2.6.1 Programme and course outcomes for all Programmes offered by the institution are stated and displayed on website and communicated to teachers and students

COs for all Programmes

BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY
Mangalpally(V), Ibrahimpatnam, R. R. District E1

PRINCIPAL

Principal
Bharat Institute of Engg. and Tech
Mangalpally(V), Ibrahimpatnam(M)
Ranga Reddy (Dist)-Telangana-501510

1. Course Outcomes (COs): B. Tech I year I & II semesters: CSE/IT/EEE

JNTUH-R18 Regulations

Code	Course Name	Course Outcomes
I B. Tech I Semester		
MA101BS	Mathematics - I	CO1. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations. CO2. Find the Eigen values and Eigen vectors. CO3. Reduce the quadratic form to canonical form using orthogonal transformations. CO4. Analyse the nature of sequence and series. CO5. Solve the applications on the mean value theorems.
AP102BS	Applied Physics	CO1. The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state. CO2. The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on. CO3. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications. CO4. The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.
CS103ES	Programming for Problem Solving	CO1. To write algorithms and to draw flowcharts for solving problems. CO2. To convert the algorithms/flowcharts to C programs. CO3. To code and test a given logic in C programming language. CO4. To decompose a problem into functions and to develop modular reusable code. CO5. To use arrays, pointers, strings and structures to write C programs.
ME104ES	Engineering Graphics	CO1. Preparing working drawings to communicate the ideas and information. CO2. Read, understand and interpret engineering drawings. CO3. Ability to make orthographic projections. CO4. Ability to make isometric projections.

Code	Course Name	Course Outcomes
MC109ES	Environmental Science	CO1. Determine the Natural resources on which the structure of development is raised for sustainability of the society through equitable maintenance of natural resources. CO2. Illustrate about biodiversity that raises an appreciation and deeper understanding of species, ecosystems and also the interconnectedness of the living world and thereby avoids the mismanagement, misuse and destruction of biodiversity. CO3. Summarize a methodology for identification, assessment and quantification of global environmental issues in order to create awareness about the international conventions for mitigating global environmental problems CO4. Sustainable development that aims to meet raising human needs of the present and future generations through preserving the environment CO5. Outline green environmental issue provides an opportunity to overcome the current global environmental issues by implementing modern techniques like CDM, green building, green computing etc. CO6. Global environmental issues in order to create awareness

Code	Course Name	Course Outcomes
I B. Tech 2 Semester		
MA201BS	Mathematics – II	**At the end of this course, each student should be able to:** CO1. Identify whether the given differential equation of first order is exact or not. CO2. Solve higher differential equation and apply the concept of differential equation to real world problems. CO3. Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelepiped CO4. Evaluate the line, surface and volume integrals and converting them from one to another. CO5. Apply Gauss, Greens and Stokes theorems
AP202BS	Applied Physics	**At the end of this course, each student should be able to:** CO1. The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state. CO2. The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on. CO3. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications. CO4. The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.
CS203ES	Programming for Problem Solving	**At the end of this course, each student should be able to:** CO1. To write algorithms and to draw flowcharts for solving problems. CO2. To convert the algorithms/flowcharts to C programs. CO3. To code and test a given logic in C programming language. CO4. To decompose a problem into functions and to develop modular reusable code. CO5. To use arrays, pointers, strings and structures to write C programs. CO6. Searching and sorting problems.
ME204ES	Engineering Graphics	**At the end of this course, each student should be able to:** CO1. Preparing working drawings to communicate the ideas and information. CO2. Read, understand and interpret engineering drawings

Code	Course Name	Course Outcomes
AP205BS	Applied Physics Lab	**At the end of this course, each student should be able to:** CO1. Examine the usage of different components and build the electrical circuits. CO2. Compare the theory and co-relate with experiment. CO3. Understand the applications of physics experiments in day – to – day life.
CS206ES	Programming for Problem Solving Lab	**At the end of this course, each student should be able to:** CO1. formulate the algorithms for simple problems CO2. translate given algorithms to a working and correct program CO3. correct syntax errors as reported by the compilers CO4. identify and correct logical errors encountered during execution CO5. represent and manipulate data with arrays, strings and structures CO6. use pointers of different types CO7. create, read and write to and from simple text and binary files CO8. modularize the code with functions so that they can be reused
*MC109ES	Environmental Science	CO1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

2. Course Outcomes (COs): B. Tech I year I & II semesters: ECE

JNTUH-R18 Regulations

Code	Course Name	Course Outcomes
I B. Tech I Semester		
MA101BS	Mathematics - I	CO1. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations. CO2. Find the Eigen values and Eigen vectors. CO3. Reduce the quadratic form to canonical form using orthogonal transformations. CO4. Analyse the nature of sequence and series. CO5. Solve the applications on the mean value theorems.
AP102BS	Applied Physics	CO1. The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state. CO2. The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on. CO3. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications. CO4. The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.
CS103ES	Programming for Problem Solving	CO1. To write algorithms and to draw flowcharts for solving problems. CO2. To convert the algorithms/flowcharts to C programs. CO3. To code and test a given logic in C programming language. CO4. To decompose a problem into functions and to develop modular reusable code. CO5. To use arrays, pointers, strings and structures to write C programs.
ME104ES	Engineering Graphics	CO1. Preparing working drawings to communicate the ideas and information. CO2. Read, understand and interpret engineering drawings. CO3. Ability to make orthographic projections. CO4. Ability to make isometric projections.

Code	Course Name	Course Outcomes
MC109ES	Environmental Science	CO1. Determine the Natural resources on which the structure of development is raised for sustainability of the society through equitable maintenance of natural resources. CO2. Illustrate about biodiversity that raises an appreciation and deeper understanding of species, ecosystems and also the interconnectedness of the living world and thereby avoids the mismanagement, misuse and destruction of biodiversity. CO3. Summarize a methodology for identification, assessment and quantification of global environmental issues in order to create awareness about the international conventions for mitigating global environmental problems CO4. Sustainable development that aims to meet raising human needs of the present and future generations through preserving the environment CO5. Outline green environmental issue provides an opportunity to overcome the current global environmental issues by implementing modern techniques like CDM, green building, green computing etc. CO6. Global environmental issues in order to create awareness

Code	Course Name	Course Outcomes
I B. Tech 2 Semester		
MA201BS	Mathematics – II	**At the end of this course, each student should be able to:** CO1. Identify whether the given differential equation of first order is exact or not. CO2. Solve higher differential equation and apply the concept of differential equation to real world problems. CO3. Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelepiped CO4. Evaluate the line, surface and volume integrals and converting them from one to another . CO5. Apply Gauss, Greens and Stokes theorems
CH202BS	Chemistry	**At the end of this course, each student should be able to:** CO1. The knowledge of atomic, molecular and electronic changes, band theory related to conductivity CO2. The required knowledge about importance of water and understanding its treatments methods. CO3. The required principles and concepts of electrochemistry, corrosion. CO4. The required skills to get clear concepts on basic spectroscopy and application to medical and other fields. CO5. The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.
EE203ES	Basic Electrical Engineering	**At the end of this course, each student should be able to:** CO1. To analyze and solve electrical circuits using network laws and theorem CO2. To understand and analyze basic Electric and Magnetic circuits CO3. To study the working principles of Electrical Machines CO4. To introduce various switches & batteries
ME205ES	Engineering Workshop	**At the end of this course, each student should be able to:** CO1. Study and practice on machine tools and their operations CO2. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding. CO3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling. CO4. Apply basic electrical engineering knowledge for house wiring practice.

Code	Course Name	Course Outcomes
EN205HS	English	**At the end of this course, each student should be able to:** CO1. Use English Language effectively in spoken and written forms. CO2. Comprehend the given texts and respond appropriately. CO3. Communicate confidently in various contexts and different cultures. CO4. Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
CH206BS	Engineering Chemistry Lab	**At the end of this course, each student should be able to:** CO1. Determination of parameters like hardness and chloride content in water. CO2. Estimation of rate constant of a reaction from concentration – time relationships. CO3. Determination of physical properties like adsorption and viscosity. CO4. Calculation of Rfvalues of some organic molecules by TLC technique.
EN207HS	English Language and Communication skills Lab	CO1. Better understanding of nuances of English language through audio- visual experience and group activities CO2. Neutralization of accent for intelligibility CO3. Speaking skills with clarity and confidence which in turn enhances their employability skills
EE208ES	Basic Electrical Engineering Lab	CO1. Get an exposure to basic electrical laws. CO2. Understand the response of different types of electrical circuits to different excitations. CO3. Understand the measurement, calculation and relation between the basic electrical parameters CO4. Understand the basic characteristics of transformers and electrical machines.
*MC109ES	Environmental Science	CO1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

3. Course Outcomes (COs): B. Tech I year I & II semesters: Mechanical & Civil

JNTUH-R18 Regulations

Code	Course Name	Course Outcomes
I B. Tech I Semester		
MA101BS	Mathematics - I	CO6. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations. CO7. Find the Eigen values and Eigen vectors. CO8. Reduce the quadratic form to canonical form using orthogonal transformations. CO9. Analyse the nature of sequence and series. CO10. Solve the applications on the mean value theorems.
AP102BS	Applied Physics	CO5. The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state. CO6. The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on. CO7. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications. CO8. The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.
CS103ES	Programming for Problem Solving	CO6. To write algorithms and to draw flowcharts for solving problems. CO7. To convert the algorithms/flowcharts to C programs. CO8. To code and test a given logic in C programming language. CO9. To decompose a problem into functions and to develop modular reusable code. CO10. To use arrays, pointers, strings and structures to write C programs.
ME104ES	Engineering Graphics	CO5. Preparing working drawings to communicate the ideas and information. CO6. Read, understand and interpret engineering drawings. CO7. Ability to make orthographic projections. CO8. Ability to make isometric projections.

Code	Course Name	Course Outcomes
MC109ES	Environmental Science	CO7. Determine the Natural resources on which the structure of development is raised for sustainability of the society through equitable maintenance of natural resources. CO8. Illustrate about biodiversity that raises an appreciation and deeper understanding of species, ecosystems and also the interconnectedness of the living world and thereby avoids the mismanagement, misuse and destruction of biodiversity. CO9. Summarize a methodology for identification, assessment and quantification of global environmental issues in order to create awareness about the international conventions for mitigating global environmental problems CO10. Sustainable development that aims to meet raising human needs of the present and future generations through preserving the environment CO11. Outline green environmental issue provides an opportunity to overcome the current global environmental issues by implementing modern techniques like CDM, green building, green computing etc. CO12. Global environmental issues in order to create awareness

Code	Course Name	Course Outcomes
I B. Tech II Semester		
MA201BS	Mathematics – II	**At the end of this course, each student should be able to:** CO1. Identify whether the given differential equation of first order is exact or not. CO2. Solve higher differential equation and apply the concept of differential equation to real world problems. CO3. Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelepiped CO4. Evaluate the line, surface and volume integrals and converting them from one to another. CO5. Apply Gauss, Greens and Stokes theorems
CH202BS	Chemistry	**At the end of this course, each student should be able to:** CO1. The knowledge of atomic, molecular and electronic changes, band theory related to conductivity CO2. The required knowledge about importance of water and understanding its treatments methods. CO3. The required principles and concepts of electrochemistry, corrosion. CO4. The required skills to get clear concepts on basic spectroscopy and application to medical and other fields. CO5. The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.
ME203ES	Engineering Mechanics	**At the end of this course, each student should be able to:** CO1. Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces. CO2. Solve problem of bodies subjected to friction CO3. Find the location of centroid and calculate moment of inertia of a given section. CO4. Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion. CO5. Solve problems using work energy equations for translation, fixed axis rotation and plane motion and solve problems of vibration.

Code	Course Name	Course Outcomes
ME205ES	Engineering Workshop	**At the end of this course, each student should be able to:** CO1. Study and practice on machine tools and their operations CO2. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding. CO3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling. CO3. Apply basic electrical engineering knowledge for house wiring practice.
EN205HS	English	**At the end of this course, each student should be able to:** CO1. Use English Language effectively in spoken and written forms. CO2. Comprehend the given texts and respond appropriately. CO3. Communicate confidently in various contexts and different cultures. CO4. Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
CH206BS	Engineering Chemistry Lab	**At the end of this course, each student should be able to:** CO1. Determination of parameters like hardness and chloride content in water. CO2. Estimation of rate constant of a reaction from concentration – time relationships. CO3. Determination of physical properties like adsorption and viscosity. CO4. Calculation of Rf values of some organic molecules by TLC technique.
EN207HS	English Language and Communication skills Lab	**At the end of this course, each student should be able to:** CO1. Better understanding of nuances of English language through audio- visual experience and group activities CO2. Neutralization of accent for intelligibility CO3. Speaking skills with clarity and confidence which in turn enhances their employability skills

4. Course Outcomes (COs): B. Tech-Computer Science and Engineering: I, II, III & IV years (JNTUH: R16)

Code	Course Name	Course Outcomes
B. Tech. I Year I Semester		
MA101BS	MATHEMATICS – I	**At the end of this course, each student should be able to:** CO1. Write the matrix representation of a set of linear equations and to analyze solutions of system of equations. CO2. Find the Eigen values and Eigen vectors which come across under linear transformations. CO3. Find the extreme values of functions of two variables with/ without constraints. CO4. Identify whether the given first order DE is exact or not. CO5. Solve higher order DE's and apply them for solving some real world problems.
CH102BS/CH202BS	ENGINEERING CHEMISTRY	**At the end of this course, each student should be able to:** CO1. Gain the basic knowledge of electrochemical procedures related to corrosion and its control. CO2. Understand the basic properties of water and its usage in domestic and industrial purposes. CO3. Learn the use of fundamental principles to make predictions about the general properties of materials. CO4. Predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

Code	Course Name	Course Outcomes
PH103BS	ENGINEERING PHYSICS / ENGINEERING PHYSICS -I	**At the end of this course, each student should be able to:** CO1. Realize the importance of light phenomena in thin films and resolution CO2. Learn principle, working of various laser systems and light propagation through optical fibers. CO3. Distinguish various crystal systems and understand atomic packing factor. CO4. Know the various defects in crystals.
EN104HS/EN204HS	PROFESSIONAL COMMUNICATION IN ENGLISH	**At the end of this course, each student should be able to** CO1. Use English Language effectively in spoken and written forms CO2. Comprehend the given texts and respond appropriately. CO3. Communicate confidently in formal and informal contexts.
ME105ES	ENGINEERING MECHANICS	**At the end of this course, each student should be able to** CO1. Understand the resolving forces and moments for a given force system CO2. Analyze the types of friction for moving bodies and problems related to friction. CO3. Determine the centroid and second moment of area
EE106ES/EE205ES	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	**At the end of this course, each student should be able to** CO1. Analyze and solve problems of electrical circuits using network laws and theorems. CO2. Identify and characterize diodes and various types of transistors.

Code	Course Name	Course Outcomes
EN107HS/EN207HS	ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB	**At the end of this course, each student should be able to** CO1. Better understanding of nuances of English language through audio- visual experience and group activities CO2. Neutralization of accent for intelligibility CO3. Speaking skills with clarity and confidence which in turn enhances their employability skills.
ME108ES/ME208ES	ENGINEERING WORKSHOP	**At the end of this course, each student should be able to:** CO1. Study and practice on machine tools and their operations CO2. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding. CO3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling. CO4. Apply basic electrical engineering knowledge for house wiring practice.
B. Tech. I Year II Semester		
PH201BS	ENGINEERING PHYSICS - II	**At the end of this course, each student should be able to:** CO1. Realize the importance of behavior of a particle quantum mechanically. CO2. Learn concentration estimation of charge carriers in semi conductors. CO3. Learn various magnetic dielectric properties and apply them in engineering applications CO4. Know the basic principles and applications of super conductors.

Code	Course Name	Course Outcomes
MA102BS/MA202BS	MATHEMATICS - II	**At the end of this course, each student should be able to:** CO1. Use Laplace transform techniques for solving DE's CO2. Evaluate integrals using Beta and Gamma functions CO3. Evaluate multiple integrals and can apply these concepts to find areas, volumes, moment of inertia etc of regions on a plane or in space. CO4. Evaluate the line, surface and volume integrals and converting them from one to another.
MA203BS	Mathematics - III	**At the end of this course, each student should be able to:** CO1. Differentiate among random variables involved in the probability models which are useful for all branches of engineering CO2. Calculate mean, proportions and variances of sampling distributions and to make important decisions s for few samples which are taken from a large data CO3. Solve the tests of ANOVA for classified data CO4. Find the root of a given equation and solution of a system of equations CO5. Fit a curve for a given data CO6. Find the numerical solutions for a given first order initial value problem
CS104ES/CS204ES	COMPUTER PROGRAMMING IN C	**At the end of this course, each student should be able to:** CO1. Demonstrate the basic knowledge of computer hardware and software. CO2. Write algorithms for solving problems. CO3. Draw flowcharts for solving problems CO4. Code a given logic in C programming language. CO5. Gain knowledge in using C language for solving problems.

Code	Course Name	Course Outcomes
ME106ES/ME205ES	ENGINEERING GRAPHICS	**At the end of this course, each student should be able to:** CO1. Ability to prepare working drawings to communicate the ideas and information. CO2. Ability to read, understand and interpret engineering drawings.
CH206BS	ENGINEERING CHEMISTRY LAB	**At the end of this course, each student should be able to:** CO1. Develop experimental skills to design new experiments in Engineering. c. Exposure to these experiments the student can compare the theory and correlate with experiment. CO2. Estimate the number of free ions, charge & mobility of ions in the mixture of acids using conductivity meter and also gets an idea about titrations without using any indicator. CO3. Determine the presence and quantity of impurities in water and he can estimate amount of metal in metalores.
PH107BS/PH207BS	ENGINEERING PHYSICS LAB	**At the end of this course, each student should be able to:** CO1. Understand the concept of error and its analysis. CO2. Compare the theory and correlate with experiment. CO3. Understand the applications of physics experiments in day to day life.
CS108ES/CS208ES	COMPUTER PROGRAMMING IN C LAB	**At the end of this course, each student should be able to:** CO1. Design and test programs to solve mathematical and scientific problems. CO2. Write structured programs using control structures and functions.

Code	Course Name	Course Outcomes
B. Tech. II Year I Semester		
MA301BS	MATHEMATICS - IV	**At the end of this course, each student should be able to:** CO1. Analyze the complex functions with reference to their analyticity integration using Cauchy's integral theorem. CO2. Find the Taylor's and Laurent's series expansion of complex functions CO3. Express any periodic function in term of sines and cosines CO4. Express a non-periodic function as integral representation CO5. Analyze one dimensional wave and heat equation
CS302ES	DATA STRUCTURES THROUGH C++	**At the end of this course, each student should be able to:** CO1. Choose appropriate data structures to represent data items in real world problems. CO2. Analyze the time and space complexities of algorithms CO3. Design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees. CO4. Analyze and implement various kinds of searching and sorting techniques.
CS303ES	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	**At the end of this course, each student should be able to:** CO1. Apply mathematical logic to solve problems CO2. Understand sets, relations, functions, and discrete structures. CO3. Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions. CO4. Formulate problems and solve recurrence relations. CO5. Model and solve real-world problems using graphs and trees.

Code	Course Name	Course Outcomes
CS304ES	DIGITAL LOGIC DESIGN	**At the end of this course, each student should be able to:** CO1. Understand number systems and codes. CO2. Solve Boolean expressions using Minimization methods. CO3. Design the sequential and combinational circuits. CO4. Apply state reduction methods to solve sequential circuits.
CS305ES	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	**At the end of this course, each student should be able to:** CO1. Solve real world problems using OOP techniques. CO2. Understand the use of abstract classes. CO3. Solve problems using java collection framework and I/O classes. CO4. Develop multithreaded applications with synchronization. CO5. Develop applets for web applications. CO6. Design GUI based applications**.**
CS306ES	DATA STRUCTURES THROUGH C++ LAB	**At the end of this course, each student should be able to:** CO1. Identify the appropriate data structures and algorithms for solving real world problems. CO2. Implement various kinds of searching and sorting techniques CO3. Implement data structures such as stacks, queues, Search trees, and hash tables to solve various computing problems.
CS307ES	IT WORKSHOP	**At the end of this course, each student should be able to:** CO1. Apply knowledge for computer assembling and software installation CO2. Ability how to solve the trouble shooting problems. CO3. Apply the tools for preparation of PPT, documentation and budget sheet etc.

Code	Course Name	Course Outcomes
CS308ES	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB	**At the end of this course, each student should be able to:** CO1. Write programs for solving real world problems using java collections frame CO2. Write programs using abstract classes. CO3. Write multithreaded programs CO4. Write GUI programs using swing controls in Java.
MC300ES	ENVIRONMENTAL SCIENCE AND TECHNOLOGY	**At the end of this course, each student should be able to:** CO1. Understand the importance of ecological balance for sustainable development. CO2. Understand the impacts of developmental activities and mitigation measures. CO3. Understand the environmental policies and regulations.
B. Tech. II Year II Semester		
CS401ES	COMPUTER ORGANIZATION	**At the end of this course, each student should be able to:** CO1. Understand the basic components and the design of CPU, ALU and Control Unit. CO2. Understand memory hierarchy and its impact on computer cost/performance. CO3. Understand the advantage of instruction level parallelism and pipelining for high performance Processor design. CO4. Understand the instruction set, instruction formats and addressing modes of 8086. CO5. Write assembly language programs to solve problems.

Code	Course Name	Course Outcomes
CS402ES	DATABASE MANAGEMENT SYSTEMS	**At the end of this course, each student should be able to:** CO1. Demonstrate the basic elements of a relational database management system. CO2. Identify the data models for relevant problems. CO3. Design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data. CO4. Apply normalization for the development of application software.
CS403ES	OPERATING SYSTEMS	**At the end of this course, each student should be able to:** CO1. Apply optimization techniques for the improvement of system performance. CO2. Design and solve synchronization problems. CO3. Learn about minimization of turnaround time, waiting time and response time and also maximization of throughput by keeping CPU as busy as possible. CO4. Change access controls to protect files. CO5. Compare the different operating systems.
CS404ES	FORMAL LANGUAGES AND AUTOMATA THEORY	**At the end of this course, each student should be able to:** CO1. Understand the concept of abstract machines and their power to recognize the languages. CO2. Employ finite state machines for modeling and solving computing problems. CO3. Design context free grammars for formal languages. CO4. Distinguish between decidability and undecidability. CO5. Gain proficiency with mathematical tools and formal methods.

Code	Course Name	Course Outcomes
SM405ES	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS	**At the end of this course, each student should be able to:** CO1. Understand the various Forms of Business and the impact of economic variables on the Business. CO2. Learnt the Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. CO3. Study the firm's financial position by analyzing the Financial Statements of a Company.
CS406ES	COMPUTER ORGANIZATION LAB	**At the end of this course, each student should be able to:** CO1. Understand and apply the fundamentals of assembly level programming of microprocessors. CO2. Write assembly language programs for Evaluating expressions, Arithmetic operations etc using GNU Assembler. CO3. Write assembly language programs for Armstrong numbers, Fibonacci and factorial using procedure calls using GNU Assembler.
CS407ES	DATABASE MANAGEMENT SYSTEMS LAB	**At the end of this course, each student should be able to:** CO1. Design and implement a database schema for given problem. CO2. Apply the normalization techniques for development of application software to realistic problems. CO3. Formulate queries using SQL DML/DDL/DCL commands.

