMS and devices.
		CO6-	Understanding system on chip.
2	BEENE 802 COMPUTER COMMUNICATION NETWORK	CO1-	Understand the requirement of theoretical & practical aspect of computer network.
		CO2-	Understand the network traffic in computer network.
		CO3-	Describe various protocols used in network.
		CO4-	Describe the concept of computer network security.
		CO5-	Understand the different wired &wireless LAN stds.& Routers.
		CO6-	Understand basics of Network security.

3	**BEENE 803** **CMOS VLSI DESIGN**	**CO1-**	Design PMOS and NMOS transistor
		CO2-	Implementation different combinational logic circuits.
		CO3-	Design layout for various circuits.
		CO4-	Design CMOS transistor.
		CO5-	Experiment on CMOS logic design.
		CO6-	Detect and correct errors in VLSI Design.
4	**BEENE 804** **Elective 2-** **DATA COMPRESSION AND ENCRYPTIO**	**CO1-**	implement various text, audio, video, compression technique.
		CO2-	provide various authentication using digital communication.
		CO3-	Gain the knowledge of encryption techniques application to digital communication
		CO4-	Able to explain Tntroduction, Types of attacks, Steganography, Data Encryption Standards, Block Cipher
		CO5-	Able to explain Euler's theorems, Principles of public key cryptography, RSA,algorithm, Diffie-Hellman Key Exchange. Elliptic curve cryptology, message authentification and Hash functions, Hash and Mac algorithms, Digital signatures.
		CO6-	Able to explain Intruders, Viruses, Worms, firewall design, antivirus techniques, digital Immune systems,
5	**BEENE 804** **Elective 2-** **WIRELESS SENSOR NETWORK**	**CO1-**	Demonstrate advanced knowledge and understanding of the engineering principle of sensor design, signal processing, established digital communications techniques, embedded hardware and software, sensor network architecture, sensor networking principles and protocols.
		CO2-	Demonstrate a computing science approach, in terms of software techniques, for wireless sensor networking with emphasis on tiny sensors, sensor specific programming languages, RFID technology, embedded architectures, software program design and associated hardware, data fusion
		CO3-	Demonstrate knowledge of the associated business,legislative, safety and commercial issues; future technological advances and the way these will impact on the engineering product enterprise process.
		CO4-	Demonstrate Protocols, Transport Control Protocols for Wireless Sensors Networks, Traditional transport control
		CO5-	protocol, transport protocol design issues, examples of existing transport control protocol, performance of TCP.
		CO6-	Demonstate Middleware for Sensor Networks, WSN middleware principles, Middleware architecture, existing middleware.

6	**BEENE 805** **Elective 2-** **SATELLITE** **COMMUNICATIO** **N**	**CO1-**	Do research with capabilities in the design, development and manufacture of satellite communication systems used in a wide spectrum of applications.
		CO2-	Experience real world experience from household appliances to sophisticated satellite communication, from electronic ignition to neural networks and signal processing chips & to integrate academic discipline with project -based engineering applications, classroom learning theory.
		CO3-	Able for Acquisition of technical competence in specialized areas of Satellite Communication engineering.
		CO4-	Able to identify, formulate and model problems and find Satellite Communication engineering solutions based on a system approach.
		CO5-	Encoding and forward error correction: Error detection and correction, channel capacity, error detecting
		CO6-	Able to explain codes, linear block codes, error correction with linear block codes, performance of block error correction'Earth Station technology: Earth Station design; antennas tracking, LNA, HPA, RF multiplexing, factors
6	**BEENE 805 :** **Elective 3-** **ROBOTICS AND** **AUTOMATION**	**CO1-**	Explore 8051 microcontroller architecture
		CO2-	Effectively utilize instruction set for assembly language programming.
		CO3-	Interface different on & off chip peripherals with 8051 using C language.
		CO4-	Able to explain Basics of 8051 can be used for robotic applications.
		CO5-	Able to explain Triangularation Method, Time of Flight (TOF), Ranging Method, Robot Position and Proximity Sensing, Tactile- Sensing System, Sensing Joint Forces and their importance in Robot programming,
		CO6-	Able to explain Various Root Programming Languages and their characteristics, characteristics of Robot Task Level language, comparison of Robot programming language, features of the high level languages used