Code	Course Name	Course Outcomes
CS408ES	OPERATING SYSTEMS LAB	**At the end of this course, each student should be able to:** CO1. Develop application programs using system calls in UNIX. CO2. Implement interprocess communication between two processes. CO3. Design and solve synchronization problems. CO4. Simulate and implement operating system concepts such as scheduling, deadlock management, file management, and memory management.
MC400HS	GENDER SENSITIZATION LAB	**At the end of this course, each student should be able to:** CO1. Have developed a better understanding of important issues related to gender in contemporary India. CO2. Be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film. CO3. Attain a finer grasp of how gender discrimination works in our society and how to counter it. CO4. Acquire insight into the gendered division of labour and its relation to politics and economics. CO5. Men and women students and professionals will be better equipped to work and live together as equals. CO6. Develop a sense of appreciation of women in all walks of life. CO7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

5. B. Tech-Electronics and Communication Engineering: I, II, III & IV years
JNTUH-R16 Regulations

MATHEMATICS-I

Course Outcome	Statement
C111.1	Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
C111.2	Find the Eigen values and Eigen vectors which come across under linear transformations
C111.3	Find the extreme values of functions of two variables with/ without constraints.
C111.4	Identifywhetherthegiven first order DEisexactornot
C111.5	Solve higherorder DE'sand applythem forsolvingsome real world problems.

ENGINEERING CHEMISTRY

Course Outcome	Statement
C112.1	Students will gain the basic knowledge of electrochemical procedures related to corrosion and its control.
C112.2	They can understand the basic properties of water and its usage in domestic and industrial purposes.
C112.3	They learn the use of fundamental principles to make predictions about the general properties of materials.
C112.4	They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

ENGINEERING PHYSICS-I

Course Outcome	Statement
C113.1	Realize the importance of light phenomena in thin films and resolution.
C113.2	Learn principle, working of various laser systems and light propagation through optical fibers.
C113.3	Distinguish various crystal systems and understand atomic packing factor.
C113.4	Know the various defects in crystals.

PROFESSIONAL COMMUNICATION IN ENGLISH

Course Outcome	Statement
C114.1	Use English Language effectively in spoken and written forms.
C114.2	Comprehend the given texts and respond appropriately.
C114.3	Communicate confidently in formal and informal contexts.
C114.4	Develop an awareness about the significance of silent reading and comprehension.

ENGINEERING MECHANICS

Course Outcome	Statement
C115.1	Understand there solving forces and moments for a given force system
C115.2	Analyze the types of friction for moving bodies and problems related to friction.
C115.3	Determine the centroid and second moment of area.
C115.4	Know the principles of kinetics.

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcome	Statement
C116.1	Student shall explain basic electrical concepts, including electric charge, current, electrical potential, electrical Power and energy.
C116.2	Student shall explain the relationship of voltage and current in resistors, capacitors and inductors.
C116.3	Student will analyze circuits with ideal, independent, and controlled voltage and current sources.
C116.4	Student able to apply Kirchhoff's voltage and current laws to the analysis of electric circuits.
C116.5	Student able to apply concepts of electric networks, nodes, branches, and loops to solve circuit problems, including the use of computer simulation.
C116.6	Student emphasize on basic laws, theorems and techniques which are used to develop a working knowledge of the methods of analysis used.

ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB

Course Outcome	Statement
C117.1	Better understanding of nuances of English language through audio- visual experience and group activities.
C117.2	Neutralization of accent for intelligibility.
C117.3	Speakingskillswithclarityandconfidencewhichinturnenhancestheiremployability skills.
C117.4	Develop an awareness about the significance of silent reading and comprehension.

ENGINEERING WORKSHOP

Course Outcome	Statement
C118.1	Study and practice on machine tools and their operations.
C118.2	Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
C118.3	Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
C118.4	Apply basic electrical engineering knowledge for house wiring practice.

I YEAR II SEMESTER (R16)

I B. Tech II Semester		
C121	PH201BS	Engineering Physics-II
C122	MA202BS	Mathematics-II
C123	MA203BS	Mathematics-III
C124	CS204ES	Computer Programming in C
C125	ME205ES	Engineering Graphics
C126	CH206BS	Engineering Chemistry Lab
C127	PH207BS	Engineering Physics Lab
C128	CS208ES	Computer Programming in C Lab

ENGINEERING PHYSICS–II

Course Outcome	Statement
C121.1	Realizetheimportance ofbehaviorofaparticle quantummechanically.
C121.2	Learn concentration estimationofchargecarriersin semi conductors.
C121.3	Learnvariousmagneticdielectricproperties andapplytheminengineeringapplications.
C121.4	Knowthebasicprinciplesandapplications ofsuperconductors.

MATHEMATICS-II

Course Outcome	Statement
C122.1	Use Laplace transform techniques for solving DE's.
C122.2	Evaluate integrals using Beta and Gamma functions.
C122.3	Evaluate the multiple integrals and can apply these concepts to find areas, volumes, moment of inertia etc of regions on a plane or in space.
C122.4	Evaluate the line, surface and volume integrals and converting them from one to another.

MATHEMATICS-III

Course Outcome	Statement
C123.1	Differentiate among random variables involved in the probability models which are useful for all branches of engineering.
C123.2	Calculate mean, proportions and variances of sampling distributions and to make important decisions s for few samples which are taken from a large data.
C123.3	Solve the tests of anova for classified data.
C123.4	Find the root of a given equation and solution of a system of equations.
C123.5	Fit a curve for a given data.
C123.6	Find the numerical solutions for a given first order initial value problem.

COMPUTERP ROGRAMMING IN C

Course Outcome	Statement
C124.1	Demonstrate the basic knowledge of computer hardware and software.
C124.2	Ability to write algorithms for solving problems.
C124.3	Ability to draw flowcharts for solving problems.
C124.4	Ability to code a given logic in C programming language.
C124.5	Gain knowledge in using C language for solving problems.

ENGINEERING GRAPHICS

Course Outcome	Statement
C125.1	Ability to prepare working drawings to communicate the ideas and information.
C125.2	Ability to read, understand and interpret engineering drawings.
C125.3	Ability to make orthographic projections.
C125.4	Ability to make isometric projections.

ENGINEERING CHEMISTRY LAB

Course Outcome	Statement
C126.1	Estimate the ferrous ion.
C126.2	Estimate the hardness of water.
C126.3	Estimate ferrousandferricions from a mixture.
C126.4	Determine percentage of available chlorine in bleaching powder.
C126.5	Determine salt concentration

ENGINEERING PHYSICS LAB

Course Outcome	Statement
C127.1	Determine dispersive power of the material of a prism.
C127.2	Determine wavelengths of white source.
C127.3	Perform Newton's Rings experiment.
C127.4	Estimate the energy gap of a material of p-n junction.

COMPUTER PROGRAMMINGINCLAB

Course Outcome	Statement
C128.1	Ability to design and test programs to solve mathematical and scientific problems.
C128.2	Ability to write structured programs using control structures and functions.
C128.3	Ability to code a given logic in C programming language.
C128.4	Gain knowledge in using C language for solving problems.

II B. Tech I Semester (R16)

II B. Tech I Semester		
C211	MA301BS	Mathematics–IV
C212	EC302ES	Analog Electronics
C213	EC303ES	Electrical Technology
C214	EC304ES	Signals and Stochastic Process
C215	EC305ES	Network Analysis
C216	EC306ES	Electronic Devices and Circuits Lab
C217	EC307ES	Basic Simulation Lab
C218	EC308ES	Basic Electrical Engineering Lab
C219	MA301BS	Environmental Science and Technology

Mathematics –IV

Course Outcome	Statement
C211.1	Solve Cauchy's and Legendre's differential equations.
C211.2	Identify ordinary points, singular points and regular singular points for the given ODE.
C211.3	Determine the solution of ordinary differential equations in series form, Frobenius method to obtain a series solution for the given linear ODE.
C211.4	Identify Bessel equation and Legendre equation and solve them under special conditions with the help of series solutions method.
C211.5	Analyze the complex functions with reference to their analyticity, Integration using Cauchy's integral theorem.
C211.6	Identify the conditions for a complex variable function to be analytic and/or harmonic.

Analog Electronics

Course Outcome	Statement
C212.1	Understand Electronic Circuit Analysis Theory in order to equip them with the necessary tools for the analysis of various Electronic Circuits.
C212.2	Understand various electronic circuits and their analysis.
C212.3	Classify various amplifiers.
C212.4	Analyse transformer and direct coupled amplifiers and their frequency response considerations.
C212.5	Analyse BJT & MOS amplifiers at low and high frequencies.
C212.6	Understand small signal model and their frequency response.

Electrical Technology

Course Outcome	Statement
C213.1	CO1. Understand the DC transient analysis of RL, RC and RLC circuits.
C213.2	CO2. Apply the basic fundamentals to construct and operate DC generators, DC Motors, transformers.
C213.3	CO3. Develop the basic skills needed to perform and design experimental projects.
C213.4	CO4. Apply the principles to form simple electric apparatus and machinery that are of use in practical situations.
C213.5	CO5. Formulate problems and projects and to plan a process for solution, taking advantage of diverse technical knowledge and skills.
C213.6	CO6. Impart knowledge of electrical engineering principles along with the required supporting knowledge of computing, engineering fundamentals, mathematics, and science.

Signals and Stochastic Process

Course Outcome	Statement
C214.1	CO1. Understand the principles of vector spaces, including how to relate the concepts of basis, dimension, inner product, and norm to signals.
C214.2	CO2. Understand and classify signals (e.g. periodic, even) and systems (e.g. causal, linear) and an understanding of the difference between discrete and continuous time signals and systems, understand the principles of impulse functions, step function and signum function.
C214.3	CO3. Analyze the implications of linearity, time-invariance, causality, memory, and BIBO stability.

C214.4	CO4. Determine the response of linear systems to any input signal by convolution in the time domain, and by transformation to the frequency domain, filter characteristics of a system and its bandwidth, the concepts of auto correlation and cross correlation and psd.
C214.5	CO5. Understand the definitions and basic properties (e.g. time-shift, modulation, Parseval's Theorem) of Fourier series, Fourier transforms, Laplace transforms, Z transforms, and an ability to compute the transforms and inverse transforms of basic examples using methods such as partial fraction expansions, ROC of Z Transform/ Laplace Transform.
C214.6	CO6. Analyze the Sampling theorem, reconstruction, aliasing, and Nyquist's theorem to represent continuous-time signals in discrete time so that they can be processed by digital computers.

Network Analysis

Course Outcome	Statement
C215.1	CO1. Understand the gains concept and acquire the knowledge on Basic network elements.
C215.2	CO2. Understand and analyze the RLC circuits' behavior in detail.
C215.3	CO3. Analyze and understand the performance of periodic waveforms.
C215.4	CO4. Understand and learns the concept of the gain, and knowledge in the characteristics of two port network parameters (Z, Y, ABCD, h & g).
C215.5	CO5. To analyze the filter design concepts in real world applications
C215.6	CO6. Understand the concept of attenuator, image transfer constant, and impedance matching network.

Electronic Devices and Circuits Lab

Course Outcome	Statement
C216.1	CO1. Apply various devices to real time problems.
C216.2	CO2. Compute frequency response of various amplifiers.
C216.3	CO3. Student shall explain the relationship of voltage and current in resistors, capacitors and inductors.
C216.4	CO4. Student will analyze circuits with ideal, independent, and controlled voltage and current sources.
C216.5	CO5. Analyse characteristics of various active devices
C216.6	CO6. Analyse frequency response

Basic Simulation Lab

Course Outcome	Statement
C217.1	CO1. Apply various simulations to real time problems.
C217.2	CO2. Generation of Various Signals and Sequences.
C217.3	CO3. Apply convolution for Signals and sequences.
C217.4	CO4. Analyse linearity and time invariance properties.
C217.5	CO5. Analyse waveform synthesis using Laplace Transform.
C217.6	CO5. To verify Weiner-Khinchine Relations.

Basic Electrical Engineering Lab

Course Outcome	Statement
C218.1	CO1. To apply KVL and KCL in real time applications.
C218.2	CO2. To analyse Serial and Parallel Resonance.
C218.3	CO3. To determine time response of first order systems.
C218.4	CO4. To analyse two port network parameters.
C218.5	CO5. To verify various network theorems.

Environmental Science and Technology

Course Outcome	Statement
C219.1	CO1. Discover Knowledge regarding environment and its components.
C219.2	CO2. Understand various ecosystems, their biodiversity and Scientific methods to protect them..
C219.3	CO3. Categorize different types of pollution and their control measures.
C219.4	CO4. Discover effective methods of waste management.
C219.5	CO5. Analyze global environmental problems and come out with best possible solutions.
C219.6	CO6. Illustrate green environmental issues.

II B. Tech II Semester		
C221	EC401ES	Switching Theory and Logic Design
C222	EC402ES	Pulse and Digital Circuits
C223	EE404ES	Control Systems
C224	EC405ES	Analog Communications
C225	SM405MS	Business Economics and Financial Analysis
C226	EC406ES	Analog Communications Lab
C227	EC407ES	Pulse and Digital Circuits Lab
C228	EC408ES	Analog Electronics Lab
C229	MC400HS	Gender Sensitization Lab

Switching Theory and Logic Design

Course Outcome	Statement
C221.1	CO1. Understand number systems, binary addition and subtraction, 2's complement representation and operations with this representation and understand the different binary codes.
C221.2	CO2. Explain switching algebra theorems and apply them for logic functions.
C221.3	CO3. Identify the importance of SOP and POS canonical forms in the minimization of combinational circuits or other optimization of Boolean formulas in general using Karnaugh map or tabulation method and study of digital logic gates and their properties.
C221.4	CO4. Design of basic building blocks of combinational circuits and extend to build more larger complex circuits.
C221.5	CO5. Analyze the of basic building blocks of sequential circuits and design procedures of Sequential logic circuits.
C221.6	CO6. Evaluate larger sequential circuits using FSM such as Melay and Moore.

Pulse and Digital Circuits

Course Outcome	Statement
C222.1	CO1. Understand the linear wave shaping circuits like high pass circuits for various input signals.
C222.2	CO2. Understand the linear wave shaping circuits like low pass RC circuits for various input signals.
C222.3	CO3. Analyze the application of attenuators.
C222.4	CO4. Understand the non-linear wave shaping circuits like clippers diodes and transistors.
C222.5	CO5. Understand the non-linear wave shaping circuits like clampers using diodes.
C222.6	CO6. Analyze the clamping circuit theorem..

Control Systems

Course Outcome	Statement
C223.1	CO1. Understand and analyze the operation of open loop and closed loop systems.
C223.2	CO2. Analyze transfer functions for electro-dynamic plants and machines, with electrical, electro-mechanical, electro-pneumatic, and electro-hydraulic elements from plant site collected data.
C223.3	CO3. Understand and analyze the stability of a system in s – domain.
C223.4	CO4. Analyze the control systems in the frequency domain and solve the problems related to compensation techniques.
C223.5	CO5. Understand the problems relating to stability of control systems and formulate state model to electrical and electro mechanical plants and evaluate plant response to particular inputs.

Analog Communications

Course Outcome	Statement
C224.1	CO1. Understand the baseband signal and system.
C224.2	CO2. Identify various element processes and parameters in telecommunication systems and describe their functions, effects and inter relationship .
C224.3	CO3. Design procedure of AM transmission and reception, Analyze, Measure and Evaluate the performance of a Telecommunication system against given criteria.
C224.4	CO4. Understand basic knowledge of FM transmission and reception
C224.5	CO5. Understand various types of DSB &SSB transmission and reception.
C224.6	CO6. Understand various types of VSB transmission and reception.

Business Economics and Financial Analysis

Course Outcome	Statement
C225.1	CO1. Describe the economic activities performed by the businessmen in the business for profit earning.
C225.2	CO2. Understand the significance of demand, its analysis, measurement of demand and its forecasting
C225.3	CO3. Write the production function through the Cobb Douglas Production Function.
C225.4	CO4. Design and implement different structures of market covering how price is determined under different market structures.
C225.5	CO5. Analyze different forms of business organizations existing in the modern business.
C225.6	CO6. Describe the allocation of capital which plays a vital role in a business organization.

Analog Communications Lab

Course Outcome	Statement
C226.1	CO1. Understand the baseband signal and system.
C226.2	CO2. Identify various element processes and parameters in telecommunication systems and describe their functions, effects and inter relationship
C226.3	CO3. Design procedure of AM transmission and reception.
C226.4	CO4. Analyze, Measure and Evaluate the performance of a Telecommunication system against given criteria.
C226.5	CO5. Understand basic knowledge of FM transmission and reception
C226.6	CO6. Understand various types of DSB &SSB transmission and reception.

Pulse and Digital Circuits Lab

Course Outcome	Statement
C227.1	CO1. Understand the linear wave shaping circuits like high pass circuits for various input signals.
C227.2	CO2. Understand the linear wave shaping circuits like low pass RC circuits for various input signals.
C227.3	CO3. Analyze the application of attenuators.
C227.4	CO4. Understand the non-linear wave shaping circuits like clippers diodes and transistors.
C227.5	CO5. Understand the non-linear wave shaping circuits like clampers using diodes.
C227.6	CO6. Analyze the clamping circuit theorem.

Analog Electronics Lab

Course Outcome	Statement
C228.1	CO1. Analyze various transistor amplifier circuits and their freq. responses at low, mid and high frequencies
C228.2	CO2. Designing amplifier circuits using BJTs.
C228.3	CO3. Analyze the concepts of both positive and negative feedback in electronic circuits
C228.4	CO4. Design, construct & analyze oscillator circuits to generate signals in various frequency ranges
C228.5	CO5. Design different types of power amplifiers for practical applications of desired specifications
C228.6	CO6. Acquire experience in building and troubleshooting simple electronic analog circuits

Gender Sensitization Lab

Course Outcome	Statement
C229.1	CO1. Students will have developed a better understanding of important issues related to gender in contemporary India.
C229.2	CO2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film.
C229.3	CO3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
C229.4	CO4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
C229.5	CO5. Men and women students and professionals will be better equipped to work and live together as equals.
C229.6	CO6. Students will develop a sense of appreciation of women in all walks of life.

III B. Tech I Semester		
C311	EC501PC	Electromagnetic Theory and Transmission Lines
C312	EC502PC	Linear and Digital IC Applications
C313	EC503PC	Digital Communications
C314	SM504MS	Fundamentals of Management
C315	EC505PC	Linear IC Applications Lab
C316	EC506PC	Digital IC Applications Lab
C317	EC507PC	Digital Communications Lab
C318	MC500HS	Professional Ethics

Electromagnetic Theory and Transmission Lines

Course Outcome	Statement
C311.1	CO1. Able to understand and design the electrical machines based on the concept of electrostatics.
C311.2	CO2. Generate modified equations for boundaries and medias.
C311.3	CO3. Design the long time charge storage devices.
C311.4	CO4. Know the energy storage design of high magnetic field coils used in transformers, motors and generators.
C311.5	CO5. Understand and development of Maxwell's equation for dielectric and conducting media
C311.6	CO6. Understand the design of long length transmission lines for point to point communications.

Linear and Digital IC Applications

Course Outcome	Statement
C312.1	CO1:Understand the operation of linear integrated circuits and its applications.
C312.2	CO2: Understand and Analyze the operation of Active filters.
C312.3	CO3: Study the operation of IC 555 Timer and its applications.
C312.4	CO4: To know the knowledge of IC 565 and its applications.
C312.5	CO5: Understanding of the different families of digital integrated circuits and their characteristics.
C312.6	CO6:Designing of all digital circuits and studying of all types of memories.

Digital Communications

Course Outcome	Statement
C313.1	CO1. Understand the basic concepts of digital communications with an insight into practical applications.
C313.2	CO2. Identify the importance of conversion of analog signals in to digital domain.
C313.3	CO3. Differentiate between PCM and DM and to know their usage in specific applications.
C313.4	CO4. Compare and contrast ASK, FSK, PSK digital carrier modulation schemes in terms of occupied bandwidth, complexity etc., and extend these into QPSK, MPSK, QAM for improved spectral efficiency.
C313.5	CO5. Apply the basics of information theory to calculate channel capacity and other measures.
C313.6	CO6. Distinguish between source coding and channel coding for optimization of discrete memory-less source (DMS), with error-free/min error transmission of data over a channel.

Fundamentals of Management

Course Outcome	Statement
C314.1	CO1.Understand the various concepts, principles and theories of management.
C314.2	CO2. Understand the basic concepts of planning and various structures of organizations.
C314.3	CO3. Understand the process of staffing and controlling.
C314.4	CO4. Understand the process of operations management. Also learn the concepts of materials management and marketing management at an organization.
C314.5	CO5. Understand the various contemporary management practices.
C314.6	CO6. Understand the various project management techniques.

Linear IC Applications Lab

Course Outcome	Statement
C315.1	CO1. Understand the internal operation of Op-Amp and its specifications.
C315.2	CO2. Analyze and design linear applications like adder, subs tractor, instrumentation amplifier and etc. using Op-Amp.
C315.3	CO3. Analyze and design non linear applications like multiplier, comparator and etc, using Op-Amp.
C315.4	CO4. Classify various active filter configurations based on frequency response and construct using 741 Op-Amp.
C315.5	CO5. Operate 555 timers in different modes like bistable, monostable and astable operations and study their applications.
C315.6	CO6. Determine the lock range and capture range of PLL and use in various applications of communications.

Digital IC Applications Lab

Course Outcome	Statement
C316.1	CO1. Understand the internal operation of Op-Amp and its specifications.
C316.2	CO2. Analyze and design linear applications like adder, subs tractor, instrumentation amplifier and etc. using Op-Amp.
C316.3	CO3. Analyze and design non linear applications like multiplier, comparator and etc, using Op-Amp.
C316.4	CO4. Classify various active filter configurations based on frequency response and construct using 741 Op-Amp.
C316.5	CO5. Operate 555 timers in different modes like bistable, monostable and astable operations and study their applications.
C316.6	CO6. Determine the lock range and capture range of PLL and use in various applications of communications.

Digital Communications Lab

Course Outcome	Statement
C317.1	CO1. Understand the basic concepts of digital communications with an insight into practical applications.
C317.2	CO2. Identify the importance of conversion of analog signals in to digital domain.
C3217.3	CO3. Differentiate between PCM and DM and to know their usage in specific applications.
C317.4	CO4. Compare and contrast ASK, FSK, PSK digital carrier modulation schemes in terms of occupied bandwidth, complexity etc., and extend these into QPSK, MPSK, QAM for improved spectral efficiency.
C317.5	CO5. Apply the basics of information theory to calculate channel capacity and other measures.
C317.6	CO6. Distinguish between source coding and channel coding for optimization of discrete memory-less source (DMS) ,with error-free/min error transmission of data over a channel.

III B. Tech II Semester		
C321	EC601PC	Antennas and Wave Propagation
C322	EC602PC	Microprocessors and Microcontrollers
C323	EC603PC	Digital Signal Processing
C324	EC604PC	Digital Signal Processing Lab
C325	EC605PC	Microprocessors and Microcontrollers Lab
C326	EN606HS	Advanced English Communication Skills Lab

Antennas and Wave Propagation

Course Outcome	Statement
C321.1	CO1. Aware of the parameter consideration viz. antenna efficiency, beam efficiency, radiation resistance etc. in the design of an antenna.
C321.2	CO2. Capable of analyze the designed antenna and field evaluation under various conditions and formulate the electric as well as the magnetic fields equations set for far field and near field conditions.
C321.3	CO3. Understand array system of different antenna and field analysis under application of different currents to the individual antenna elements.
C321.4	CO4. Understand and design issues, operation of fundamental antennas like Yagi-Uda, Horn antennas and Helical structure and also their operation methodology in practice.
C321.5	CO5. Design a lens structure and also the bench setup for antenna parameters measurement of testing for their effectiveness.
C321.6	CO6. Knowledge about the means of propagation of Electromagnetic wave i.e. free space propagation and also about frequency dependent layer selection, its respective issues for an effective transmission of information in the form of EM wave to a remote location and related issues.

Microprocessors and Microcontrollers

Course Outcome	Statement
C322.1	CO1 .Understand the detailed schematics about 8086 microprocessor architecture.
C322.2	CO2. Apply the program in 8086 microprocessor using assembly language program.
C322.3	CO3. Demonstrate the interfacing circuit in real system.
C322.4	CO4. Acquire knowledge of 8086 interrupt structure.
C322.5	CO5. Demonstrate the hardware architecture of 8051 microcontroller.
C322.6	CO6. Understand real time control using 8051 microcontroller.

Digital Signal Processing

Course Outcome	Statement
C323.1	CO1. Perform time, frequency and Z -transform analysis on signals and systems.
C323.2	CO2. Perform time, frequency and Z -transform analysis on signals and systems.
C323.3	CO3. Understand the significance of various filter structures and effects of roundoff errors.
C323.4	CO4. Design a digital filter for a given specification.
C323.5	CO5. Design a digital filter for a given specification.
C323.6	CO6. Understand the tradeoffs between normal and multi rate DSP techniques and finite length word effects.

Digital Signal Processing Lab

Course Outcome	Statement
C324.1	CO1. Understand how digital to analog (D/A) and analog to digital (A/D) converters operate on a signal and be able to model these operations mathematically.
C324.2	CO2. Perform time, frequency and Z-transform analysis on signals and LTI systems and study the properties like stability, causality, time-invariance and etc.
C324.3	CO3. Understand the inter-relationship between DFT and various transforms.
C324.4	CO4. Understand the significance of various filter structures and effects of round-off errors.
C324.5	CO5. Design of infinite impulse response filters for a given specification.
C324.6	CO6. Understand the fast computation of DFT and appreciate the FFT Processing.

Microprocessors and Microcontrollers Lab

Course Outcome	Statement
C325.1	CO1. Understand the internal organization and different modes of operation of popular 8086 microprocessors.
C325.2	CO2. Understand the importance of addressing modes and the instruction set of the processor / controller which is used for programming the processor and controller.
C325.3	CO3. Use design tools for microprocessor system design, test and evaluation.
C325.4	CO4. Understand I/O operation with 8086 and software interaction and integration.
C325.5	CO5. Understand the memory organization and interrupts of processors/ micro-controllers helps in various system designing aspects.
C325.6	CO6. Designandconductexperimentsrelatedtomicroprocessor/microcontrollerbased system design.

Advanced English Communication Skills Lab

Course Outcome	Statement
C326.1	CO1. Acquire vocabulary and use it contextually.
C326.2	CO2. Listen and speak effectively.
C326.3	CO3. Develop proficiency in academic reading and writing.
C326.4	CO4. Increase possibilities of job prospects.
C326.5	CO5. Communicate confidently in formal and informal contexts.

IV B. Tech I Semester		
C411	EC701PC	Microwave Engineering
C412	EC721PE	Professional Elective - II: Computer Networks
C413	EC731PE	Professional Elective - III: Cellular and Mobile Communications
C414	EC742PE	Professional Elective - IV: Embedded System Design
C415	EC702PC	VLSI Design
C416	EC703PC	VLSI and E-CAD Lab
C417	EC704PC	Microwave Engineering Lab

Microwave Engineering

Course Outcome	Statement
C411.1	CO1. Understand the significance microwaves and microwave transmission lines.
C411.2	CO2. Analyze wave propagation in TE, TM or TEM modes, in structures such as rectangular waveguides.
C411.3	CO3. Compare the passive microwave components and applications such as directional couplers, power dividers/ combiner and etc., with given characteristics.
C411.4	CO4. Analyze and design microwave resonators.
C411.5	CO5. Analyze the characteristics of microwave tubes and compare them..
C411.6	CO6. Understand the characteristics of slow wave structures.

Computer Networks

Course Outcome	Statement
C412.1	CO1. Understand the basics of Computer Networks and various protocols.
C412.2	CO2. Understand the World Wide Web concepts.
C412.3	CO3. Describe Computer Networks and the basic components of a Network system..
C412.4	CO4. Apply the pieces of hardware and software to make networks more efficient, faster, more secure, easier to use, able to transmit several simultaneous messages, and able to interconnect with other networks.
C412.5	CO5. Explain how communication works in data networks and the Internet.
C412.6	CO6. Discuss the different internetworking devices and their functions.

Cellular and Mobile Communications

Course Outcome	Statement
C413.1	CO1. Identify the limitations of conventional Mobile Telephone Systems; understand the basic cellular mobile system..
C413.2	CO2. Understand the concept of frequency Reuse channels, Deduce the Co-channel interference reduction factor.
C413.3	CO3. Explain Co-channel interference.
C413.4	CO4. Explain adjacent channel interference, near end far end interference and UHF TV interference.
C413.5	CO5. Understand cell coverage for signal and traffic.
C413.6	CO6. Learn cell site and mobile antennas.

Embedded System Design

Course Outcome	Statement
C414.1	CO1.Understand basic concepts and applications of embedded systems in various processors and domains, what a microcomputer is and core of the embedded system.
C414.2	CO2. Remember the definitions of ASICs, PLDs, memory, memory interface. Understand different concepts of a CTOS, sensors, memory interface, communication interface and definitions of circuits and blocks of embedded firmware design.
C414.3	CO3. Analyze to understand embedded firmware design approaches and development languages, RTOS with examples and ability to learn debugging techniques for an embedded system.
C414.4	CO4. Remember how to design RTOS in embedded system and to document their design and explain them to others. Understand task communication and synchronization, choosing of RTOS.

C414.5	CO5. Remember about shared memory, message passing, remote procedure calls and softwares, task synchronization, task communication issues and its synchronization techniques.
C414.6	CO6.Understand the device drivers , and how to choose a driver.

VLSI Design

Course Outcome	Statement
C415.1	CO-1: Able to analysis the fabricating procedures of different MOS transistors and behavior electrical properties
C415.2	CO-2: An ability to extract the analog parasitic elements from the layout and Analyze the circuit timing using a logic simulator and an analog simulator.
C415.3	CO-3: An ability to design elementary data paths for logic circuits, including moderate-speed adders, subtractors, and multipliers.
C415.4	CO-4: Provide design concepts required to design building blocks of data path using gates.
C415.5	CO-5: Design simple memories using MOS transistors and can understand design of large memories.
C415.6	CO-6: Design simple logic circuit using PLA, PAL, FPGA and CPLD And Understand different types of faults that can occur in a system

6. Course Outcomes (COs): B. Tech-Information Technology
JNTUH-R16 Regulations

Code	Course Name	Course Outcomes
B. Tech. I Year I Semester		
MA101BS	MATHEMATICS – I	**At the end of this course, each student should be able to:** CO1. Write the matrix representation of a set of linear equations and to analyze solutions of system of equations. CO2. Find the Eigen values and Eigen vectors which come across under linear transformations. CO3. Find the extreme values of functions of two variables with/ without constraints. CO4. Identify whether the given first order DE is exact or not. CO5. Solve higher order DE's and apply them for solving some real world problems.
CH102BS/CH202BS	ENGINEERING CHEMISTRY	**At the end of this course, each student should be able to:** CO1. Gain the basic knowledge of electrochemical procedures related to corrosion and its control. CO2. Understand the basic properties of water and its usage in domestic and industrial purposes. CO3. Learn the use of fundamental principles to make predictions about the general properties of materials. CO4. Predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

Code	Course Name	Course Outcomes
PH103BS	ENGINEERING PHYSICS / ENGINEERING PHYSICS -I	**At the end of this course, each student should be able to:** CO1. Realize the importance of light phenomena in thin films and resolution CO2. Learn principle, working of various laser systems and light propagation through optical fibers. CO3. Distinguish various crystal systems and understand atomic packing factor. CO4. Know the various defects in crystals.
EN104HS/EN204HS	PROFESSIONAL COMMUNICATION IN ENGLISH	**At the end of this course, each student should be able to** CO1. Use English Language effectively in spoken and written forms CO2. Comprehend the given texts and respond appropriately. CO3. Communicate confidently in formal and informal contexts.
ME105ES	ENGINEERING MECHANICS	**At the end of this course, each student should be able to** CO1. Understand the resolving forces and moments for a given force system CO2. Analyze the types of friction for moving bodies and problems related to friction. CO3. Determine the centroid and second moment of area
EE106ES/EE205ES	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	**At the end of this course, each student should be able to** CO1. Analyze and solve problems of electrical circuits using network laws and theorems. CO2. Identify and characterize diodes and various types of transistors.

Code	Course Name	Course Outcomes
EN107HS/EN207HS	ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB	**At the end of this course, each student should be able to** CO1. Better understanding of nuances of English language through audio- visual experience and group activities CO2. Neutralization of accent for intelligibility CO3. Speaking skills with clarity and confidence which in turn enhances their employability skills.
ME108ES/ME208ES	ENGINEERING WORKSHOP	**At the end of this course, each student should be able to:** CO1. Study and practice on machine tools and their operations CO2. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding. CO3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling. CO4. Apply basic electrical engineering knowledge for house wiring practice.
B. Tech. I Year II Semester		
PH201BS	ENGINEERING PHYSICS - II	**At the end of this course, each student should be able to:** CO1. Realize the importance of behavior of a particle quantum mechanically. CO2. Learn concentration estimation of charge carriers in semi conductors. CO3. Learn various magnetic dielectric properties and apply them in engineering applications CO4. Know the basic principles and applications of super conductors.

Code	Course Name	Course Outcomes
MA102BS/MA202BS	MATHEMATICS - II	**At the end of this course, each student should be able to:** CO1. Use Laplace transform techniques for solving DE's CO2. Evaluate integrals using Beta and Gamma functions CO3. Evaluate multiple integrals and can apply these concepts to find areas, volumes, moment of inertia etc of regions on a plane or in space. CO4. Evaluate the line, surface and volume integrals and converting them from one to another.
MA203BS	Mathematics - III	**At the end of this course, each student should be able to:** CO1. Differentiate among random variables involved in the probability models which are useful for all branches of engineering CO2. Calculate mean, proportions and variances of sampling distributions and to make important decisions s for few samples which are taken from a large data CO3. Solve the tests of ANOVA for classified data CO4. Find the root of a given equation and solution of a system of equations CO5. Fit a curve for a given data CO6. Find the numerical solutions for a given first order initial value problem
CS104ES/CS204ES	COMPUTER PROGRAMMING IN C	**At the end of this course, each student should be able to:** CO1. Demonstrate the basic knowledge of computer hardware and software. CO2. Write algorithms for solving problems. CO3. Draw flowcharts for solving problems CO4. Code a given logic in C programming language. CO5. Gain knowledge in using C language for solving problems.

Code	Course Name	Course Outcomes
ME106ES/ME205ES	ENGINEERING GRAPHICS	**At the end of this course, each student should be able to:** CO1. Ability to prepare working drawings to communicate the ideas and information. CO2. Ability to read, understand and interpret engineering drawings.
CH206BS	ENGINEERING CHEMISTRY LAB	**At the end of this course, each student should be able to:** CO1. Develop experimental skills to design new experiments in Engineering. c. Exposure to these experiments the student can compare the theory and correlate with experiment. CO2. Estimate the number of free ions, charge & mobility of ions in the mixture of acids using conductivity meter and also gets an idea about titrations without using any indicator. CO3. Determine the presence and quantity of impurities in water and he can estimate amount of metal in metalores.
PH107BS/PH207BS	ENGINEERING PHYSICS LAB	**At the end of this course, each student should be able to:** CO1. Understand the concept of error and its analysis. CO2. Compare the theory and correlate with experiment. CO3. Understand the applications of physics experiments in day to day life.
CS108ES/CS208ES	COMPUTER PROGRAMMING IN C LAB	**At the end of this course, each student should be able to:** CO1. Design and test programs to solve mathematical and scientific problems. CO2. Write structured programs using control structures and functions.

Code	Course Name	Course Outcomes
B. Tech. II Year I Semester		
MA301BS	MATHEMATICS - IV	**At the end of this course, each student should be able to:** CO1. Analyze the complex functions with reference to their analyticity integration using Cauchy's integral theorem. CO2. Find the Taylor's and Laurent's series expansion of complex functions CO3. Express any periodic function in term of sines and cosines CO4. Express a non-periodic function as integral representation CO5. Analyze one dimensional wave and heat equation
CS302ES	DATA STRUCTURES THROUGH C++	**At the end of this course, each student should be able to:** CO1. Choose appropriate data structures to represent data items in real world problems. CO2. Analyze the time and space complexities of algorithms CO3. Design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees. CO4. Analyze and implement various kinds of searching and sorting techniques. CO5. Understand numerous algorithm design techniques including greedy, divide-and-conquer, dynamic programming, randomized algorithms, and backtracking;

Code	Course Name	Course Outcomes
CS303ES	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE	**At the end of this course, each student should be able to:** CO1. Apply mathematical logic to solve problems CO2. Understand sets, relations, functions, and discrete structures. CO3. Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, and functions. CO4. Formulate problems and solve recurrence relations. CO5. Model and solve real-world problems using graphs and trees.
CS304ES	DIGITAL LOGIC DESIGN	**At the end of this course, each student should be able to:** CO1. Understand number systems and codes. CO2. Solve Boolean expressions using Minimization methods. CO3. Design the sequential and combinational circuits. CO4. Apply state reduction methods to solve sequential circuits.
CS305ES	OBJECT ORIENTED PROGRAMMING THROUGH JAVA	**At the end of this course, each student should be able to:** CO1. Solve real world problems using OOP techniques. CO2. Understand the use of abstract classes. CO3. Solve problems using java collection framework and I/O classes. CO4. Develop multithreaded applications with synchronization. CO5. Develop applets for web applications. CO6. Design GUI based applications**.**

Code	Course Name	Course Outcomes
CS306ES	DATA STRUCTURES THROUGH C++ LAB	**At the end of this course, each student should be able to:** CO1. Identify the appropriate data structures and algorithms for solving real world problems. CO2. Implement various kinds of searching and sorting techniques CO3. Implement data structures such as stacks, queues, Search trees, and hash tables to solve various computing problems.
CS307ES	IT WORKSHOP	**At the end of this course, each student should be able to:** CO1. Apply knowledge for computer assembling and software installation CO2. Ability how to solve the trouble shooting problems. CO3. Apply the tools for preparation of PPT, documentation and budget sheet etc.
CS308ES	OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB	**At the end of this course, each student should be able to:** CO1. Write programs for solving real world problems using java collections frame CO2. Write programs using abstract classes. CO3. Write multithreaded programs CO4. Write GUI programs using swing controls in Java.

Code	Course Name	Course Outcomes
MC300ES	ENVIRONMENTAL SCIENCE AND TECHNOLOGY	**At the end of this course, each student should be able to:** CO1. Understand the importance of ecological balance for sustainable development. CO2. Understand the impacts of developmental activities and mitigation measures. CO3. Understand the environmental policies and regulations. CO4. Implement various Environmental policies, regulations and schemes. CO5. Students can apply the knowledge, techniques, skills and modern tools to become successful professionals in communication and media industries.
B. Tech. II Year II Semester		
CS401ES	COMPUTER ORGANIZATION	**At the end of this course, each student should be able to:** CO1. Understand the basic components and the design of CPU, ALU and Control Unit. CO2. Understand memory hierarchy and its impact on computer cost/performance. CO3. Understand the advantage of instruction level parallelism and pipelining for high performance Processor design. CO4. Understand the instruction set, instruction formats and addressing modes of 8086. CO5. Write assembly language programs to solve problems.

Code	Course Name	Course Outcomes
CS402ES	DATABASE MANAGEMENT SYSTEMS	**At the end of this course, each student should be able to:** CO1. Demonstrate the basic elements of a relational database management system. CO2. Identify the data models for relevant problems. CO3. Design entity relationship model and convert entity relationship diagrams into RDBMS and formulate SQL queries on the data. CO4. Apply normalization for the development of application software. CO5. To be familiar with the basic issues of transaction processing and concurrency control
CS403ES	OPERATING SYSTEMS	**At the end of this course, each student should be able to:** CO1. Apply optimization techniques for the improvement of system performance. CO2. Design and solve synchronization problems. CO3. Learn about minimization of turnaround time, waiting time and response time and also maximization of throughput by keeping CPU as busy as possible. CO4. Change access controls to protect files. CO5. Compare the different operating systems.
CS404ES	FORMAL LANGUAGES AND AUTOMATA THEORY	**At the end of this course, each student should be able to:** CO1. Understand the concept of abstract machines and their power to recognize the languages. CO2. Employ finite state machines for modeling and solving computing problems. CO3. Design context free grammars for formal languages. CO4. Distinguish between decidability and undecidability. CO5. Gain proficiency with mathematical tools and formal methods.

Code	Course Name	Course Outcomes
SM405ES	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS	**At the end of this course, each student should be able to:** CO1. Understand the various Forms of Business and the impact of economic variables on the Business. CO2. Learnt the Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. CO3. Study the firm's financial position by analyzing the Financial Statements of a Company.
CS406ES	COMPUTER ORGANIZATION LAB	**At the end of this course, each student should be able to:** CO1. Understand and apply the fundamentals of assembly level programming of microprocessors. CO2. Write assembly language programs for Evaluating expressions, Arithmetic operations etc using GNU Assembler. CO3. Write assembly language programs for Armstrong numbers, Fibonacci and factorial using procedure calls using GNU Assembler.
CS407ES	DATABASE MANAGEMENT SYSTEMS LAB	**At the end of this course, each student should be able to:** CO1. Design and implement a database schema for given problem. CO2. Apply the normalization techniques for development of application software to realistic problems. CO3. Formulate queries using SQL DML/DDL/DCL commands.

Code	Course Name	Course Outcomes
CS408ES	OPERATING SYSTEMS LAB	**At the end of this course, each student should be able to:** CO1. Develop application programs using system calls in UNIX. CO2. Implement interprocess communication between two processes. CO3. Design and solve synchronization problems. CO4. Simulate and implement operating system concepts such as scheduling, deadlock management, file management, and memory management.
MC400HS	GENDER SENSITIZATION LAB	**At the end of this course, each student should be able to:** CO1. Have developed a better understanding of important issues related to gender in contemporary India. CO2. Be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film. CO3. Attain a finer grasp of how gender discrimination works in our society and how to counter it. CO4. Acquire insight into the gendered division of labour and its relation to politics and economics. CO5. Men and women students and professionals will be better equipped to work and live together as equals. CO6. Develop a sense of appreciation of women in all walks of life. CO7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

7. B. Tech-Electrical & Electronics Engineering: I, II, III & IV years

JNTUH-R16 Regulations

Code	Course Name	Course Outcomes
I B. TechI Semester		
MA101BS	Mathematics – I	**At the end of this course, each student should be able to:** CO6. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations CO7. Find the Eigen values and Eigen vectors which come across under linear transformations CO8. Find the extreme values of functions of two variables with/ without constraints CO9. Identify weather the given first order DE is exact or not CO10. Solve higher order DE's and apply them for solving some real world problems
CH102BS	Engineering Chemistry	**At the end of this course, each student should be able to:** CO5. Gain the basic knowledge of electrochemical procedures related to corrosion and its control CO6. Understand the basic properties of water and its usage in domestic and industrial purposes CO7. Use of fundamental principles to make predictions about the general properties of materials CO8. Predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.
PH103BS	Engineering Physics-I	**At the end of this course, each student should be able to:** CO7. Realize the importance of light phenomena in thin films and resolution CO8. Learn principle, working of various laser systems and light propagation through optical fibers CO9. Distinguish various crystal systems and understand atomic packing factor CO10. Know the various defects in crystals
EN104HS	Professional Communication in English	**At the end of this course, each student should be able to:** CO4. Understand the value of English as an international language, as a Lingua-Franca and try to improve their knowledge regarding language skills and elements to be perfect in their usage. CO5. Usage of English Language, written and spoken. CO6. Enrichment of comprehension and fluency CO7. Gaining confidence in using language in verbal situations. CO8. Develop the ability to analyze the language used in descriptions and narrations. CO9. Augment skills related to technical English

Code	Course Name	Course Outcomes
ME105ES	Engineering Mechanics	**At the end of this course, each student should be able to:** CO1. Understand the resolving forces and moments for a given force system CO2. Analyse the types of friction for moving bodies and problems related to friction CO3. Determine the centroid and second moment of area CO4. Understand the principles of kinetics CO5. Learn the mechanical vibrations
EE106ES	Basic Electrical and Electronics Engineering	**At the end of this course, each student should be able to:** CO9. Understand the concept of electrical circuits and its components CO10. Learn the basic principles of diode and transistors CO11. Analyse and solve problems of electrical circuits using network laws and theorems CO12. Identify and characterise diodes and various types of transistors
ME107HS	English Language Communication Skills Lab	**At the end of this course, each student should be able to:** CO2. Ability to discuss role and importance of communication skills and learn to make use of various forms of communication in their respective professional fields. CO3. Ability to use communication tool to be an effective team leader or team member. CO4. Ability to use communication modes as a tool for success in career progression. CO5. Ability to present in various social and professional situations formally. CO6. Ability to analyze and share the ideas by various media of information transfer. CO7. Ability to design various behavioural aspects in relation to problem solving.
ME108ES	Engineering Workshop	**At the end of this course, each student should be able to:** CO1. Study and practice on machine tools and their operations CO2. Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding. CO3. Identify and apply suitable tools for different trades of engineering processes including drilling, material removing, measuring and chiselling CO4. Apply basic electrical engineering knowledge for house wiring practice.