LOKMANYA TILAK JANKALYAN SHIKSHAN SANSTHAS
PRIYADARSHINI INDIRA GANDHI COLLEGE OF
ENGINEERING,NAGPUR
CO's Of All Department's
DEPARTMENT OF FIRST YEAR
I SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	BESI-1 Applied Mathematics – I	CO1-	Apply Mathematical concepts and Principles to perform computations.
		CO2-	Apply math to solve problem
		CO3-	Create ,use and analyze graphical representation of Mathematical relationship.
		CO4-	Communicate Mathematical knowledge and understanding
		CO5-	An ability to design Mathematical model apply mathematical Analysis and problem solving skill in a broad range of Intellectual domain (e.g. biological, physical or social sciences and engineering) in public and private interest
		CO6-	Apply knowledge of math science and engineering fundamental to the solution of complex problems involved in different engineering areas
2	BESI-2 Engineering Physics	CO1-	Assimilate basic knowledge of duality of light & phenomena based on particle nature of light.
		CO2-	Understand concept of matter waves & its applications to free & bound sates of electron in an atom
		CO3-	Understand basic physics concepts to Study crystal structure parameters in basic cubic systems , Miller Indices of crystal planes and Bragg's Law.
		CO4-	Apply basic knowledge of semiconductors to study their energy band structure in comparison with conductors & Insulators, Effect of temperature on no. of charge carriers, Fermi energy in Intrinsic & Extrinsic Semiconductors and their applications.
3	BESI-3 Engineering Chemistry	CO1-	understand various techniques for water softening and ability to solve numericals based on different formulae.
		CO2-	Understand mechanism, types and causes of corrosion of metals and its control measures, protection method.
		CO3-	Understand manufacturing process of construction material, cement and its type and engineering applications.
		CO4-	Understand application of green chemistry to develop new technology which are environment friendly and the importance of batteries in daily life.
4	BESI-4 Basic Electrical Engineering	CO1-	Students will be able to understand different circuits, laws etc.
		CO2-	Students will be able to understand magnetic circuit and hysteresis loop
		CO3-	Students will get basic idea about single phase and three phase AC circuits
		CO4-	Students will be able to understand basic idea of transformer.
5	BESI-5 Basic Civil Engineering	CO1-	Summarize the basic concept of civil Engineering and building materials.
		CO2-	Understand basic knowledge of surveying and transportation Engineering
		CO3-	Relate the different aspect of Enviornmental and Hydraulics.
		CO4-	Understand basic information of Construction management.

6	BESI-6 Engineering Graphics – I	CO1-	Graphically construct and understand the importance of curves in Engineering application
		CO2-	Understand the concept of projection and acquire visualization skills
		CO3-	Visualize geometrical solids in 3D space through exercises in Orthographic Projections
		CO4-	Visualize the objects and convert them in isometric view/ projection.

II SEMESTER

Sr. No.	Subject Name & Course Code		CO's A student will be able to
1	BESII-1 Applied Mathematics – II	CO1-	Apply Mathematical concepts and Principles to perform computations.
		CO2-	Apply math to solve problem
		CO3-	Create ,use and analyze graphical representation of Mathematical relationship.
		CO4-	Communicate Mathematical knowledge and understanding
		CO5-	An ability to design Mathematical model apply mathematical Analysis and problem solving skill in a broad range of Intellectual domain (e.g. biological, physical or social sciences and engineering) in public and private interest
		CO6-	Apply knowledge of math science and engineering fundamental to the solution of complex problems involved in different engineering areas
2	BESII-2 Advanced Physics	CO1-	Understand various applications of laser beam guided by optical fiber such as medical, military etc. Also They will understand the concept of Interference of light and its applications.
		CO2-	Know about Effects of Uniform and non-uniform Electric as well as Magnetic Fields on the charged particles.
		CO3-	Apply these concepts to understand working of various electro-optical devices such as CRO, Cyclotron, mass spectrographs etc.
		CO4-	Understand construction and basic principle of optical fiber and its various applications for communication, as sensor using laser beam etc. Also they will come to know about Nano Materials, its Synthesis & technological applications.
3	BESII-3 Materials Chemistry	CO1-	Classify fuels in conventional and non conventional energy sources. Determination of theoretical calorific value of fuel using Bomb and Boys calorimeter as well as to analyze coal for industrial purpose.
		CO2-	Understand process of fractional distillation and synthetic methods of petroleum and to solve numerical of combustion calculation for solid and liquid fuels.
		CO3-	Select appropriate lubricant for particular use depending on its various properties.
		CO4-	Understand proper selection and application of advanced material to develop new technology.
4	BESII-4 Engineering Mechanics	CO1-	Understanding the concepts of 2-Dcoordination sytem .
		CO2-	Understanding the concepts of 3-Dcoordination sytem .
		CO3-	Understanding the applications of statics .
		CO4-	Understanding the applications of dynamics.

5	**BESII-5 Advanced Electrical Engineering**	CO1-	Students will be able to understand power generation, fuses, ups and invertor
		CO2-	Students will be able to understand the basic concept of d.c. motor.
		CO3-	Students will be able to calculate domestic electricity bill and illuminations.
		CO4-	Students will be able to understand the basic concept of single and three phase induction motor.
6	**BESII-6 Ethical Science**	CO1-	Understand the culture of the society in which they live and will understand how society is structured,managed and governed. Students will develop socio-legal awareness.
		CO2-	Understand the nature and concept of industrial psychology and industrial sociology which would prepare them for the Industrial work-culture.
		CO3-	Understand professional ethics and develop the managerial skills.
		CO4-	Appreciate the values enshrined in the Indian Constitution and understand the governance of the country and its application in industrial fields & the work organization and relevant changes in society due to urbanization and industrialization.