Code	Course Name	Course Outcomes
I B. Tech II Semester		
PH201BS	Engineering Physics-II	**At the end of this course, each student should be able to:** CO1. Realise the importance of behaviour of a practical quantum mechanically CO2. Learn concentration estimation of charge carriers in semi-conductors CO3. Learn various magnetic dielectric properties and apply them in engineering applications CO4. Know the basic principles and application of supper conductors
MA202BS	Mathematics-II	**At the end of this course, each student should be able to:** CO1. Understand the concept of Laplace transform of standard functions and applications CO2. Ability to solve Integrals by beta and gamma functions. CO3. Ability to solve double integrals. CO4. Ability to solve triple integrals. CO5. Ability to find vector differentiation and line integrals, surface integrals and volume Integrals. CO6. Evaluate vector integral theorems
MA203BS	Mathematics-III	**At the end of this course, each student should be able to:** CO1. Differentiate among random variables involved in the probability models which are useful for all branches of engineering CO2. Calculate mean, proportions and variances of sampling distributions and to make important decisions for few samples which are taken form a large data CO3. Solve the tests of ANOVA for classified data CO4. Find the root of a given equation and solution of a system of equations CO5. Fit a curve for a given data CO6. Find the numerical solutions for a given first order initial value problem
CS204ES	Computer Programming in C	**At the end of this course, each student should be able to:** CO1. Demonstrate the basic knowledge of computer hardware and software CO2. Ability to write algorithms for solving problems CO3. Ability to draw flowcharts for solving problems CO4. Ability to code a given logic in C programming language CO5. Gain knowledge in using C language for solving problems

Code	Course Name	Course Outcomes
ME205ES	Engineering Graphics	**At the end of this course, each student should be able to:** CO1. Prepare working drawings to communicate the ideas and information CO2. Read, understand and interpret engineering drawings
CH206BS	Engineering Chemistry Lab	**At the end of this course, each student should be able to:** CO1. Extrapolate the knowledge of cell, electrode, cathode, anode, electrolysis, electromotive force and reference electrode. CO2. Explore the engineering applications of polymeric materials. CO3. Develop awareness about the usage of conducting polymers as an engineering material. CO4. Justify the immense importance of basic constructional material, Portland cement in Civil Engineering works. CO5. Summarize the application of phase rule to one and two component systems. CO6. The knowledge of chemistry provides the requisite expertise to deal with challenges in engineering disciplines and development of new materials.
PH207BS	Engineering Physics Lab	**At the end of this course, each student should be able to:** CO4. Learn the fundamental concepts on behavior of crystalline solids. CO5. The knowledge on fundamentals of Quantum Mechanics, Statistical Mechanics enables the student to apply to various systems like Communications Solar Cells, Photo Cells and so on. CO6. Design, Characterization and study of properties of materials help the student to prepare new materials for various Engineering applications. CO7. Helps the student exposed to non-destructive testing methods. CO8. Develop problem solving skills and analytical skills. CO9. Ability to apply knowledge of engineering and interpret data
CS208ES	Computer Programming in C Lab	**At the end of this course, each student should be able to:** CO1. Ability to design and test programs to solve mathematical and scientific problems. CO2. Ability to write structured programs using control structures and functions.

Code	Course Name	Course Outcomes
II B. Tech I Semester		
MA301BS	Mathematics – IV	**At the end of this course, each student should be able to:** CO1. Analyze the complex functions with reference to their analyticity, integration using CO2. Cauchy's integral theoremfind the Taylor's and Laurent's series expansion of complex functions CO3. The bilinear transformation CO4. Express any periodic function in term of sine's and cosines CO5. Express a non-periodic function as integral representation CO6. Analyze one dimensional wave and heat equation
EE302ES	Electromagnetic Fields	**At the end of this course, each student should be able to:** CO1. Apply vector calculus to static electric – magnetic fields. CO2. Compute the force, potential & Energy for different charge & current configurations and Evaluate capacitance in static electric field. CO3. Solve Electromagnetic Relation using Maxwell Formulae. CO4. Compute the force, potential & Energy for different charge & current configurations and Evaluate Inductance. CO5. Analyse moving charges on Magnetic fields CO6. Analyze Maxwell's equation in different forms (Differential and integral) in Electro Magnetic time varying fields.
EE303ES	Electrical Machines-I	**At the end of this course, each student should be able to:** CO1. Understand and classify different parts of a DC machine & understand its operation. CO2. Organize different testing methods to predetermine the efficiency of DC machines. CO3. Understand different excitation and starting methods of DC machines. CO4. Develop the speed control of a DC machines. CO5. Understand and classify different parts of a transformer & understand its operation.
EE304ES	Network Theory	**At the end of this course, each student should be able to:** CO1. Analyze the Electrical Circuits with the concept of Network topology CO2. Apply the concepts of Magnetic circuit & Analyze Magnetic circuits CO3. Understand the importance of three phase circuits and analyze the three phase circuits CO4. Analyze the transient behaviour of electrical networks for various excitations CO5. Obtain the various network parameters for the given two port networks and design of various filters

Code	Course Name	Course Outcomes
EE305ES	Electronic Circuits	**At the end of this course, each student should be able to:** CO1. Apply the knowledge of BJT to design practical amplifier circuits. CO2. Design electronic sub systems such as feedback amplifiers, oscillators and power amplifiers to meet the required specifications. CO3. Design linear and non-linear wave shaping circuits with different inputs. CO4. Analyze multi vibrators using transistors.
EE306ES	Electrical Machines Lab – I	**At the end of this course, each student should be able to:** CO1. Study performance characteristics of DC Generators CO2. Identify performance characteristics of DC Motors CO3. Find starting and speed control methods of different DC Machines. CO4. Assess the efficiency of DC machines using different testing methods. CO5. Identify different conditions required to be satisfied for self - excitation of DC Generators. CO6. Analyze separation of iron losses of DC machines into different components.
EC306ES	Electronic Devices & Circuits Lab	**At the end of this course, each student should be able to:** CO1. After Completion of the course the student is able to apply various devices to real-time problems. CO2. Compute frequency response of various amplifiers.
EE307ES	Networks Lab	**At the end of this course, each student should be able to:** CO1. Analyze complex DC and AC linear circuits CO2. Apply concepts of electrical circuits across engineering CO3. Evaluate response in a given network by using theorems

Code	Course Name	Course Outcomes
MC300ES	Environmental Science and Technology	**At the end of this course, each student should be able to:** CO1. Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development CO2. Get the information about ecosystem and also about its functions like Food chain, Ecological pyramids etc., CO3. Get the knowledge about the different types of resources like land, water, mineral and energy and also about the effects of environment by the usage of these resources. CO4. Gain the knowledge about the ecosystem diversity, its values and also about the importance of the endemic species. CO5. Get the complete information about EIA- Environmental Impact Assessment in which the student will get the knowledge about the projects and the process involved in getting the projects. CO6. Gain the knowledge about the present resources and different techniques involved in its conservation.
II B. Tech II Semester		
EC401ES	Switching Theory & Logic Design	**At the end of this course, each student should be able to:** CO1. Be able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray and BCD. CO2. Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions. CO3. Be able to design and Analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits. CO4. Be able to design and Analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.
EE402ES	Power Systems - I	**At the end of this course, each student should be able to:** CO1. Draw the layout of hydro power plant, thermal power station, Nuclear power plant and gas power plant and explain its operation CO2. Describe A.C. and D.C. distribution systems and its voltage drop calculations CO3. Illustrate various economic aspects of the power plant erection, operation and different tariff methods CO4. Understand power factor improvement methods and determine economical power factor

Code	Course Name	Course Outcomes
EE403ES	Electrical Machines – II	**At the end of this course, each student should be able to:** CO1. ***Understand*** the construction and working of 3-φ Induction machines CO2. ***Understand*** the characteristics and different speed control methods of 3-φ Induction motor. CO3. ***Understand*** the construction and working of Alternator. CO4. ***Analyze*** different methods to find the regulation of alternators. CO5. ***Understand*** the parallel operation of alternators and operation of synchronous motor CO6. ***Understand*** the operation of different 1-φ Induction motors
EE404ES	Control Systems	**At the end of this course, each student should be able to:** CO1. Improve the system performance by selecting a suitable controller and/or a compensator for a specific application CO2. Apply various time domain and frequency domain techniques to assess the system performance CO3. Apply various control strategies to different applications (example: Power systems, electrical drives etc…) CO4. Test system Controllability and Observability using state space representation and applications of state space representation to various systems.
SM405MS	Business Economics and Financial Analysis	**At the end of this course, each student should be able to:** CO1. The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analyzing the Financial Statements of a Company. CO2. Understand the concepts of managerial economics and the market dynamics namely demand, elasticity of demand and pricing in different market structures. CO3. Gain the knowledge on the production theories and cost analysis while dealing with the production and the concept of break even analysis. CO4. Examine the price-output decisions under different types of marketing structures and the significance of different forms of business organizations existing in the modern business. CO5. Describe the significance of the project management, capital budgeting, estimation of the projects through capital budgeting methods for choosing the best and optimal projects. CO6. Provide the optimal decisions for acquiring the knowledge on financial accounting, management accounting and ratio analysis.

Code	Course Name	Course Outcomes
EE406ES	Control Systems Lab	**At the end of this course, each student should be able to:** CO1. How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application CO2. Apply various time domain and frequency domain techniques to assess the system performance CO3. Apply various control strategies to different applications(example: Power systems, electrical drives etc) CO4. Test system controllability and Observability using state space representation and applications of state space representation to various systems
EE407ES	Electrical Machines Lab - II	**At the end of this course, each student should be able to:** CO1. Assess the performance of different machines using different testing methods CO2. To convert the Phase from three phase to two phase and vice versa CO3. Compensate the changes in terminal voltages of synchronous generator after CO4. estimating the change by different methods CO5. Control the active and reactive power flows in synchronous machines CO6. Start different machines and control the speed and power factor
EE408ES	Electronic Circuits Lab	**At the end of this course, each student should be able to:** CO1. Apply the concepts of amplifiers in the design of Public Addressing System CO2. Generate Sinusoidal wave forms CO3. Design stable system using feedback concepts. CO4. Design multi vibrator using transistor

Code	Course Name	Course Outcomes
MC400HS	Gender Sensitization Lab	**At the end of this course, each student should be able to:** CO1. Students will have developed a better understanding of important issues related to gender in contemporary India. CO2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature, and film. CO3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. CO4. Students will acquire insight into the gendered division of labour and its relation to politics and economics. CO5. Men and women students and professionals will be better equipped to work and live together as equals. CO6. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
III B. Tech I Semester		
EE501PC	Electrical Measurements & Instrumentation	**At the end of this course, each student should be able to:** CO1. Understand different types of measuring instruments, their construction, operation and characteristics CO2. Identify the instruments suitable for typical measurements CO3. Apply the knowledge about transducers and instrument transformers to use them effectively
EE502PC	Power Systems - II	**At the end of this course, each student should be able to:** CO1. Able to compute inductance and capacitance for different configurations of transmission lines. CO2. Able to analyze the performance of transmission lines CO3. Can understand transient's phenomenon of transmission lines. CO4. Able to calculate sag and tension calculations. CO5. Will be able to understand overhead line insulators and underground cables.

Code	Course Name	Course Outcomes
EI503PC	Microprocessors and Microcontrollers	**At the end of this course, each student should be able to:** CO1. Understands the internal architecture and organization of 8086, 8051 and ARM processors/controllers. CO2. Understands the interfacing techniques to 8086 and 8051 and can develop assembly language programming to design microprocessor/ micro controller based systems. CO3. Understand I/O operation with 8086 and software interaction and integration. CO4. Understand the memory organization and interrupts of processors/ micro-controllers helps in various system designing aspects. CO5. Design and conduct experiments related to microprocessor/microcontroller based system design. CO6. Identify the significance of serial communication
SM504MS	Fundamentals of Management	**At the end of this course, each student should be able to:** CO1. Understand the significance of Management in their Profession. CO2. Can learn the various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects in this course. CO3. Can explore the Management Practices in their domain area.
EE511OE	***Open Elective –I*** Principles Of Electronic Communications	**At the end of this course, each student should be able to:** CO1. Understand modulation and various analog & digital modulation schemes. CO2. Broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.
EE505PC	Electrical Measurements & Instrumentation Lab	**At the end of this course, each student should be able to:** CO1. To choose instruments CO2. Test any instrument CO3. Find the accuracy of any instrument by performing experiment CO4. Calibrate PMMC instrument using D.C potentiometer
EE506PC	Basic Electrical simulation Lab	**At the end of this course, each student should be able to:** CO1. Apply signal generation in different systems. CO2. Analyze networks by various techniques CO3. Analyze circuit responses CO4. Analyze bridge rectifiers
EI507PC	Microprocessors and Microcontrollers Lab	**At the end of this course, each student should be able to:** CO1. Study the Architecture of 8086 microprocessor. CO2. Learn the design aspects of I/O and Memory Interfacing circuits. CO3. Study the Architecture of 8051 microcontroller CO4. Apply different communication methods between two microprocessor kits.

Code	Course Name	Course Outcomes
*MC500HS	Professional Ethics	**At the end of this course, each student should be able to:** CO1. Understand the importance of Values and Ethics in their personal lives and professional careers. CO2. Learn the rights and responsibilities as an employee, team member and a global citizen.
III B. Tech II Semester		
EE601PC	Power Systems Analysis	**At the end of this course, each student should be able to:** CO1. Develop the Ybus and Zbus matrices CO2. Analyze load flow for various requirements of the power system **CO3.** Analyze short circuit studies for the protection of power system **CO4.** Estimate stability and instability in power systems
EE602PC	Power Electronics	**At the end of this course, each student should be able to:** CO1. Choose the appropriate converter for various applications CO2. Design the power converters suitable for particular applications CO3. Develop the novel control methodologies for better performance.
EE603PC	Switch Gear and Protection	**At the end of this course, each student should be able to:** CO1. Understand the types of Circuit breakers and choice of Relays for appropriate protection of power system equipment. CO2. Understand various types of Protective devices in Electrical Power Systems. CO3. Interpret the existing transmission voltage levels and various means to protect the system against over voltages. CO4. Understand the importance of Neutral Grounding, Effects of Ungrounded Neutral grounding on system performance, Methods and Practices.
EC621OE	***Open Elective – II*** Principles of Computer Communications and Networks	CO1 The student can get the knowledge of networking of computers, data transmission between computers. CO2 Will have the exposure about the various communication concepts. **CO3** Will get awareness about the structure and equipment of computer network structures.

Code	Course Name	Course Outcomes
EM611PE EE612PE **EE613PE** EE614PE	***Professional Elective – I*** Computer Organization Linear Systems Analysis **Linear and Digital IC Applications** Electrical and Electronics Instrumentation	**At the end of this course, each student should be able to:** CO1. A thorough understanding of operational amplifiers with linear integrated circuits. CO2. Understanding of the different families of digital integrated circuits and their characteristics. CO3. Also students will be able to design circuits using operational amplifiers for various applications.
EE604PC	Power Systems Lab	**At the end of this course, each student should be able to:** CO1. Perform various load flow techniques CO2. Understand Different protection methods **CO3.** Analyze the experimental data and draw the conclusions.
EE605PC	Power Electronics Lab	**At the end of this course, each student should be able to:** CO1. Understand the operating principles of various power electronic converters. CO2. Use power electronic simulation packages& hardware to develop the power converters. CO3. Analyze and choose the appropriate converters for various applications

Code	Course Name	Course Outcomes
EE606PC	Advanced English Communication Skills Lab	**At the end of this course, each student should be able to:** CO1. To improve students' fluency in spoken English CO2. To enable them to listen to English spoken at normal conversational speed CO3. To help students develop their vocabulary CO4. To read and comprehend texts in different contexts CO5. To communicate their ideas relevantly and coherently in writing CO6. To make students industry-ready CO7. To help students acquire behavioural skills for their personal and professional life CO8. To respond appropriately in different socio-cultural and professional contexts
IV B. Tech I Semester		
EE701PC	Power Semiconductor Drives	**At the end of this course the student is able to:** CO1. Identify the drawbacks of speed control of motor by conventional methods. CO2. Differentiate Phase controlled and chopper controlled DC drives speed-torque characteristics merits and demerits CO3. Understand Ac motor drive speed–torque characteristics using different control strategies its merits and demerits CO4. Describe Slip power recovery schemes
EE702PC	Power System Operation and control	**At the end of this course, the student will be able to:** CO1. Analyze the optimal scheduling of power plants CO2. Analyze the steady state behavior of the power system for voltage and frequency fluctuations CO3. Describe reactive power control of a power system CO4. Design suitable controller to dampen the frequency and voltage steady state oscillations
EE722PE	***Professional Elective – II*** HVDC Transmission	**At the end of this course the student is able to:** CO1. Compare EHV AC and HVDC system and to describe various types of DC links CO2. Analyze Graetz circuit for rectifier and inverter mode of operation CO3. Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems CO4. Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters

Code	Course Name	Course Outcomes
EE732PE	***Professional Elective – III*** Power Quality	**At the end of this course, the student will be able to:** CO1. Know the severity of power quality problems in distribution system CO2. Understand the concept of voltage sag transformation from up-stream (higher voltages) to down-stream (lower voltage) CO3. Concept of improving the power quality to sensitive load by various mitigating custom power devices
EE743PE	***Professional Elective – IV*** Flexible A.C. Transmission Systems	**At the end of this course the student is able to:** CO1. Choose proper controller for the specific application based on system requirements CO2. Understand various systems thoroughly and their requirements CO3. Understand the control circuits of Shunt Controllers SVC & STATCOM for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping CO4. Understand the Power and control circuits of Series Controllers GCSC, TSSC and TCSC
EE703PC	Electrical Systems Simulation Lab	**After going through this lab the student will be able to** CO1. Design and Analyze electrical systems in time and frequency domain CO2. Analyze various transmission lines and perform fault analysis CO3. Model Load frequency control of Power Systems CO4. Design various Power Electronic Converters and Drives.
EE704PC	Electrical Workshop	**After completion of course, student will be able to:** CO1. Get practical knowledge related to electrical CO2. Fabricate basic electrical circuit elements/networks CO3. Trouble shoot the electrical circuits CO4. Design filter circuit for application CO5. Get hardware skills such as soldering, winding etc. CO6. Get debugging skills.

Code	Course Name	Course Outcomes
EE705PC	Industry Oriented Mini Project	**At the end of this course, each student should be able to** CO1. Apply the relevant knowledge and skills, which are acquired within the technical area, to a given problem within given constraints, even with limited information, independently analyse and discuss complex inquiries/problems and handle larger problems on the advanced level within the technical area CO2. Reflect on, evaluate, and critically assess one's own and others' scientific results CO3. Document and present one's own work, for a given target group, with strict requirements on structure, format, and language usage. CO4. Identify one's need for further knowledge and continuously develop one's own competencies CO5. Understand how to apply technology for the real time problems
EE706PC	Seminar	**At the end of this course, each student should be able to** CO1. To assess and enhance the capability of the student to present a seminar on a technical topic CO2. Understand the learning and critical thinking about a technical topic CO3. Draw upon literature from different traditions to help the students appreciate the universal importance social trust, truth telling and mutual obligations CO4. Learn how to document and present a technical reports CO5. Acquire awareness on latest technology and current trends in the field of power systems CO6. Participate in discussions for enhancement of knowledge and Adapt professional ethics
IV B. Tech II Semester		
EE854PE	***Professional Elective – V*** High Voltage Engineering	**After completion of this course, the student will be able to:** CO1. Acquire knowledge on, basics of high voltage engineering CO2. Understand break-down phenomenon in different types of dielectrics CO3. Understand generation and measurement of high voltages and currents CO4. Understand the phenomenon of over-voltages, concept of insulation co-ordination CO5. Know testing of various materials and electrical apparatus used in high voltage engineering

Code	Course Name	Course Outcomes
EE862PE	***Professional Elective – VI*** Smart Electric Grid	**Upon the completion of the subject, the student will be able to:** CO1. Recite the structure of an electricity market in either regulated or deregulated market conditions. CO2. Understand the advantages of DC distribution and developing technologies in distribution CO3. Discriminate the trade-off between economics and reliability of an electric power system, differentiate various investment options (e.g. generation capacities, transmission, renewable, demand-side resources, etc) in electricity markets CO4. Analyze the development of smart and intelligent domestic systems.
MT831OE	***Open Elective-*** Renewable Energy Sources	**After completion of this course, the student will be able to:** CO1. Understand the concept of Renewable energy sources and technologies for their effective utilization. CO2. Understand the basic concept of Solar energy and its types. CO3. Understand the potential of wind energy, types of wind energy and environmental aspects of wind system. CO4. Identify the alternate to use waste and remember the concept of Biogas plants. CO5. Understand the concept of ocean energy and its importance.
EE801PC	Major Project	**After completing this course the student must demonstrate the knowledge and ability to:** CO1. To provide an opportunity to pursue their interest in Electrical Engineering, through design, research, theoretical, and experimental approach. CO2. Use of fundamental knowledge and skills in engineering and apply it effectively on a project. CO3. To effectively communicate by making an oral presentation before an evaluation committee. CO5. Understand how to apply technology for the real time problems.

8. B. Tech-Mechanical Engineering: I, II, III & IV years

JNTUH-R16 Regulations

Course Code	Course Title	Course Outcomes and Program Outcomes
MA101BS	**MATHEMATICS-I**	CO.1 able to write the matrix representation of set of linear equations and to analyze the solution of the system of equations CO.2 able tofind the Eigen values and Eigenvectors which come across under linear transformations CO.3 able to find the extreme values of functions of two variables with/without constraints CO.4 able to identify whether the given first DE is exact or not CO.5 able to solve higher order DE's and apply them for solving some real world problems
MA102BS/ MA202BS	**MATHEMATICS-II**	CO.1 able to Laplacetransform techniques for solving DE's CO.2 able to evaluate integrals using Beta and Gamma Functions CO.3 able to evaluate the multiple integrals and can apply these concepts to these concepts to find areas, volumes, moment of inertia etc. of regions on a plane or in space CO.4 able to evaluate the line,surface and volume integrals and converting them from one to another
PH103BS	**ENGINEERING PHYSICS**	CO.1 able to realize the importance of light phenomenon in thin films and resolution CO.2 able to learn principle, working of various laser systems and light propagation through optical fibers CO.3 able to distinguish various crystal systems and understand atomic packing factor CO.4 able to know the various defects in crystals
CS104ES/ CS204ES	**COMPUTER PROGRAMMING IN C**	CO.1 able to demonstrate the basic knowledge of computer hardware & software CO.2 able to write algorithms for solving problems CO.3 able to draw flowcharts for solving problems CO.4 ability to code a given logic in C Programming language CO.5 Gain knowledge in using C language for solving problems

Course Code	Course Title	Course Outcomes and Program Outcomes
ME105ES	**ENGINEERING MECHANICS**	CO.1 Classify basic engineering mechanics concepts required for predicting behavior static structures. CO.2 Identify an appropriate structural system to study a given problem and isolate it from its environment. CO.3 Model the problem using free-body diagrams and accurate equilibrium equations. CO.4 Communicate the solution to all problems in an organized and coherent manner and elucidate the meaning of the solution in the context of the problem. CO.5 Develop concepts of rigid body kinematics and dynamics with an emphasis on the modeling, analysis, and simulation of how forces produce motion of rigid body systems. CO.6 Determine simple dynamic variables and solve simple dynamic problems involving kinematics, energy and momentum.
ME106ES/ ME205ES	**ENGINEERING GRAPHICS**	CO.1 Preparing working drawings to communicate the ideas and information CO.2 Read, Understand and interpret engineering drawing
PH107BS/ PH207BS	**ENGINEERING PHYSICS LAB**	CO.1 From a given discrete data, one will be able to predict the value of the data at an intermediate point and by curve fitting, can find the most appropriate formula for a guessed relation of the data variables. This method of analysis data helps engineers to understand the system for better interpretation decision making After studying this unit one will be able to find a root of a given equation and will be able to find a numerical solution for a given differential equation CO.2 Helps in describing the system by an ODE, if possible. Also, suggests to find the solution as a first approximation. CO.3 One will be able to find the expansion of a given function by Fourier series and Fourier transform of the function. CO.4 Helps in phase transformation, phase change and attenuation coefficients in acoustics

Course Code	Course Title	Course Outcomes and Program Outcomes	
		CO.5	After studying this unit, one will be able to find a corresponding partial differential equation for an unknown function with many independent variables and to find their solution
CS108ES/ CS208ES	**COMPUTER PROGRAMMING IN C LAB**	CO.1 CO.2	ability to design and test programs to solve mathematical and scientific problems ability to write structured programs using control structures and functions
I B.TECH II SEM			
AP201BS	**APPLIED PHYSICS**	CO.1 CO.2 CO.3 CO.4	Able to realize the importance of elastic behavior of materials. Able to Learn Sabine's formula for reverberation time and apply in architecture of buildings. Able to learn various methods of producing ultrasonic and their uses. Able to Learn magnetic, dielectric and superconducting properties of materials
CH102BS/ CH202BS	**ENGINEERING CHEMISTRY**	CO.1 CO.2 CO.3 CO.4	Students will gain the basic knowledge of electrochemical procedures related to corrosion and its control. They can understand the basic properties of water and its usage in domestic and industrial purposes. They learn the use of fundamental principles to make predictions about the general properties of materials. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs
MA203BS	**Mathematics - III**	CO.1 CO.2 CO.3 CO.4	Able to differentiate among random variables involved in the probability models which are useful for all branches of engineering Able to calculate mean, proportions and variances of sampling distributions and to make important decisions s for few samples which are taken from a large data Able to solve the tests of ANOVA for classified data Able to find the root of a given equation and

Course Code	Course Title	Course Outcomes and Program Outcomes	
			solution of a system of equations
		CO.5	Able to fit a curve for a given data
		CO.6	Able to find the numerical solutions for a given first order initial value problem
EN104HS/ EN204HS	**PROFESSIONAL COMMUNICATION IN ENGLISH**	CO.1	Able to Use English Language effectively in spoken and written forms.
		CO.2	Able to Comprehend the given texts and respond appropriately.
		CO.3	Able to Communicate confidently in formal and informal contexts
EE106ES/ EE205ES	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	CO.1	Able to analyze and solve electrical circuits using network laws and theorems.
		CO.2	Able to identify and characterize diodes and various types of transistors
CH206BS	**ENGINEERING CHEMISTRY LAB**	CO.1	From a given discrete data, one will be able to predict the value of the data at an intermediate point and by curve fitting, can find the most appropriate formula for a guessed relation of the data variables. This method of analysis data helps engineers to understand the system for better interpretation decision making
		CO.2	After studying this unit one will be able to find a root of a given equation and will be able to find a numerical solution for a given differential equation
		CO.3	Helps in describing the system by an ODE, if possible. Also, suggests to find the solution as a first approximation.
		CO.4	One will be able to find the expansion of a given function by Fourier series and Fourier transform of the function.
		CO.5	Helps in phase transformation, phase change and attenuation coefficients in acoustics
		CO.6	After studying this unit, one will be able to find a corresponding partial differential equation for an unknown function with many independent variables and to find their solution
EN107HS/ EN207HS	**ENGLISH LANGUAGE COMMUNICATION**	CO.1	able to Better understanding of nuances of English language through audio- visual experience and group activities
		CO.2	able to Neutralization of accent for

Course Code	Course Title	Course Outcomes and Program Outcomes
	SKILLS LAB	intelligibility CO.3 Able to Speaking skills with clarity and confidence which in turn enhances their employability skills.
ME108ES/ ME208ES	**ENGINEERING WORKSHOP**	CO.1 Able to Study and practice on machine tools and their operations CO.2 Able to Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding. CO.3 Able to Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling. CO.4 Able to apply basic electrical engineering knowledge for house wiring practice
II BTECH I SEM		
MA301BS	**Mathematics - IV**	CO.1 Able to analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem CO.2 Able to find the Taylor's and Laurent's series expansion of complex functions CO.3 Able to the bilinear transformation CO.4 Able to express any periodic function in term of sines and cosines CO.5 Able to express a non-periodic function as integral representation CO.6 Able to analyze one dimensional wave and heat equation
ME304ES	**THERMODYNAMICS**	CO.1 Able to Understand and differentiate between different thermodynamic systems and processes. CO.2 Ableto Understand and apply the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis. CO.3 Able to Understand and analyze the Thermodynamic cycles and evaluate performance parameters.
ME302ES	**KINEMATICS OF MACHINERY**	CO.1 Able to give an idea about the relative motions obtained in four bar/slider crank/double slider crank/straight line

Course Code	Course Title	Course Outcomes and Program Outcomes
		motionmechanism of components used in mechanical Engineering.
ME305ES	**METALLURGY AND MATERIAL SCIENCE**	CO.1 Application of knowledge relating the composition, structure and processing of materials to their uses. The field encompasses the spectrum of materials that covers metals, ceramics, polymers, semiconductors, and combinations of materials or composites. CO.2 Able to investigate the relationship between structure of materials and their properties. It also includes elements of applied physics and chemistry, as well as chemical, mechanical, civil and electrical engineering CO.3 Able to understand the new developments such as nano-science and nanotechnology continue to propel materials science and engineering to the forefront of the studies (at many universities) around the world
ME303ES	**MECHANICS OF SOLIDS**	CO.1 Able to Analyze the behavior of the solid bodies subjected to various types of loading CO.2 Able to Apply knowledge of materials and structural elements to the analysis of simple structures CO.3 Able to Undertake problem identification, formulation and solution using a range of analytical methods CO.4 Able to Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams. CO.5 Expectation and capacity to undertake lifelong learning
ME306ES	**FUELS AND LUBRICANTS LAB**	Find the kinematic viscosity of fuels and its variation with temperature.
ME307ES	**MECHANICS OF SOLIDS LAB**	CO.1 Able to analyze the behavior of the solid bodies subjected to various types of loading. CO.2 Able to Apply knowledge of materials and structural elements to the analysis of simple structures.

Course Code	Course Title	Course Outcomes and Program Outcomes
		CO.3 Able to Undertake problem identification, formulation and solution using a range of analytical methods CO.4 Able to Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams. CO.5 Expectation and capacity to undertake lifelong learning
ME308ES	**METALLURGY AND MATERIAL SCIENCE LAB**	CO.1 The Primary focus of the Metallurgy and Material science program is to provide undergraduates with a fundamental knowledge based associated materials properties, CO.2 Students would have acquired and developed the necessary background and skills for successful careers in the materials-related industries. CO.3 After completing the program, the student should be well prepared for management positions in industry or continued education toward a graduate degree.
MC300HS	**GENDER SENSITIZATION LAB**	CO.1 Students will have developed a better understanding of important issues related to gender in contemporary India. CO.2 Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film CO.3 Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. CO.4 Students will acquire insight into the gendered division of labor and its relation to politics and economics. CO.5 Men and women students and professionals will be better equipped to work and live together as equals. CO.6 Students will develop a sense of appreciation of women in all walks of life.

Course Code	Course Title	Course Outcomes and Program Outcomes
II BTECH II SEM		
ME403ES	**DYNAMICS OF MACHINERY**	CO.1 Able to study the necessary data and have an idea while designing the various machine members like shafts, bearings, gears, belts & chains and various I.C.Engine Components & Machine tool parts
ME401ES	**FLUID MECHANICS AND HYDRAULIC MACHINES**	CO.1 Able to explain the effect of fluid properties on a flow system. CO.2 Able to identify type of fluid flow patterns and describe continuity equation. CO.3 To analyze a variety of practical fluid flow and measuring devices and utilize fluid Mechanics principles in design CO.4 To select and analyze an appropriate turbine with reference to given situation in power plants. CO.5 To estimate performance parameters of a given Centrifugal and Reciprocating pump. CO.6 Able to demonstrate boundary layer concepts.
ME404ES	**MACHINE DRAWING**	CO.1 Preparation of engineering and working drawings with dimensions and bill of material during design and development. CO.2 Developing assembly drawings using part drawings of machine components. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
ME405ES	**MANUFACTURING PROCESS**	CO.1 Able to understand the idea for selecting materials for patterns, Types and allowances of patterns used in casting and analyze the components of moulds. CO.2 Able to Design core, core print and gating system in metal casting processes Understand arc, gas, solid state and resistance welding processes CO.3 Able to Develop process-maps for metal forming processes using plasticity principles. CO.4 Able to Identify the effect of process variables to manufacture defect free products

Course Code	Course Title	Course Outcomes and Program Outcomes
SM405MS	**BUSINESS ECONOMICS AND FINANCIAL ANALYSIS**	CO.1 Able to understand the various Forms of Business and the impact of economic variables on the Business. CO.2 Able to analyze The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. CO.3 Able to study the firm's financial position by analyzing the Financial Statements of a Company
ME406ES	**KINEMATICS AND DYNAMICS LAB**	CO.1 Able to Understand types of motion CO.2 Able to Analyze forces and torques of components in linkages CO.3 Able to Understand static and dynamic balance CO.4 Able to Understand forward and inverse kinematics of open-loop mechanisms
ME407ES	**FLUID MECHANICS AND HYDRAULIC MACHINES LAB**	CO.1 Able to explain the effect of fluid properties on a flow system. CO.2 Able to identify type of fluid flow patterns and describe continuity equation. CO.3 Able to analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles in design. CO.4 Able to select and analyze an appropriate turbine with reference to given situation in power plants. CO.5 Able to estimate performance parameters of a given Centrifugal and Reciprocating pump CO.6 Able to demonstrate boundary layer concepts
ME408ES	**MANUFACTURING PROCESS LAB**	CO.1 Able to Understanding the properties of Moulding sands and pattern making. CO.2 Able to Fabricate joints using gas welding and arc welding. Evaluate the quality of welded joints. CO.3 Able to understand the Basic idea of press working tools and performs Moulding studies on plastics
MC400ES	**ENVIRONMENTAL SCIENCE & TECHNOLOGY**	CO.1 Able to understand the /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

Course Code	Course Title	Course Outcomes and Program Outcomes
III BTECH I SEM		
ME501PC	**DESIGN OF MACHINE MEMBERS - I**	CO.1 Able to acquire the knowledge about the principles of design, material selection, component behavior subjected to loads, and criteria of failure. CO.2 Able to Understand the concepts of principal stresses, stress concentration in machine members and fatigue loading CO.3 Able to Design on the basis of strength and rigidity and analyze the stresses and strains induced in a machine element.
ME502PC	**THERMAL ENGINEERING – I**	CO.1 Able to evaluate the performance of IC engines and compressors under the given operating conditions. CO.2 Able to Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles. CO.3 Able to Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance
ME503PC	**METROLOGY AND MACHINE TOOLS**	CO.1 Able to identify techniques to minimize the errors in measurement. CO.2 Able to Identify methods and devices for measurement of length, angle, gear & thread parameters, surface roughness and geometric features of parts CO.3 Able to understand working of lathe, shaper, planer, drilling, milling and grinding machines. CO.4 Able to Comprehend speed and feed mechanisms of machine tools CO.5 Able to Estimate machining times for machining operations on machine tools
SM504MS	**FUNDAMENTALS OF MANAGEMENT**	CO.1 Able to understand the significance of Management in their Profession. CO.2 Able to understand The various Management Functions like Planning, Organizing, Staffing, Leading,Motivation and Control aspects are learnt in this course. CO.3 Able to explore the Management Practices in

Course Code	Course Title	Course Outcomes and Program Outcomes
		their domain area.
MC500HS	**PROFESSIONAL ETHICS**	CO.1 Able to understand the importance of Values and Ethics in their personal lives and professional careers. CO.2 Able to understand learn the rights and responsibilities as an employee, team member and a global citizen
ME505PC	**THERMAL ENGINEERING LAB**	CO.1 Determine the valve timing diagram of SI engine & CI engine. CO.2 Analyze the influence of variations in TDC and BDC operations CO.3 Calculate the IP,BP, brake thermal efficiency CO.4 Calculate & Compare the performance characteristics CO.5 Apply the concept of Morse test on SI engine.(multi cylinder). CO.6 Determine the principle of various parameters in boilers.
ME506PC	**MACHINE TOOLS LAB**	CO.1 Understanding the properties of Moulding sands and pattern making CO.2 Fabricate joints using gas welding and arc welding. Evaluate the quality of welded joints CO.3 Basic idea of press working tools and performs Moulding studies on plastics. CO.4 Able to understanding patterns design and making CO.5 Able to understanding basic Physical, Chemical Properties of materials
ME507PC	**ENGINEERING METROLOGY LAB**	CO.1 Understanding the properties of Moulding sands and pattern making CO.2 Fabricate joints using gas welding and arc welding. Evaluate the quality of welded joints CO.3 Basic idea of press working tools and performs Moulding studies on plastics. CO.4 Able to understanding patterns design and making CO.5 Able to understanding basic Physical, Chemical Properties of materials

Course Code	Course Title	Course Outcomes and Program Outcomes
III BTECH II SEM		
ME601PC	**THERMAL ENGINEERING - II**	CO.1 Able to Develop state – space diagrams based on the schematic diagrams of process flow of steam and gas turbine plants CO.2 Able to Apply the laws of Thermodynamics to analyze thermodynamic cycles CO.3 Able to Differentiate between vapor power cycles and gas power cycles CO.4 Able to Infer from property charts and tables and to apply the data for the evaluation of performance parameters of the steam and gas turbine plants CO.5 Able to Understand the functionality of major components of steam and gas turbine plants and to do the analysis of these components
ME602PC	**DESIGN OF MACHINE MEMBERS - II**	CO.1 Able to Knowledge about journal bearing design using different empirical relations. CO.2 Able to Estimation of life of rolling element bearings and their selection for given service conditions CO.3 Able to Acquaintance with design of the components as per the standard, recommended procedures which is essential in design and development of machinery in industry.
ME603PC	**HEAT TRANSFER**	CO.1 Able to Understand the basic modes of heat transfer CO.2 Able to Compute one dimensional steady state heat transfer with and without heat generation CO.3 Able to Understand and analyze heat transfer through extended surfaces CO.4 Able to Understand one dimensional transient conduction heat transfer CO.5 Able to Understand concepts of continuity, momentum and energy equations CO.6 Able to Interpret and analyze forced and free convective heat transfer
NT603PC/	**FINITE ELEMENT METHODS**	CO.1 Able to Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer.

Course Code	Course Title	Course Outcomes and Program Outcomes
ME611PE		CO.2 Able to Formulate and solve problems in one dimensional structures including trusses, beams and frames. CO.3 Able to Formulate FE characteristic equations for two dimensional elements and analyze plain stress, plain strain, axi-symmetric and plate bending problems. CO.4 Able to Implement and solve the finite element formulations using MATLAB
ME612PE	**REFRIGERATION AND AIR CONDITIONING**	CO.1 Able to Differentiate between different types of refrigeration systems with respect to application as well as conventional and unconventional refrigeration systems. CO.2 Able to analyzethermodynamically refrigeration and air conditioning systems and evaluate performance parameters. CO.3 Able to apply the principles of Psychometrics to design the air conditioning loads for the industrial applications.
ME613PE	**MACHINE TOOL DESIGN**	CO.1 Able to Understand basic motions involved in a machine tool. Design machine tool structures. CO.2 Able to Design and analyze systems for specified speeds and feeds. Select subsystems for achieving high accuracy in machining. CO.3 Able to Understand control strategies for machine tool operations CO.4 Able to apply appropriate quality tests for quality assurance.
ME614PE	**IC ENGINES AND GAS TURBINES**	CO.1 Able to explain basic concepts of actual cycles with analysis and to describe the fundamental concepts of IC engines along with its working principles. CO.2 Able to describe the combustion phenomenon in SI and CI engines. CO.3 Able to evaluate the performance of IC engines and the importance of alternate fuels. CO.4 Able to classify the essential components of gas turbine along with its performance Improving methods. CO.5 Able to illustrate the working principle of

Course Code	Course Title	Course Outcomes and Program Outcomes
		different types of Jet propulsive engines and Rockets.
ME604PC	**HEAT TRANSFER LAB**	CO.1 Able to Perform steady state conduction experiments to estimate thermal conductivity of different materials CO.2 Able to Perform transient heat conduction experiment CO.3 Able to Estimate heat transfer coefficients in forced convection, free convection,condensation and correlate with theoretical values CO.4 Able to Obtain variation of temperature along the length of the pin fin under forced and free convection CO.5 Able to Perform radiation experiments: Determine surface emissivity of a test plate and Stefan- Boltzmann's constant and compare with theoretical value
ME605PC	**CADD and MAT LAB**	CO.1 Able to apply computer methods for solving a wide range of engineering problems CO.2 Able to use computer engineering software to solve and present problem solutions in a technical format. CO.3 Able to utilize computer skills to enhance learning and performance in other engineering and science courses. CO.4 Able to demonstrate professionalism in interactions with Colleagues, faculty, and staff
EN606HS	**ADVANCED ENGLISH COMMUNICATIONS SKILLS LAB**	CO.1 Able to Listen and speak effectively CO.2 Able to Develop proficiency in academic reading and writing CO.3 Able to Increase possibilities of job prospects CO.4 Able to Communicate confidently in formal and informal contexts

9. B. Tech-Civil Engineering: I, II, III & IV years

JNTUH-R16 Regulations

Code	Course Name	Course Outcomes
B. Tech. I Year I Semester		
MA101BS	MATHEMATICS – I	**At the end of this course, each student should be able to:** CO1. Write the matrix representation of a set of linear equations and to analyze solutions of system of equations. CO2. Find the Eigen values and Eigen vectors which come across under linear transformations. CO3. Find the extreme values of functions of two variables with/ without constraints. CO4. Identify whether the given first order DE is exact or not. CO5. Solve higher order DE's and apply them for solving some real world problems.
CH102BS/CH202BS	ENGINEERING CHEMISTRY	**At the end of this course, each student should be able to:** CO1. Gain the basic knowledge of electrochemical procedures related to corrosion and its control. CO2. Understand the basic properties of water and its usage in domestic and industrial purposes. CO3. Learn the use of fundamental principles to make predictions about the general properties of materials. CO4. Predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.
PH103BS	ENGINEERING PHYSICS / ENGINEERING PHYSICS -I	**At the end of this course, each student should be able to:** CO1. Realize the importance of light phenomena in thin films and resolution CO2. Learn principle, working of various laser systems and light propagation through optical fibers. CO3. Distinguish various crystal systems and understand atomic packing factor. CO4. Know the various defects in crystals.

Code	Course Name	Course Outcomes
EN104HS/EN204HS	PROFESSIONAL COMMUNICATION IN ENGLISH	**At the end of this course, each student should be able to** CO1. Use English Language effectively in spoken and written forms CO2. Comprehend the given texts and respond appropriately. CO3. Communicate confidently in formal and informal contexts.
ME105ES	ENGINEERING MECHANICS	**At the end of this course, each student should be able to** CO1. Understand the resolving forces and moments for a given force system CO2. Analyze the types of friction for moving bodies and problems related to friction. CO3. Determine the centroid and second moment of area
EE106ES/EE205ES	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	**At the end of this course, each student should be able to** CO1. Analyze and solve problems of electrical circuits using network laws and theorems. CO2. Identify and characterize diodes and various types of transistors.
EN107HS/EN207HS	ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB	**At the end of this course, each student should be able to** CO1. Better understanding of nuances of English language through audio- visual experience and group activities CO2. Neutralization of accent for intelligibility CO3. Speaking skills with clarity and confidence which in turn enhances their employability skills.
ME108ES/ME208ES	ENGINEERING WORKSHOP	**At the end of this course, each student should be able to:** CO1. Study and practice on machine tools and their operations CO2. Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding. CO3. Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling. CO4. Apply basic electrical engineering knowledge for house wiring practice.

Code	Course Name	Course Outcomes
B. Tech. I Year II Semester		
PH201BS	ENGINEERING PHYSICS - II	**At the end of this course, each student should be able to:** CO1. Realize the importance of behavior of a particle quantum mechanically. CO2. Learn concentration estimation of charge carriers in semi conductors. CO3. Learn various magnetic dielectric properties and apply them in engineering applications CO4. Know the basic principles and applications of super conductors.
MA102BS/MA202BS	MATHEMATICS - II	**At the end of this course, each student should be able to:** CO1. Use Laplace transform techniques for solving DE's CO2. Evaluate integrals using Beta and Gamma functions CO3. Evaluate multiple integrals and can apply these concepts to find areas, volumes, moment of inertia etc of regions on a plane or in space. CO4. Evaluate the line, surface and volume integrals and converting them from one to another.
MA203BS	Mathematics - III	**At the end of this course, each student should be able to:** CO1. Differentiate among random variables involved in the probability models which are useful for all branches of engineering CO2. Calculate mean, proportions and variances of sampling distributions and to make important decisions s for few samples which are taken from a large data CO3. Solve the tests of ANOVA for classified data CO4. Find the root of a given equation and solution of a system of equations CO5. Fit a curve for a given data CO6. Find the numerical solutions for a given first order initial value problem

Code	Course Name	Course Outcomes
CS104ES/CS204ES	COMPUTER PROGRAMMING IN C	**At the end of this course, each student should be able to:** CO1. Demonstrate the basic knowledge of computer hardware and software. CO2. Write algorithms for solving problems. CO3. Draw flowcharts for solving problems CO4. Code a given logic in C programming language. CO5. Gain knowledge in using C language for solving problems.
ME106ES/ME205ES	ENGINEERING GRAPHICS	**At the end of this course, each student should be able to:** CO1. Ability to prepare working drawings to communicate the ideas and information. CO2. Ability to read, understand and interpret engineering drawings.
CH206BS	ENGINEERING CHEMISTRY LAB	**At the end of this course, each student should be able to:** CO1. Develop experimental skills to design new experiments in Engineering. c. Exposure to these experiments the student can compare the theory and correlate with experiment. CO2. Estimate the number of free ions, charge & mobility of ions in the mixture of acids using conductivity meter and also gets an idea about titrations without using any indicator. CO3. Determine the presence and quantity of impurities in water and he can estimate amount of metal in metalores.
PH107BS/PH207BS	ENGINEERING PHYSICS LAB	**At the end of this course, each student should be able to:** CO1. Understand the concept of error and its analysis. CO2. Compare the theory and correlate with experiment. CO3. Understand the applications of physics experiments in day to day life.
CS108ES/CS208ES	COMPUTER PROGRAMMING IN C LAB	**At the end of this course, each student should be able to:** CO1. Design and test programs to solve mathematical and scientific problems. CO2. Write structured programs using control structures and functions.

Code	Course Name	Course Outcomes
B. Tech. II Year I Semester		
MA301BS	MATHEMATICS - IV	**At the end of this course, each student should be able to:** CO1. Analyze the complex functions with reference to their analyticity integration using Cauchy's integral theorem. CO2. Find the Taylor's and Laurent's series expansion of complex functions CO3. Express any periodic function in term of sines and cosines CO4. Express a non-periodic function as integral representation CO5. Analyze one dimensional wave and heat equation
CS302ES	STRENGTH OF MATERIALS - I	**At the end of this course, each student should be able to:** CO1. Analyze the statically determinate and indeterminate problems. CO2. Determine the stresses and strains in the members subjected to axial, bending. CO3. Evaluate the slope and deflection of beams subjected to loads. CO4. Determine the principal stresses and strains in structural members
CE303ES	FLUID MECHANICS - I	**At the end of this course, each student should be able to:** CO1. Apply conservation laws to derive governing equations of fluid flows. CO2. Compute hydrostatic and hydrodynamic forces. CO3. Analyze and design simple pipe systems. CO4. Apply principles of dimensional analysis to design experiments. CO5. Compute drag and lift coefficients.
CE304ES	BUILDING MATERIALS, CONSTRUCTION AND PLANNING	**At the end of this course, each student should be able to:** CO1. Define the Basic terminology that is used in the industry. CO2. Categorize different building materials, properties and their uses. CO3. Understand the Prevention of damage measures and good workmanship CO4. Explain different building services

Code	Course Name	Course Outcomes
CE305ES	SURVEYING	**At the end of this course, each student should be able to:** CO1. Calculate angles, distances and levels**.** CO2. Identify data collection methods and prepare field notes. CO3. Understand the working principles of survey instruments**.** CO4. Estimate measurement errors and apply corrections CO5. Interpret survey data and compute areas and volumes
CE306ES	STRENGTH OF MATERIALS LAB	**At the end of this course, each student should be able to:** CO1. Conduct tension test on Materials like steel etc. CO2. Conduct compression tests on spring, wood and concrete. CO3. Conduct flexural and torsion test to determine elastic constants CO4. Determine hardness of metals
CE307ES	COMPUTER AIDED DRAFTING LAB	**At the end of this course, each student should be able to:** CO1. Master the usage of AutoCAD commands for drawing 2D & 3D building drawings required for different civil engineering applications CO2. Introduction to computer aided drafting Software for CAD- Introduction to different softwares CO3. Practice exercises on CAD software CO4. Drawing of plans of buildings using software a) Single storied buildings b) multi storied buildings CO5. Developing sections and elevations for a) Single storied buildings b) multi storied buildings CO6. Detailing of building components like Doors, Windows, Roof Trusses etc. using CAD softwares CO7. Exercises on development of working drawings of buildings.

Code	Course Name	Course Outcomes
CE308ES	SURVEYING LAB – I	**At the end of this course, each student should be able to:** CO1. Surveying of an area by chain survey (closed traverse) & plotting. CO2. Chaining across obstacles CO3. Determine of distance between two inaccessible points with compass CO4. Survey of a given area by prismatic compass (closed traverse) and plotting after adjustment. CO5. Radiation method, intersection methods by plane table survey. CO6. Two point and three point problems in plane table survey. CO7. Levelling – Longitudinal and cross-section and plotting CO8. Trigonometric leveling using theodolite CO9. Height and distances using principles of tacheometric surveying CO10. a) Measurement of Horizontal angle & vertical angle. b) Distance between inaccessible point by theodolite.

Code	Course Name	Course Outcomes
MC300HS	GENDER SENSITIZATION LAB	**At the end of this course, each student should be able to:** CO1. Students will have developed a better understanding of important issues related to gender in contemporary India. CO2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film. CO3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. CO4. Students will acquire insight into the gendered division of labour and its relation to politics and economics. CO5. Men and women students and professionals will be better equipped to work and live together as equals. CO6. Students will develop a sense of appreciation of women in all walks of life. CO7. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.
B. Tech. II Year II Semester		
CE401ES	STRENGTH OF MATERIALS – II	**At the end of this course, each student should be able to:** CO1. Determine stresses in the member subjected to Torsion CO2. Analyze columns and struts CO3. Understand the concept of direct and bending stresses CO4. Analyze and design springs, thin and thick cylinders CO5. Understand the concept of unsymmetrical bending.

Code	Course Name	Course Outcomes
CE402ES	FLUID MECHANICS - II	**At the end of this course, each student should be able to:** CO1. Understand the concepts o channel flows. CO2. Compute flow profiles in channel transitions and analyze hydraulic transients CO3. Design the working proportions of hydraulic machines
CE403ES	STRUCTURAL ANALYSIS	**At the end of this course, each student should be able to:** CO1. Analyze Perfect, Imperfect And Redundant Frames. CO2. Formulate Equilibrium and compatibility equations for structural members CO3. Analyze one dimensional and two dimensional problems using classical methods CO4. Analyze indeterminate structures CO5. Analyze structures for gravity loads, moving loads and lateral loads
CV404ES	ENGINEERING GEOLOGY	**At the end of this course, each student should be able to:** CO1. Understand weathering process and mass movement CO2. Distinguish geological formations CO3. Identify geological structures and processes for rock mass quality CO4. Identify subsurface information and groundwater potential sites through geophysical investigations. CO5. Apply geological principles for mitigation of natural hazards and select sites for dams and tunnels
SM405ES	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS	**At the end of this course, each student should be able to:** CO1. Understand the various Forms of Business and the impact of economic variables on the Business. CO2. Learnt the Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. CO3. Study the firm's financial position by analyzing the Financial Statements of a Company.

Code	Course Name	Course Outcomes
CE406ES	FLUID MECHANICS LAB	**At the end of this course, each student should be able to:** CO1. Determine coefficient of discharge for orifice and mouthpiece. CO2. Calibrate notches venturimeter orifice meters CO3. Determine miner losses in pipes
CE408ES	SURVEYING - II LAB	**At the end of this course, each student should be able to:** CO1. Determine of area using total station CO2. Traversing using total station CO3. Contouring using total station CO4. Determination of remote height using total station CO5. Stake out using total station CO6. Distance, gradient, differential height between two inaccessible points using total station. CO7. Curve settling using total station CO8. Resection using total station CO9. Setting out works for buildings and pipe lines CO10. Finding position of stations using G.P.S
CV407ES	ENGINEERING GEOLOGY LAB	**At the end of this course, each student should be able to:** CO1. Study of physical properties and identification of minerals referred under theory. CO2. Megascopic description and identification of rocks referred under theory. CO3. Microscopic study of rocks. CO4. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc. CO5. Simple Structural Geology problems. CO6. Electrical resistivity meter.
MC400ES	ENVIRONMENTAL SCIENCE AND TECHNOLOGY	**At the end of this course, each student should be able to:** CO1. Understanding the importance of ecological balance for sustainable development. CO2. Understanding the impacts of developmental activities and mitigation measures CO3. Understanding the environmental policies and regulations

Code	Course Name	Course Outcomes
B. Tech. III Year I Semester		
CE501PC	CONCRETE TECHNOLOGY	**At the end of this course, each student should be able to:** CO1. Identify Quality Control tests on concrete making materials CO2. Understand the behavior of fresh and hardened concrete CO3. Design concrete mixes as per IS and ACI codes CO4. Understand the durability requirements of concrete CO5. Understand the need for special concretes
CE502PC	DESIGN OF REINFORCED CONCRETE STRUCTURES	**At the end of this course, each student should be able to:** CO1. Design RC Structural elements CO2. Design the Reinforced Concrete beams using limit state Design CO3. Design Reinforced Concrete slabs CO4. Design the Reinforced Concrete Columns and footings CO5. Design structures for serviceability CO6. Design staircases, canopy
CE503PC	WATER RESOURCES ENGINEERING	**At the end of this course, each student should be able to:** CO1. Analyze hydro-meteorological data CO2. Estimate abstractions from precipitation CO3. Compute yield from surface and subsurface basin CO4. Develop rainfall-runoff models CO5. Formulate and solve hydrologic flood routing models CO6. Estimate runoff, design discharge from catchment
SM504MS	FUNDAMENTALS OF MANAGEMENT	**At the end of this course, each student should be able to** CO1. The students understand the significance of Management in their Profession. CO2. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. CO3. The students can explore the Management Practices in their domain area.

Code	Course Name	Course Outcomes
CE505PC	CONCRETE TECHNOLOGY LAB	**At the end of this course, each student should be able to** CO1. Understand properties of concrete material, behavior of concrete CO2. Understand properties of fresh & hardened concrete
CE506PC	GEOGRAPHICAL INFORMATION SYSTEMS LAB	**At the end of this course, each student should be able to** CO1. The students will be exposed to spatial technologies. CO2. Will be able to map the field problems and solution convergence through GIS.
CE507PC	HYDRAULICS AND HYDRAULIC MACHINERY LAB	**At the end of this course, each student should be able to** CO1. Compute drag coefficients CO2. Test the performance of pumps and turbines CO3. Determine Manning's and Chezy's coefficients for smooth and rough channels CO4. Determine Energy loss in Hydraulic jump and Calibrate standing wave flume
MC500HS	PROFESSIONAL ETHICS	**At the end of this course, each student should be able to:** CO1. The students will understand the importance of Values and Ethics in their personal lives and professional careers. CO2. The students will learn the rights and responsibilities as an employee, team member and a global citizen.
B. Tech. III Year II Semester		
CE601PC	DESIGN OF STEEL STRUCTURES	**At the end of this course, each student should be able to:** CO1. Design tension and compression members CO2. Design beams and beam columns CO3. Design bolt and weld connections CO4. Design built up members and Column base CO5. Design of plate girders and Roof Trusses
CE602PC	ENVIRONMENTAL ENGINEERING	**At the end of this course, each student should be able to:** CO1. Analyze characteristics of water and wastewater CO2. Estimate the quantity of drinking water and domestic wastewater generated CO3. Design components of water supply systems Design sewerage system

Code	Course Name	Course Outcomes
CE603PC	SOIL MECHANICS	**At the end of this course, each student should be able to:** CO1. Understand the mechanism Behavior of Soil for different loads and from Soil Condition CO2. Determine properties of soil
CE611PE	AIR POLLUTION AND CONTROL	**At the end of this course, each student should be able to:** CO1. Identify sampling and analysis techniques for air quality assessment CO2. Describe the plume behavior for atmospheric stability conditions CO3. Able to control air pollution by properties various techniques to control
CE604PC	SOIL MECHANICS LAB	**At the end of this course, each student should be able to:** CO1. Classify and evaluate the behavior of the soils subjected to various loads.
CE605PC	COMPUTER AIDED DRAFTING – II LAB	**At the end of this course, each student should be able to:** CO1. Student can draft various structures CO2. Detailing of reinforcement in Cantilever, Simply supported and Continuous Beams (Both Singly & Doubly Reinforced Beams) CO3. Detailing of reinforcement in canopy & columns (both uniaxial & biaxial) CO4. Detailing of reinforcement in RC isolated footings square, rectangular, circular and combined footings. CO5. Detailing of reinforcement in RC one-way, two-way slabs and dog-legged staircases. CO6. Drawing of Steel bolted and welded connections. CO7. Drawing of steel compression and tension members. CO8. Drafting of steel beams-built-up sections. CO9. Drafting of steel plate girder CO10. Drafting of steel roof truss.

Code	Course Name	Course Outcomes
EN606HS	ADVANCED ENGLISH COMMUNICATION SKILLS (AECS) LAB	**At the end of this course, each student should be able to:** CO1. Acquire vocabulary and use it contextually CO2. Listen and speak effectively CO3. Develop proficiency in academic reading and writing CO4. Increase possibilities of job prospects CO5. Communicate confidently in formal and informal contexts
B. Tech. IV Year I Semester		
CE701PC	TRANSPORTATION ENGINEERING	**At the end of this course, each student should be able to:** CO1. Understand Plan highway networks CO2. Design highway geometrics. CO3. Design Intersections and prepare traffic management plans. CO4. Design flexible and rigid pavements.
CE702PC	ESTIMATION, QUANTITY SURVEYING AND VALUATION	**At the end of this course, each student should be able to:** CO1. Do estimation of Buildings, Roads and Canals. CO2. Understand contracts and specification.
CE723PE	FOUNDATION ENGINEERING	**At the end of this course, each student should be able to:** CO1. Check the stability of slopes CO2. Analyze and design the shallow and pile foundations. CO3. Analyze and design earth retaining structures.
CE731PE	WATERSHED MANAGEMENT	**At the end of this course, each student should be able to:** CO1. Identify causes of soil erosion CO2. Plan and design soil conservation measures in a watershed CO3. Plan and design water harvesting and groundwater recharge structures CO4. Plan measures for reclamation of saline soils

Code	Course Name	Course Outcomes
CE741PE	TRAFFIC ENGINEERING	**At the end of this course, each student should be able to:** CO1. Understand basics principles of Traffic Engineering CO2. Analyze parking data and model accidents CO3. Determine capacity and LOS. CO4. To provide engineering techniques to achieve Safe and efficient movement of people and goods on roadways
CE703PC	TRANSPORTATION ENGINEERING LAB	**At the end of this course, each student should be able to:** CO1. Asses for Highway construction properties of highway materials CO2. Study the various traffic trends.
CE704PC	ENVIRONMENTAL ENGINEERING LAB	**At the end of this course, each student should be able to:** CO1. Students will able to find various properties of water.
B. Tech. IV Year II Semester		
CE852PE	PAVEMENT DESIGN	**At the end of this course, each student should be able to:** CO1. Characterize the response characteristics of soil, aggregate, asphalt, and asphalt mixes CO2. Analyze flexible pavements CO3. Analyze rigid pavements CO4. Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods CO5. Design a rigid pavement using IRC, and AASHTO methods
CE864PE	INDUSTRIAL WASTE WATER TREATMENT	**At the end of this course, each student should be able to:** CO1. Identify the characteristics of industrial wastewaters. CO2. Describe pollution effects of disposal of industrial effluent. CO3. Identify and design treatment options for industrial wastewater CO4. Formulate environmental management plan
MT831OE/ME853PE	RENEWABLE ENERGY SOURCES	**At the end of this course, each student should be able to:** CO1. Understanding of renewable energy sources CO2. Knowledge of working principle of various energy systems CO3. Capability to carry out basic design of renewable energy systems

10. M. Tech-Computer Science and Engineering: I & II – Semester
JNTUH-R17 Regulations

Code	Course Name	Course Outcomes
M. Tech. I Year I Semester		
PC-1	Advanced Algorithms	CO1. To Understand the fundamental design, analysis, and implementation of basic data structures. CO2. To Know the Basic concepts in the specification and analysis of programs. CO3. To Understand the Principles for good program design, especially the uses of data abstraction. CO4. To Design the Significance of algorithms in the computer field. CO5. To Illustrate the Various aspects of algorithm development
PC-2	Computer Networking	CO1. Understand the concepts of Computer Communications and Networking Techniques CO2. To understand networking models ,multiplexing and switching CO3. To analyze the data signals and analog signals CO4. To Understand the Physical and Data Link Layers CO5. To understand the network layer hardware components like switches, bridges and routers.

Code	Course Name	Course Outcomes
PC-3	Software Engineering	CO1. To Illustrate the Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD). CO2. To Identify and apply appropriate software architectures and patterns to carry out high level design of a system and be able to critically compare alternative choices. CO3. To have an Hands – on experience and/or awareness of testing problems and will be able to develop a simple testing report CO4. To know the benefits of applying Predictive Analytics to Software CO5. To know the concepts of Quality control of management
PE-1	Network Security and Cryptography	CO1. To Understand the basic categories of threats to computers and networks CO2. Understand various cryptographic algorithms. CO3. Describe public-key cryptosystem. CO4. Describe the enhancements made to IPv4 by IPSec CO5. Understand Intrusions and intrusion detection CO6. Discuss the fundamental ideas of public-key cryptography.
PE-2	Software Architecture and Design Patterns	CO1. To understand the concept of patterns and the Catalog. CO2. To discuss the Presentation tier design patterns and their affect on: sessions, client access, validation, and consistency. CO3. To understand the variety of implemented bad practices related to the Business and Integration tiers. CO4. To highlight the evolution of patterns. CO5. To how to add functionality to designs while minimizing complexity CO6. To learn about specific design patterns.

Code	Course Name	Course Outcomes
OE-1	Principles of Computer Communication and Networks	CO1. Students should be understand and explore the basics of Computer Networks and Various Protocols. CO2. Understand the World Wide Web Concepts. CO3. Students will be in a position to administrate a network and flow of information further he/she can understand easily the concepts of network security, Mobile and ad hoc networks. CO4. Understand the 4G Technological Concepts. CO5. Students should be understand and explore the basics of Routers and Routing Algorithms.
Laboratory I	Advanced Algorithms Lab	CO1. Ability to Find the fundamental design, analysis, and implementation of basic data structures CO2. Defining the Basic concepts in the specification and analysis of programs. CO3. Able to find the Principles for good program design, especially the uses of data abstraction.
M. Tech. I Year II Semester		
PC-4	Network Programming	CO1. To understand to Linux utilities CO2. To understand file handling, signals CO3. To understand IPC, network programming in Java CO4. To understand processes to communicate with each other across a Computer Network CO5. To understand the Computer Network Protocol Management.
PC-5	Distributed Systems and Cloud Computing	CO1. To explain the evolving computer model called cloud computing. CO2. To introduce the various levels of services that can be achieved by cloud. CO3. To describe the security aspects in cloud. CO4. To Define the Network Models CO5. To understand the Distributed Cluster Environment.

Code	Course Name	Course Outcomes
PC-6	Theory of Computation	CO1. Able to understand the concept of abstract machines and their power to recognize the languages. CO2. Able to employ finite state machines for modeling and solving computing problems. CO3. Able to design context free grammars for formal languages. CO4. Able to distinguish between decidability and undecidability. CO5. Able to gain proficiency with mathematical tools and formal methods.
PE-3	Data Warehousing and Data Mining	CO1. To develop the abilities of critical analysis to data mining systems and applications CO2. To implement practical and theoretical understanding of the technologies for data mining CO3. To understand the strengths and limitations of various data mining models; CO4. To understand the limitations of various Predictive models; CO5. To understand the Data Mining tools;
PE-4	Big Data Analytics	CO1. To understand about big data CO2. To learn the analytics of Big Data CO3. To Understand the MapReduce fundamentals CO4. To Understand the method for the development of missing values reduction CO5. To Understand the Removal algorithms for NaN

Code	Course Name	Course Outcomes
Laboratory II	Internet Technologies and Services Lab	CO1. Write syntactically correct HTTP messages and describe the semantics of common HTTP methods and header fields CO2. Discuss differences between URIs, URNs, and URLs, and demonstrate a detailed understanding of http-scheme URLs, both relative and absolute CO3. Describe the actions, including those related to the cache, performed by a browser in the process of visiting a Web address CO4. Install a web server and perform basic administrative procedures, such as tuning communication parameters, denying access to certain domains, and interpreting an access log CO5. Write a valid standards-conformant HTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms

11. M.Tech-Wireless Technology (WT)/ Wireless & Mobile Communication(WMC): I & II Years

JNTUH-R17 Regulations

I - SEMESTER	
PC-1	**Wireless Communications & Networks**
CO1	Discuss about wireless components and wireless networks.
CO2	Describe System architecture and medium access control protocols.
CO3	Explain Mobile IP and mobile Adhoc networks.
CO4	Compare different transport layer protocols.
CO5	Analyze requirements of digital audio and video broadcasting for high-speed internet access.
PC-2	**Random Processes and Time Series Analysis**
CO1	Solve single, multiple random variables and their operations.
CO2	**Develop the analysis of time and spectral characteristics of random process.**
CO3	**Analyze the concept and application of Markov chains in theanalysis of random signals.**
CO4	Describe the concept of Series representation of random process.
CO5	**Discuss about different types of queuing techniques and their applications in random processes.**
PC-3	**Advanced Data Communications**
CO1	Understand the concepts of the OSI reference model, ATM and TCP- IP reference model.
CO2	Gain the Knowledge about data link layers protocols.
CO3	Get complete knowledge on different routing algorithms in Network.
CO4	Understand the traffic control and congestion management
CO5	Get knowledge on Network administration and Network security

PE-1	**Coding Theory and Techniques**
CO1	Apply Linear block codes with error correction and error detection.
CO2	Develop the concepts of cyclic codes
CO3	Apply convolution codes for performance analysis
CO4	Acquire the basics of burst error correcting codes and convolutional codes
CO5	Design BCH codes for for channel performance improvement against burst errors
PE-2	**TCP/IP Internetworking**
CO1	Analyse the MAC layer protocol statistics.
CO2	Implement the routing algorithms for data networks.
CO3	Identify the ATM and VPN architectures.
CO4	Comprehend the network security, IPsec and Firewall principles.
CO5	Understand Mobile Transport Layer.
OE-1	**Machine Learning**
CO1	Understand the concepts of computational intelligence like machine learning.
CO2	Ability to get the skill to apply machine learning techniques to address the real time problems in different areas.
CO3	Understand the Neural Networks and its usage in machine learning application.
CO4	Understand computational learning theory
CO5	Understand the pattern comparison techniques.
Sem-1	**Seminar**
CO1	Survey on latest developments in core technical domain.
CO2	Develop audience centric presentation.
CO3	Adapt effective report writing skills.

Lab	**Wireless Communications and Networks Lab**
CO1	Implement the advanced digital modulation techniques.
CO2	Design Convolutional encoder and decoder for error control coding techniques.
CO3	Calculate path loss for Free space, Okumura and Hata models for outdoor propagation.
II SEMESTER	
PC-4	**Advanced Communication Systems**
CO1	To demonstrate various digital modulation techniques.
CO2	To design basic and advanced coding for a digital communication system.
CO3	To use base band signal conditioning methods involved for exploiting channel.
CO4	To Understand clearly about equalization fundamentals.
CO5	To Understand the basic concepts and characteristics of Turbo Coding.
PC-5	**Spread Spectrum Communications**
CO1	Describe the types and advantages of spread spectrum modulation formats.
CO2	Perform analysis on the performance of spread spectrum modulation formats.
CO3	Describe the differences and benefits of different types of spreading codes.
CO4	Analyze the performance of spread spectrum systems in the presence of interference.
CO5	Analyze the performance of spreading code acquisition and tracking circuits.
PC-6	**Adhoc Wireless Networks**
CO1	Understand the basics of mobile ADHOC networks.
CO2	Got the knowledge of MAC and network protocols.
CO3	Realize the need for security and challenges.
CO4	Understand the role of cross layer design in enhancing the network performance.
CO5	Know the Integration of ad hoc network with other wired and wireless networks.

PE-3	**Wireless LANs and PANs**
CO1	Analyze the design considerations of wireless MAC layer.
CO2	Formulate wireless network planning and operation techniques.
CO3	Discuss various WLAN and WWAN standards.
CO4	Analyze the design considerations of wireless networks.
CO5	Compare various wireless networks based on its performance.
PE-4	**3G Netrworks**
CO1	Understand the concepts of wireless communication.
CO2	Acquire knowledge about the various propagation methods and Channel models.
CO3	Have an enhanced understanding of various transceivers and its multiple access schemes.
CO4	Gain knowledge in Energy Management Technology
CO5	Understand the fundamentals of Security in WSN
OE-2	**Machine Learning**
CO1	Understand the concepts of computational intelligence like machine learning.
CO2	Ability to get the skill to apply machine learning techniques to address the real time problems in different areas.
CO3	Understand the Neural Networks and its usage in machine learning application.
CO4	Understand computational learning theory
CO5	Understand the pattern comparison techniques.
Sem-2	**Seminar-II**
CO1	Survey on latest developments in core technical domain.
CO2	Develop audience centric presentation.
CO3	Adapt effective report writing skills.

Lab	Advanced Communications Lab
CO1	Determine specifications, design, construct and test antenna.
CO2	Explore and use tools for designing, analyzing and testing antennas.
CO3	Antenna design and analysis software, network analyzers, spectrum analyzers, and antenna pattern measurement techniques.

12. M. Tech-VLSI: I & II Years
JNTUH-R17 Regulations

M.Tech (VLSI) I SEMESTER	
PC-1	**Advanced Digital System Design**
CO1	Examine CAMP Algorithms for minimizing the complexity of digital system design.
CO2	Simplify digital circuits using PLA minimization algorithm and PLA folding algorithm
CO3	Construct digital circuits using CPLDs, FPGAs and ASICs.
CO4	Analyze the functionality of combinational circuits using different fault diagnosis & test methods.
CO5	Analyze the testing aspects and fault diagnosis methods of sequential circuits.
PC-2	**Device Modeling**
CO1	Apply basic equations like Poisson's equations, continuity equation etc. for the operation of semiconductor devices.
CO2	Explain the current-voltage characteristics and switching characteristics of p-n junctions with the use of mathematical equations.
CO3	Model low frequency and high frequency capacitance-voltage characteristics and other depletion effects on device performance.
CO4	Derive bipolar device models for circuit and time-dependent analysis.
CO5	Differentiate between long-channel and short-channel MOSFETs on the basis of characteristics and non-linear parameters.

PC-3	**CMOS Analog Integrated Circuit Design**
CO1	Demonstrate the small signal and large signal models of CMOS transistors in different frequencies.
CO2	Analyze the characteristics of different CMOS circuits.
CO3	Develop the two stage CMOS operational amplifiers.
CO4	Analyze different comparators and their performance parameters.
CO5	Develop the basic circuits based on the knowledge acquired in the course.
PE-1	**VLSI Technology**
CO1	Summarize the fundamental concepts of VLSI technology including both fabrication process and basic design elements.
CO2	Analyze the various VLSI design technologies and design issues.
CO3	Analyze the electrical properties, basic circuit concepts and scaling of the MOS devices.
CO4	Develop a subsystem design process for VLSI circuits.
CO5	Choose various floor planning methods for architecture design.
PE-2	**Embedded System Design**
CO1	Describe the differences between the general computing system and the embedded system.
CO2	Analyze the hardware components, processor performance of an embedded system design.
CO3	Make use of operating systems and embedded programming languages to develop a real-time system.
CO4	Utilize modern development tools, CAD tools for integrating software and hardware components in embedded system designs.
CO5	Design an embedded system by understanding the various processor architectures case studies along with its applications.
OE-1	**Renewable Energy Systems**
CO1	Understand technologies for generation of energy from solid waste.

CO2	Compare methods of solid waste disposal.
CO3	Identify sources of energy from bio-chemical conversion.
CO4	Analyze methods for management of e-waste.
CO5	Analyse biogas production methods and recycling of e-waste.
Sem-1	**Seminar**
CO1	Survey on latest developments in core technical domain.
CO2	Develop audience centric presentation.
CO3	Adapt effective report writing skills.
Lab	**Digital IC Design Lab**
CO1	Design CMOS Logic gates using Pyxis Schematic Editor.
CO2	Model digital modules using VHDL/Verilog and Simulate.
CO3	Verify Implementation of Digital Design on FPGA Board.
II SEMESTER	
PC-4	**Low Power VLSI Design**
CO1	Use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits.
CO2	Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.
CO3	Compare the different low power VLSI Design techniques that are available to design an Integrated Circuit for commercial applications
CO4	Analyze CMOS circuit by knowing the characteristics of various CMOS technologies and processes.
CO5	Develop a VLSI project having a set of objective criteria and design constraints.

PC-5	**Design for Testability**
CO1	Apply the fundamental concepts of Testing in VLSI design.
CO2	Apply simulation algorithms for verification and validation.
CO3	Evaluate a digital system using Testability Measures.
CO4	Develop skills in the modelling of BIST Architecture and Memory BIST.
CO5	Assess logic and technology-septic parameters in Boundary Scan Standards
PC-6	**CMOS Mixed Signal Circuit Design**
CO1	Apply the knowledge of basic sciences and engineering to design CMOS analog and digital circuits.
CO2	Analyze the concepts of basic topology in Phase locked loops.
CO3	Illustrate the fundamentals of different types of data converters.
CO4	Design flash converters, successive approximation type and pipelined converters.
CO5	Analyze delta sigma modulators, noise shaping data converting circuits using filters.
PE-3	**Verilog Hardware Description Language**
CO1	Interpret the HDL design styles, data types to implement the basic digital circuits.
CO2	Analyze the basic logic circuits in Xilinx tool.
CO3	Apply the HDL knowledge to implement combinational and sequential digital circuits.
CO4	Make use of the Xilinx tool Knowledge to synthesis the combinational and sequential circuits.
CO5	Test for the functionality of digital circuit by using various fault models.
PE-4	**RF IC Design**
CO1	Understand the design bottlenecks specific to RF IC design, linearity related issues, ISI
CO2	Identify noise sources, develop noise models for the devices and systems
CO3	Specify noise and interference performance metrics like noise figure, IIP3 and different matching criteria.

CO4	Comprehend different multiple access techniques, wireless standards and various transceiver architectures
CO5	Design various constituents blocks of RF receiver front end.
OE-2	**Engineering Research Methodology**
CO1	Define the research problem.
CO2	Comprehend the importance of literature survey.
CO3	Understand different research designs.
CO4	Study data analysis using different techniques.
CO5	Prepare research report writing.
Sem-2	**Seminar-II**
CO1	Survey on latest developments in core technical domain.
CO2	Develop audience centric presentation.
CO3	Adapt effective report writing skills.
Lab	**Analog IC Design Lab**
CO1	Design basic building blocks of analog VLSI Chips
CO2	Design cascade amplifier using CMOS Technology
CO3	Design operational Trans-conductance amplifier (OTA) using CMOS Technology
OE-1	**Machine Learning**
CO1	Understand the concepts of computational intelligence like machine learning.
CO2	Ability to get the skill to apply machine learning techniques to address the real time problems in different areas.
CO3	Understand the Neural Networks and its usage in machine learning application.
CO4	Understand computational learning theory
CO5	Understand the pattern comparison techniques.

13. M. Tech-Embedded Systems: I & II Years
JNTUH-R17 Regulations

Code	Course Name	Course Outcomes
M. Tech. I Year I Semester		
PC-1	Embedded System Design	1. Describe the differences between the general computing system and the embedded system. 2. Analyze the hardware components, processor performance of an embedded system design. 3. Make use of operating systems and embedded programming languages to develop a real-time system. 4. Utilize modern development tools, CAD tools for integrating software and hardware components in embedded system designs. 5. Design an embedded system by understanding the various processor architectures case studies along with its applications.
PC-2	ARM Processor Architectures	1.Understand the architecture, ISA, programming, and interface requirements of a commercially 32-bit microprocessor. 2. Analyze and design to interface a microprocessor to displays, memories, ports, serial ports (USART, SPI, I2C), etc. 3. Apply 32-microprocessor systems (ARM) to solve real-time problems like timers, counters, A2D, Motors, etc. 4. Learn to use assemblers, compilers, simulators and emulators to help with design and verification for ARM processors. 5. Develop closed and open embedded/Linux based systems for ARM processors.
PC-3	Real Time Operating Systems	1. Enumerate the need and the challenges in the design of hard and soft real time systems.

		2. Compare different scheduling algorithms and the schedulability criteria. 3. Determine schedulability of a set of periodic tasks given a scheduling algorithm. 4. Develop algorithms to decide the admission criterion of sporadic jobs and the schedule of aperiodic jobs. 5. Integrate resource access mechanisms with the scheduling techniques and develop integrated schedulability criteria.
PE -1	Digital System Design	1. Examine CAMP Algorithms for minimizing the complexity of digital system design. 2. Simplify digital circuits using PLA minimization algorithm and PLA folding algorithm 3. Construct digital circuits using CPLDs, FPGAs and ASICs. 4. Analyze the functionality of combinational circuits using different fault diagnosis & test methods. 5. Analyze the testing aspects and fault diagnosis methods of sequential circuits.
Core Lab -3	Embedded Systems Laboratory	1. Design complex electronic systems interfacing multiple integrated circuits. 2. Design and conduct experiments, as well as analyze and interpret data. 3. Design a system, component, or process to meet desired needs. 4. Identify, formulate, and solve engineering problems. 5. Use the techniques, skills, and modern engineering tools necessary for engineering practice.
M. Tech. I Year II Semester		
PC-4	Embedded Computing	1. Describe the differences between the general computing system and the embedded system, also recognize the

		classification of embedded systems. 2. Become aware of the architecture of the ATOM processor and its programming aspects (assembly Level) 3. Become aware of interrupts, hyper threading and software optimization. 4. Design real time embedded systems using the concepts of RTOS. 5. Analyze various examples of embedded systems based on ATOM processor.
PC-5	System On Chip Architecture	1. Describe the structure and functioning of a digital computer, including its overall system architecture, operating system, and digital components. 2. Understand the generic principles that underlie the building of a digital computer, including data representation, digital logic and processor programming. 3. Apply some fundamental coding schemes. 4. Present and discuss simple examples of assembly language appropriate for an introductory course. 5. Understand memory design for SoC.S
PC-6	Sensors And Actuators	1. Explain the concepts behind converting physical phenomena into measurable electrical signals in different types of sensors, including MEMS-based sensors, and microfluidic sensors. 2. Explain the concepts behind converting electrical power into a mechanical output (actuators), and describe different types of motors. 3. Apply and solve appropriate mathematical equations to describe sensor operation. 4. Design and analyze appropriate circuits for use with sensors, e.g., bridge circuits, and circuits for signal conditioning, including amplifiers and filters.

		5. Test and calibrate different sensors, and be able to read and understand sensor datasheets.
PE-3	Design For Testability	1. Apply the fundamental concepts of Testing in VLSI design. 2. Apply simulation algorithms for verification and validation. 3. Evaluate a digital system using Testability Measures. 4. Develop skills in the modelling of BIST Architecture and Memory BIST. 5. Assess logic and technology-septic parameters in Boundary Scan Standards
PE-4	***Advanced Digital Signal Processing***	1. Know the analysis of discrete time signals. 2. To study the modern digital signal processing algorithms and applications. 3. Have an in-depth knowledge of use of digital systems in real time applications 4. Apply the algorithms for wide area of recent applications.
Laboratory II	***Advanced Embedded Systems Laboratory***	1. Experience with a set of tools for embedded systems programming and debugging. 2. Experience with implementing several embedded systems with particular focus on the interaction between multiple devices. 3. Design products using microcontrollers and various analog and digital ICs. 4. Can read the datasheet for any embedded system, understand how it works. 5. Develop existing embedded systems by formulating the system design problem.

14. M. Tech-Electrical Power Engineering: I & II Years
JNTUH-R17 Regulations

Course Code	Course Title	Course Outcomes and Program Outcomes
M.Tech I - Semester		
PC -1	Machine modelling and analysis	CO.1 Analyze the voltage equation and torque equations for different machines like dc machine induction motor and synchronous machines. CO.2 Model different machines using phase and active transformations.. CO.3 Identify the different reference frames for modeling of machines.
PC-2	Modern control theory	CO.1 Understand the concepts of state variable analysis. CO.2 Apply the knowledge of basic and modern control system for the real time analysis and design of control systems. CO.3 Analyze the concept of stability of nonlinear systems and optimal control.
PC – 3	Power electronic devices and converters	CO.1 To choose appropriate device for a particular converter topology. CO.2 To analyze and design various power converters and controllers
PE – 1	Special machines	CO.1 To understand the operation of different special machines. CO.2 To select different special machines as part of control system components. CO.3 To use special machines as transducers for converting physical signals into electrical signals. CO.4 To design digital controllers for different machines.
PE - 2	Electric traction systems	CO.1 Understand Traction systems and its mechanics. CO.2 Identify the power supply equipment for traction systems. CO.3 Analyze various types of motors used in traction and differentiate AC and DC traction drives.
OE – 1	Principles of electronic communications	CO.1 To understand the basic concepts of communications
Lab - 1	Power converters simulation lab	CO.1 Acquire knowledge about potential software used in electrical engineering. CO.2 Choose and simulate any problem related to Power

Course Code	Course Title	Course Outcomes and Program Outcomes
		Electronics and allied fields using appropriate soft wares
		CO.3 Validate the obtained results and maintain the record
M.Tech II - Semester		
PC -1	**Power electronic applications to Renewable energy**	CO.1 To acquire knowledge on Non-Conventional energy source. CO.2 To analyze various technologies and for renewable energy systems CO.3 To develop stand alone DG sets and micro grid systems from renewable energy sources.
PC-2	**Embedded systems for power electronic applications**	CO.1 To describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems. CO.2 To become aware of the architecture of the AVR processor and its programming aspects (Assembly Level). CO.3 To acquire knowledge on key board interfacing,conversion from ADC and DAC.
PC – 3	**Power electronic control of drives**	CO.1 Analyze drive characteristics and converter as well chopper fed dc drives . CO.2 Develop induction motor for variable speed operations using scalar and vector control techniques. CO.3 Identify the difference between the rotor resistance control and static rotor resistance control method and significance of slip power recovery drives. CO.4 Develop Controllers for synchronous motor and variable reluctance motor can be developed.
PE – 3	**Hvdc & facts**	CO.1 Choose proper FACTS controller for the specific application based on system requirements . CO.2 Analyze the control circuits of Shunt Controllers Series controllers & Combined controllers for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping CO.3 Compare EHV AC and HVDC system and to describe various types of DC links CO.4 Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems

Course Code	Course Title	Course Outcomes and Program Outcomes
PE – 4	**Smart grid technologies**	CO.1 Understand technologies for smart grid . CO.2 Appreciate the smart transmission as well distribution systems . CO.3 Realize the distribution generation and smart consumption CO.4 Know the regulations and market models for smart grid
OE - 2	**Principles of computer communications and networks**	CO.1 Can get the knowledge of networking of computers, data transmission between computers. CO.2 Will have the exposure about the various communication concepts. CO.3 Will get awareness about the structure and equipment of computer network structures.
Lab - 2	**Power converters and drives lab**	CO.1 Conduct experiments on drives for different modes of operation using different converter topologies CO.2 Select the suitable controller for getting the desired speed performance of drive. CO.3 Validate the results

15. M. Tech- Power Electronics and Electric Drives: I & II Years
JNTUH-R17 Regulations

Course Code	Course Title	Course Outcomes and Program Outcomes
M.Tech I - Semester		
PC -1	**MACHINE MODELLING AND ANALYSIS**	CO.1 Analyze the voltage equation and torque equations for different machines like dc machine induction motor and Synchronous machines. CO.2 Model different machines using phase and Active transformations. CO.3 Identify the different reference frames for modeling of machines.
PC-2	**MODERN CONTROL THEORY**	CO.1 Understand the concepts of state variable analysis. CO.2 Apply the knowledge of basic and modern control system for the real time analysis and design of control systems. CO.3 Analyze the concept of stability of nonlinear systems and optimal control.
PC – 3	**POWER ELECTRONIC DEVICES AND CONVERTERS**	CO.1 To choose appropriate device for a particular converter topology. CO.2 To analyze and design various power converters and controllers
PC – 4	**SPECIAL MACHINES**	CO.1 To understand the operation of different special machines CO.2 To select different special machines as part of control system components. CO.3 To use special machines as transducers for converting physical signals into electrical signals. CO.4 To design digital controllers for different machines.
PE – 1	**ELECTRIC TRACTION SYSTEMS**	CO.1 Understand Traction systems and its mechanics. CO.2 Identify the power supply equipment for traction systems. CO.3 Analyze various types of motors used in traction and differentiate AC and DC traction drives.
OE – 1	**PRINCIPLES OF ELECTRONIC**	CO.1 To understand the basic concepts of communications

Course Code	Course Title	Course Outcomes and Program Outcomes
	COMMUNICATIONS	
Lab – 1	**POWER CONVERTERS SIMULATION LAB**	CO.1 Acquire knowledge about potential softwares used in electrical engineering CO.2 Choose and simulate any problem related to Power Electronics and allied fields using appropriate soft wares CO.3 Validate the obtained results and maintain the record
M.Tech II - Semester		
PC -1	**Power Electronic Applications to Renewable Energy**	CO.1 To acquire knowledge on Non-Conventional energy source. CO.2 To analyze various technologies and for renewable energy systems. CO.3 To develop stand alone DG sets and micro grid systems from renewable energy sources.
PC-2	**Embedded Systems For Power Electronic Applications**	CO.1 To describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems. CO.2 To become aware of the architecture of the AVR processor and its programming aspects (Assembly Level). CO.3 To acquire knowledge on key board interfacing,conversion from ADC and DAC. CO.4 To equipped to design and develop control of drives using Embedded system programming.
PC – 3	**POWER ELECTRONIC CONTROL OF DRIVES**	CO.1 Analyze drive characteristics and converter as well chopper fed dc drives. CO.2 Develop induction motor for variable speed operations using scalar and vector control techniques. CO.3 Identify the difference between the rotor resistance control and static rotor resistance control method and significance of slip power recovery drives. CO.4 Develop Controllers for synchronous motor and variable reluctance motor can be developed.
PE – 3	**HVDC & FACTS**	CO.1 Choose proper FACTS controller for the specific application based on system requirements.

Course Code	Course Title	Course Outcomes and Program Outcomes
		CO.2 Analyze the control circuits of Shunt Controllers Series controllers & Combined controllers for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping CO.3 Compare EHV AC and HVDC system and to describe various types of DC links CO.4 Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems
PE – 4	**Smart Grid Technologies**	CO.1 Understand technologies for smart grid . CO.2 Appreciate the smart transmission as well distribution systems . CO.3 Realize the distribution generation and smart consumption . CO.4 Know the regulations and market models for smart grid
OE - 2	**Principles of computer communications and networks**	CO.1 Can get the knowledge of networking of computers, data transmission between computers. CO.2 Will have the exposure about the various communication concepts. CO.3 Will get awareness about the structure and equipment of computer network structures.
Lab - 2	**POWER CONVERTERS AND DRIVES LAB**	CO.1 Conduct experiments on drives for different modes of operation using different converter topologies. CO.2 Select the suitable controller for getting the desired speed performance of drive. CO.3 Validate the results

16. M. Tech- CAD / CAM: I & II Years

JNTUH-R17 Regulations

Course Code	Course Title	Course Outcomes and Program Outcomes
520405	**ADVANCE CAD/CAM LAB**	CO.4 Interpret the steps involved in solving a given analysis problem and understand the procedure for carrying out engineering analysis. CO.5 Create accurate and precise geometry of complex engineering systems and use the geometric models in different engineering applications CO.6 organize & manage AutoCAD related files for 2D and 3D drawings; Create 2D and 3D models using AutoCAD CO.7 Explain the basic concepts of CNC programming and machining. CO.8 Use modification techniques to edit and modify drawings for presentation and accuracy
520403	**SEMINAR**	CO.4 Analyze the technical content and prepare a well-documented report. CO.5 make effective seminar presentation by exhibiting the presentation skills with confidence in a logical sequence. CO.6 explain the current and upcoming technologies CO.7 propose and defend opinions and technical ideas with conviction (not as mere recipient of ideas
5204AA	**Advanced CAD**	CO.3 Learn the basic principles of computer aided design. CO.4 Different transformations and projections CO.5 Characteristics and applications of curves and surfaces CO.6 Graphics standards and data base models
5204AB	**Computer Aided Manufacturing**	CO.5 describe types of automation and automation strategies CO.6 explain robot configuration and describe group technology CO.7 define basic building blocks and develop system models CO.8 describe system transfer functions and closed loop controller
5204AC	**Advanced FEM**	CO.4 Explain the steps involved in fem and concept of convergence criteria; apply the finite element formulation for solving real time one- dimensional bar elements problems. CO.5 solve real time trusses to find displacements, reactions and stresses; identify, formulate and solve different types of beam problems using fem. CO.6 apply the concept of cst element for use in plane stress and plane strain problems; comprehend finite element concepts of quadrilateral elements for use in two dimensional elasticity problems. CO.7 Analyze heat transfer problems of conduction and convection and determine temperature distribution within a body; apply finite elements to the analysis of undamped free vibrations of structures; apply rayleighritz's and galerikin's method for elasticity problems. CO.8 Derive integral statements for linear partial differential equations, such as the Laplace/Poisson equation, the wave equation, and the elasticity equations

Course Code	Course Title	Course Outcomes and Program Outcomes
5204AD	**Mechanical Behavior of Materials**	CO.2 Remember the knowledge of the dynamic nature of all structure, including materials and thesestems and environments they serve CO.3 Correlate processing, microstructure and properties of materials. CO.4 Understand behavior of materials under various conditions. CO.5 Characterize modes of failure of engineering materials and design new materials with better properties and cost effective processes.
5204AE	**Stress Analysis and Vibration**	CO.4 Understand the need and importance of vibration analysis in mechanical design of machine parts that operate in vibratory conditions. CO.5 Analyze the mathematical model of a linear vibratory system to determine its response.Create linear mathematical models of real life engineering systems. CO.6 Use Lagrange's equations for linear and nonlinear vibratory systems. CO.7 Determine vibratory responses of SDOF and MDOF systems to harmonic, periodic and non-periodic excitation. CO.8 Understand the behavior of a material under various kinds of static loadings, i.e., axial loading, bending moment, torsional loading and transverse loading etc. CO.9 perform the stress analysis based on various Energy Principles and Variational Methods
5204AF	**Additive Manufacturing Technologies**	CO.4 select and apply appropriate tools and techniques in Rapid Prototyping CO.5 explain the process, working principle and application of solid base RP processes CO.6 know the Rapid Prototyping principles, CO.7 describe the rapid prototyping data formats and applications of rapid prototyping CO.8 understand the progress in RP-technology in the context of shortening lead-time for new Production CO.9 appreciate the concept of Rapid Manufacturing in terms of its potential applicability, practicability, and expedience.
5204AG	**Automation in Manufacturing**	CO.1 Use matrix algebra for computing the kinematics of robots. CO.2 Calculate the forward kinematics and inverse kinematics of serial and parallel robots. CO.3 Calculate the Jacobian for serial and parallel robot. CO.4 Do the path planning for a robotic system.
5204AH	**Computer Aided Process Planning**	CO1. Understand basic concepts and types of computer aided process planning. CO2.Learn selection of machining parameters and tolerances that will be used for process planning CO3.Learn CAPP implementation technique & Develop mathematical models to represent curves and surfaces
5204AI	**Performance Modeling and Analysis of Manufacturing Systems**	CO1: Identify a type of system based on type of its dynamics, ways of analyzing system CO2: Develop simulation model for dynamic discrete-event stochastic system and analyze for specified steady-state performance measures
5204AJ	**Numerical Methods for Partial**	CO1 Solve nonlinear differential equations by numerical methods. CO2 Determine the convergence region for a finite difference method.

Course Code	Course Title	Course Outcomes and Program Outcomes
	Differential Equations	CO3 Solve elliptic PDE by finite difference method CO4 Solve a parabolic PDE by finite difference method CO5Solve a hyperbolic PDE by finite difference method
5204AM	**Production and Operations Management**	CO1: describe various forecasting techniques and derive equations for inventory EOQ models CO2: solve various production management problems on sequencing and scheduling material requirement planning , CPM and PERT, waiting line CO3: explain various work study and method study techniques CO4: describe the importance of job evaluation and merit rating CO5: analyze and construct various process charts in SQC

17. M. Tech-Structural Engineering: I & II Years
JNTUH-R17 Regulations

Code	Course Name	Course Outcomes
M. Tech. I Year I Semester		
PC-1	Theory of Elasticity	**At the end of this course, each student should be able to:** CO1. The learner will be able to solve problems of elasticity and plasticity and be able to apply numerical methods to solve continuum problems.
PC-2	Structural Dynamics	**At the end of this course, each student should be able to:** CO1. The learner will be able to understand the equation of motion, dynamics response of single and multi degree-of freedom systems.
PC-3	Advanced Structural Analysis	**At the end of this course, each student should be able to:** CO1. The learner will be able to analyse different indeterminate structures using Matrix methods.
PE -4	Advanced R.C. Design	**At the end of this course, each student should be able to** CO1. The learner will be able to design the reinforced concrete elements like beams, slabs and compression members.
Core Lab -3	Advanced Structural Engineering Laboratory	**At the end of this course, each student should be able to** CO1. Achieve Knowledge of design and development of experimenting skills. CO2. Understand the principles of design of experiments CO3. Design and develop analytical skills. CO4. Summerize the testing methods and equipments.

Code	Course Name	Course Outcomes
M. Tech. I Year II Semester		
PC-4	Advanced Steel Design	**At the end of this course, each student should be able to:** CO1. To impart knowledge on behavior and design of various connections, industrial and steel girders.
PC-5	Theory of Plates	**At the end of this course, each student should be able to:** CO1. The learner will be able to understand the behavior of plates for loadings and boundary conditions.
PC-6	Pre-stressed Concrete	**At the end of this course, each student should be able to:** CO1. The learner will be able to understand the prestressing techniques, design the various structural elements using Prestressing techniques.
PE – III	FINITE ELEMENT METHOD	**At the end of this course, each student should be able to:** CO1. The learner will be able to solve continuum problems using finite element analysis.
PE - IV	STABILITY OF STRUCTURES	**At the end of this course, each student should be able to:** CO1. The learner will be able to understand buckling of bars and frames

Code	Course Name	Course Outcomes
Laboratory II	CAD LABORATORY	**At the end of this course, each student should be able to:** CO1. Design of beam using Excel for flexural shear and with deflection check CO2. Singly and doubly reinforced RC Beam CO3. Design of Steel Beam using Excel for flexural shear and with deflection check CO4. Design of RC slab one-way and two-way using Excel CO5. Design of RC short & long columns subjected to biaxial bending. CO6. Design of isolated footings using Excel

18. Course Outcomes (COs): Masters in Business Administration (MBA)
JNTUH-R17 Regulations

Course Name: MANAGEMENT AND ORGANISATIONAL BEHAVIOUR	Course Code: 17MBA01
Course Year: MBA I YEAR I SEMESTER	A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA01.1	Understand the basic concept of management process and the evolution of management and contribution of management thinkers.
17MBA01.2	Learn the relevance of environmental scanning, planning and to take decisions.
17MBA01.3	Study about organizational structure and design and controlling the work place
17MBA01.4	Learn the Individual and group behavior at work place
17MBA01.5	Develop Leadership and Motivation of employees

Course Name: BUSINESS ECONOMICS	Course Code: 17MBA02
Course Year: MBA I YEAR I SEMESTER	A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA02.1	Understand business economic principles, opportunities and risk and uncertainty
17MBA02.2	Learn Forecasting Demand and Supply in the business environment.
17MBA02.3	Analyze Production and Cost Estimates
17MBA02.4	Study Market Structure and Pricing output decisions
17MBA02.5	Learn and apply pricing strategies

Course Name: FINANCIAL ACCOUNTING & ANALYSIS	Course Code: 17MBA03
Course Year: MBA I YEAR I SEMESTER	A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA03.1	Know the concept of accounting, Principles of Accounting, and recording business transactions
17MBA03.2	Understand the Accounting Process in Books of Original Record
17MBA03.3	Estimate the Inventory Valuation through various Methods
17MBA03.4	Learn to Prepare basic accountancy statements
17MBA03.5	Learn to Prepare, Analysis and Interpret the Financial Statements and Accounting Standards

Course Name: BUSINESS STATISTICS		Course Code: 17MBA04
Course Year: MBA I YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA04.1	Understand the Conceptual overview of Statistics	
17MBA04.2	Knowledge the Measures of Dispersion	
17MBA04.3	Know the Tabulation and to Various Small Sample Tests	
17MBA04.4	Apply and analyze various simple & advanced statistical tools	
17MBA04.5	Learn to interpret data through statistical tools	

Course Name: BUSINESS LAW AND ETHICS		Course Code: 17MBA05
Course Year: MBA I YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA05.1	Knowledge about Business Laws related to incorporating a company .	
17MBA05.2	Learn concept and different Law of contracts	
17MBA05.3	Knowledge of Negotiable Instruments	
17MBA05.4	Understand the business environment and Industrial Policy	
17MBA05.5	Know the Regulatory framework and environmental laws in India	

Course Name: RURAL MARKETING		Course Code: 17MBA06D
Course Year: MBA I YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA06D.1	Learn the concept and opportunities in Rural marketing	
17MBA06D.2	Knowledge Approaches and Tools of Rural Marketing Research	
17MBA06D.3	Know the Rural Marketing Mix and Product Development	
17MBA06D.4	Learn the Rural Market Brand and Channel Management	
17MBA06D.5	Understand the applications and Innovations in Rural Marketing	

Course Name: BUSINESS COMMUNICATION		Course Code: 17MBA07
Course Year: MBA I YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA07.1	Understand the importance of Communication in Business	
17MBA07.2	Learn to develop writing skills and presentation	
17MBA07.3	Know to write business proposals and letters	
17MBA07.4	Learn Oral and Employment Communication	
17MBA07.5	Understand Contemporary Aspects in Communication and Communication in Information Technology	

Course Name: HUMAN RESOURCE MANAGEMENT		Course Code: 17MBA08
Course Year: MBA I YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA08.1	Learn basic HR concepts and Globalization & Competition Trends in HR	
17MBA08.2	Knowledge the process of recruitment and selection	
17MBA08.3	Understand the importance of training and developing and performance management techniques and methods	
17MBA08.4	Apply the knowledge of Compensation Management and employees welfare facilities	
17MBA08.5	Understand the employee retention strategies and importance of employee relations and statutory compliances.	

Course Name: MARKETING MANAGEMENT		Course Code: 17MBA09
Course Year: MBA I YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA09.1	Learn concepts of marketing management and marketing environment and strategies	
17MBA09.2	Analyze Marketing Opportunities, Customer Value and Marketing Mix	
17MBA09.3	Design a customer driven strategies in Market segmentation	
17MBA09.4	Evaluate Distribution Decisions, Promotion & Communication Strategies	
17MBA09.5	Evaluate Pricing Decisions & Personal Communication	

Course Name: FINANCIAL MANAGEMENT		Course Code: 17MBA10
Course Year: MBA I YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA10.1	Understand the new role of financial function in the contemporary scenario and its Goals	
17MBA10.2	Know the Investment criteria and decision process	
17MBA10.3	Evaluate capital structure and Dividend Decisions	
17MBA10.4	Learn Working Capital Management and Finance	
17MBA10.5	Knowledge the Current Assets Management and Corporate Restructuring	

Course Name: QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS	Course Code: 17MBA11
Course Year: MBA I YEAR II SEMESTER	A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA11.1	Understand the origin and application of Operation Research
17MBA11.2	Learn Linear Programming Method and Transportation Problem
17MBA11.3	Solving Assignment Model problems
17MBA11.4	Gain knowledge in Decision Theory and Network Analysis for taking decisions for business
17MBA11.5	Gain knowledge in queuing theory for taking decisions for business

Course Name: ENTREPRENEURSHIP	Course Code: 17MBA12
Course Year: MBA I YEAR II SEMESTER	A Y: 2018-2019

After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA12.1	Understand the concept and mindset of the entrepreneurs
17MBA12.2	Understand the entrepreneurs Personality, journey and Entrepreneurial competencies
17MBA12.3	Knows techniques for generating ideas and Launching Entrepreneurial Ventures
17MBA12.4	Learn Legal challenges of Entrepreneurship
17MBA12.5	Evaluate Strategies for building entrepreneurship

Course Name: TOTAL QUALITY MANAGEMENT	Course Code: 17MBA13A
Course Year: MBA I YEAR II SEMESTER	A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA13A.1	Understand the importance of total quality management and its Principles and Practices
17MBA13A.2	Learns Continuous process Improvement through benchmarking.
17MBA13A.3	Knowledge the Tools and Techniques for Quality management System
17MBA13A.4	Understand Quality by Design through Total Productive Maintenance
17MBA13A.5	Apply various Management Tools for Quality Management in India

Course Name: INTERNATIONAL BUSINESS		Course Code: 17MBA13C
Course Year: MBA I YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA13C.1	Understand the importance and Opportunities and Challenges of International Business	
17MBA13C.2	Learn International Trade theories	
17MBA13C.3	Knowledge the International Business and Economic Integration	
17MBA13C.4	Understand the Strategy and Structure of International Business	
17MBA13C.5	Learn International Business Operations	

Course Name: SUMMER INTERNSHIP		Course Code: 17MBA14
Course Year: MBA I YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA14.1	Understand Management functions and Organizational structure	
17MBA14.2	Learn organizational dynamics in terms of organizational behaviour, culture, climate	
17MBA14.3	Knowledge Functional domain	
17MBA14.4	Know Processes and systems	
17MBA14.5	External and internal environment impact on the organization.	

Course Name: PRODUCTION AND OPERATIONS MANAGEMENT		Course Code: 17MBA15
Course Year: MBA II YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA15.1	Learn basic Concepts and Strategic of Operations management	
17MBA15.2	Knowledge of Product process, design and analysis	
17MBA15.3	Evaluate the Plant Location & Plant Layout	
17MBA15.4	Learn Types, Job Shop and Machines of Scheduling	
17MBA15.5	Understand Planning, Integration and scrap Materials Management	

Course Name: MANAGEMENT INFORMATION SYSTEM		Course Code: 17MBA16
Course Year: MBA II YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA16.1	Understand the Concepts and competitive advantage of Management Information Systems	
17MBA16.2	Learn Business applications of Management Information Systems	
17MBA16.3	Knowledge of Information System Planning, Implementations, evaluation & maintenance	
17MBA16.4	Understand the Building of Information Systems	
17MBA16.5	Know the Cyber Crime laws and security in Indian and Global Perspectives	

Course Name: DATA ANALYTICS		Course Code: 17MBA17
Course Year: MBA II YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA17.1	Understand the Importance of Data for Business Analytics	
17MBA17.2	Know the Descriptive Statistical Measures in Data Analytics	
17MBA17.3	Apply Predictive Analytics tools	
17MBA17.4	Learn Data Mining process	
17MBA17.5	Knowledge data simulation to solve the business problems	

Course Name: DIGITAL MARKETING		Course Code: 17MBA18M1
Course Year: MBA II YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA18M1.1	Learn the applications of digital marketing in the globalized market	
17MBA18M1.2	Know Channels of Digital Marketing and Era	
17MBA18M1.3	Assess digital marketing plans	
17MBA18M1.4	Understand Search Engine Marketing and Online Advertising	
17MBA18M1.5	Know Social Media Marketing	

Course Name: SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT		Course Code: 17MBA18F1
Course Year: MBA II YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA18F1.1	Learn Indian Investment Environment	
17MBA18F1.2	Know Portfolio Analysis	
17MBA18F1.3	Understand Bond valuation and management	
17MBA18F1.4	Evaluate Equity valuation of Cash market and derivatives	
17MBA18F1.5	Learn Performance evaluation of Portfolios	

Course Name: PERFORMANCE MANAGEMENT SYSTEMS	Course Code: 17MBA18H1
Course Year: MBA II YEAR I SEMESTER	A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA18H1.1	Understand the concept, significance, Strategic Planning of Performance Management
17MBA18H1.2	Learn Communication of Performance Expectations
17MBA18H1.3	Evaluate Performance Management and Employee Development
17MBA18H1.4	Know Reward Systems and Legal Issues
17MBA18H1.5	Learn relevant Performance related concepts

Course Name: ADVERTISING AND SALES MANAGEMENT	Course Code: 17MBA19M2
Course Year: MBA II YEAR I SEMESTER	A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA19M2.1	Learn the importance, evolution, role and Functions of Advertising
17MBA19M2.2	Know the Types, planning and Budget, Evaluation of Advertising Media
17MBA19M2.3	Understand the Importance, types and Strategies of Sales Management
17MBA19M2.4	Knowledge of Strategies and Ethical and legal aspects of Sales Promotion
17MBA19M2.5	Understand the need for distribution channels and managing them

Course Name: FINANCIAL INSTITUTIONS, MARKETS, AND SERVICES	Course Code: 17MBA19F2
Course Year: MBA II YEAR I SEMESTER	A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA19F2.1	Understand the concept of Indian Financial system and Regulatory and Promotional Institutions
17MBA19F2.2	Know Banking and Non Banking financial Institutions
17MBA19F2.3	Knowledge of Financial and Securities Markets
17MBA19F2.4	Learn the Asset /Fund Based Financial Services
17MBA19F2.5	Learn the Fee-based / Advisory services

Course Name: LEARNING AND DEVELOPMENT	Course Code: 17MBA19H2
Course Year: MBA II YEAR I SEMESTER	A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA19H2.1	Understand the concept of Learning and theories
17MBA19H2.2	Learn Training Strategy and Designing Training
17MBA19H2.3	Know the different kinds of Training methods
17MBA19H2.4	Know the Employee and Management Development
17MBA19H2.5	Understand the contemporary issues in Training and Development

Course Name: CONSUMER BEHAVIOR		Course Code: 17MBA20M3
Course Year: MBA II YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA20M3.1	Understand consumer behavior	
17MBA20M3.2	Know Environmental influences on consumer behaviour	
17MBA20M3.3	Knowledge of perception and attitude of consumers	
17MBA20M3.4	Evaluate Consumer Decision Making Processes	
17MBA20M3.5	Learn marketing ethics towards consumers	

Course Name: STRATEGIC MANAGEMENT ACCOUNTING		Course Code: 17MBA20F3
Course Year: MBA II YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA20F3.1	Learn Fundamentals of Management Accounting, Cost analysis and Control	
17MBA20F3.2	Know Costing for Specific Industries	
17MBA20F3.3	Understand Application of Marginal Costing	
17MBA20F3.4	Know business Marginal Costing, planning and activities	
17MBA20F3.5	Knowledge of Budget and Budgetary controls	

Course Name: MANAGEMENT OF INDUSTRIAL RELATIONS		Course Code: 17MBA20H3
Course Year: MBA II YEAR I SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA20H3.1	Understand the Importance of Industrial Relations and Management of Trade Unions	
17MBA20H3.2	Know the Collective Bargaining Mechanism	
17MBA20H3.3	Know Parties and role in Industrial Relations	
17MBA20H3.4	Knowledge Labour Legislation aspects	
17MBA20H3.5	Knowledge Standing Orders, dispute settlement and Managing good industrial	

Course Name: STRATEGIC MANAGEMENT		Course Code: 17MBA21
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA21.1	Learn Strategic management concepts and Industry and Competitive Analysis	
17MBA21.2	Apply Tools and Techniques for Strategic Analysis	
17MBA21.3	Know to Implement Strategy	
17MBA21.4	Understand the Strategies for competing in globalised marketsthrough Turnaround and Diversification strategies	
17MBA21.5	Learn strategy evaluation and control	

Course Name: CUSTOMER RELATIONSHIP MANAGEMENT		Course Code: 17MBA22M4
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA22M4.1	Understand the concept and need of Customer Relationship Management	
17MBA22M4.2	Learn building customer relations	
17MBA22M4.3	Know Customer Relationship Management process	
17MBA22M4.4	Understand Customer Relationship Management structures	
17MBA22M4.5	Customer Relationship Management Planning and Implementation	

Course Name: INTERNATIONAL FINANCIAL MANAGEMENT		Course Code: 17MBA22F4
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA22F4.1	Learn the concept and changes and challenges of International Financial Management	
17MBA22F4.2	Know International Flow of Funds and International Monetary System	
17MBA22F4.3	Knowledge of Foreign Exchange Market	
17MBA22F4.4	Understand Exchange Rates systems	
17MBA22F4.5	Learn Asset and liability Management	

Course Name: INTERNATIONAL HUMAN RESOURCE MANAGEMENT		Course Code: 17MBA22H4
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA22H4.1	Learn Cultural aspects of International Human Resource Management	
17MBA22H4.2	Understand the key role of International Human Resource Management in Successful Multinational Companies	
17MBA22H4.3	Know Global human Resource Planning	
17MBA22H4.4	Know Training and development of Global employees	
17MBA22H4.5	Know Performance Management of Global employees	

Course Name: INTERNATIONAL MARKETING		Course Code: 17MBA23M5
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA23M5.1	Learn the Global Marketing Management	
17MBA23M5.2	Understand the Environment of global markets	
17MBA23M5.3	Assess Global Market Opportunities	
17MBA23M5.4	Know to develop Global Marketing product and services	
17MBA23M5.5	Know to develop and Implement Global Marketing Strategies	

Course Name: STRATEGIC INVESTMENT AND FINANCING DECISIONS		Course Code: 17MBA23F5
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA23F5.1	Learn the Investment decisions under conditions of Risk and uncertainty	
17MBA23F5.2	Understand the Types of Investments and disinvestments	
17MBA23F5.3	Evaluate the Critical analysis of appraisal techniques	
17MBA23F5.4	Know the Strategic Analysis of selected investment decisions	
17MBA23F5.5	Learn the Financing Decisions	

Course Name: LEADERSHIP AND CHANGE MANAGEMENT		Course Code: 17MBA23H5
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA23H5.1	Understand the introduction and Skills approach to leadership	
17MBA23H5.2	Learn the concept of Contingency Leadership	
17MBA23H5.3	Know the concept of Transformational Leadership	
17MBA23H5.4	Knowledge Organizational design and change	
17MBA23H5.5	Evaluate Employee Relations and Managing Change	

Course Name: MARKETING OF SERVICES		Course Code: 17MBA24M6
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA24M6.1	Learn Marketing Management of companies offering Services	
17MBA24M6.2	Know Characteristics of services	
17MBA24M6.3	Understand consumer behaviour in services	
17MBA24M6.4	Lean to align service design and standards	
17MBA24M6.5	Know delivering service, managing services promises	

Course Name: RISK MANAGEMENT		Course Code: 17MBA24F6
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA24F6.1	Learn Concepts of Risk Management	
17MBA24F6.2	Know the Risk Management and Measurement	
17MBA24F6.3	Understand the Risk Management Techniques using Forward and Future Contracts	
17MBA24F6.4	Learn Risk Management Techniques and Options	
17MBA24F6.5	Learn Risk Management Techniques SWAPS	

Course Name: TALENT AND KNOWLEDGE MANAGEMENT		Course Code: 17MBA24H6
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA24H6.1	Learn Talent Management process, System and Competency Assessment	
17MBA24H6.2	Knows Succession and Career Planning approaches	
17MBA24H6.3	Knowledge Management driving forces and Systems	
17MBA24H6.4	Understand nature of Knowledge and Knowledge Management assessment	
17MBA24H6.5	Learns Knowledge Management Solutions and approaches	

Course Name: PRE SUBMISSION OF PROJECT WORK		Course Code: 17MBA25
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA25.1	Inculcate Research interest among students and prepare comprehensive report based on literature survey	
17MBA25.2	Assessing and selecting a suitable problem relevant to topic with an attention to practical workplace problems faced by the organizations	
17MBA25.3	Knowledge to analyse and apply various statistical tools	
17MBA25.4	Learn to interpret the data resulted from analysis	
17MBA25.5	Finding solution either through simulation or through practical work	

Course Name: COMPREHENSIVE VIVA-VOCE		Course Code: 17MBA26
Course Year: MBA II YEAR II SEMESTER		A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to		
Items	**CO**	
17MBA26.1	Assess the overall knowledge of the student in the relevant field of Management acquired over two years	
17MBA26.2	Assess the communication, presentation skills & overall impression	
17MBA26.3	Attain Oral Presentation skills by answering questions in precise and concise manner.	
17MBA26.4	Gain confidence and inter-personal skills.	
17MBA26.5	Provides opportunities to mitigate circumstances into account	

Course Name: MAIN PROJECT VIVA-VOCE	Course Code: 17MBA27
Course Year: MBA II YEAR II SEMESTER	A Y: 2018-2019
After completing this course, the student must demonstrate the knowledge and ability to	
Items	**CO**
17MBA27.1	Establish the thesis is of sufficiently high standard to merit the award of the degree for which it is submitted
17MBA27.2	Investigate the awareness of original work sits in relation to the wider research field
17MBA27.3	Understand the writing, justification and defending aspects in response to the examiners' questions
17MBA27.4	Learns the results from the work comprehensively through presentation
17MBA27.5	Presenting work in a conference or publish the work in a peer reviewed journal