Course Outcomes-Department of Applied Science

Session 2018-19 (Effective from session 2015-16)

Engineering Physics (Paper code: BAP-C101/201)

Course Objectives

The main objective of this course is to improve the ability to think logically about the problems of Science and Technology and obtain their solutions. This course is aimed to offer broad areas of Physics which are required as an essential background to Engineering students.

Course Outcomes

After successful completion of the course, the students will have desire and adequate understanding of different phenomena associated with developments in Physics.

Engineering Physics LAB (Paper code: BAP-C151/251)

Course Outcomes

After successful completion of the applied physics laboratory course, student should be able to:

1. Verify the theoretical formulations/concept of Physics.
2. Know the art of recording the observations of an experiment scientifically.
3. Learn by doing.
4. Handle and operate the various elements/ parts of experiments.
5. Understand the importance of experiments in engineering & technology.

Engineering Chemistry (Paper code: BAC-C101/201)

Course Objectives

1. To acquire knowledge of periodic properties, bonding, hydrogen bonding, hybridization and phase rule.
2. To understand the general concepts of chemical kinetics and photochemistry.
3. To gain the knowledge of polymers, conducting polymers, synthesis, properties and uses of some common polymers, rubbers and nylons.
4. To learn the significance of water treatment and different methods of softening hard water, determination of total hardness, BOD and COD of water.

5. To gain the knowledge of primary and secondary fuels, solids, liquids and gaseous fuels and their sources, calorific values, carbonization and fractional distillation processes.
6. To understand the mechanism of corrosion and preventive methods from corrosion.
7. To understand the mechanism some common organic reactions like Wurtz reaction, Reimer-Tiemann reaction, Aldol condensation and Claisen condensation.

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. The course will enable the student to:

1. Rationalize periodic properties such as atomic radius, ionization energy, electron affinity, electronegativity and electro-positivity.
2. Rationalize bulk properties and processes using thermodynamic considerations and learn about the general concepts of chemical kinetics.
3. Know about the polymers, polymerization, synthesis and uses of different polymers, conducting polymers, plastics, rubbers and nylons.
4. Know about the Nano chemistry, nanoparticles, Nano materials, their synthesis, properties and applications.
5. List major chemical reactions that are used in the synthesis of organic molecules like addition reactions, elimination reactions, substitution reactions and redox reactions.
6. Learn about the synthesis and uses of commonly used drugs like Aspirin, Phenacetin & Paracetamol.

Engineering Chemistry Lab. (Paper code: BAC-C151/251)

Course Objectives

The objective of the chemistry laboratory sessions is to:

1. Enable the students to get hands-on practice and to understand the applications of "qualitative and quantitative analysis" in engineering.
2. Develop the experimental skills by manual and by instrumentation.
3. Make students aware about the fundamental and experimental knowledge of Chromatographic techniques like Ascending paper chromatography and Thin layer chromatography.

4. Learn the students to analyze the turbidity, pH, conductivity and refractive index instrumentally.

Course Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:

1. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, pH, turbidity, refractive index, chloride content of water, etc.
2. Estimate concentration of an unknown sample via acid-base and redox titrations.
3. Synthesize a small drug molecule and analyze a salt sample.
4. Identify the acid base radicals.
5. Separate the components present in a mixture by TLC and ascending paper chromatography.

Vedic Science & Engineering (BHU-S101/201)

Course Objectives

Subject Vedic Science & Engineering was introduced in all B. Tech. Programmes to make engineering students aware of:

1. Mahirshi Kanad's atomic theory, law of gravitation, distribution of energy, samata and vishamata.
2. Laws of thermodynamics applicable in life, entropy and concept of pralay, atomic spectrum and concept of kundalini,
3. Concepts of Vedic Mathematics.
4. Concept of various engineering subjects like Electrical, Electronics & Aeronautical Engineering Mechanical, Chemical, Civil & Architectural engineering in Vedic Literature.

Course Outcomes

B. Tech. students of all programmes of faculty of engineering & technology will be able to learn about the development of various concepts of sciences and engineering in ancient India.

Engineering Mathematics I (BEM-C101)

Course Objectives

This course provides an introduction to the basic concepts and techniques of

1. Introduction to differential calculus, Leibnitz theorem asymptotes, tracing of curves.
2. Introduction to partial differential calculus, Jacobians, Maxima, Minima and their application in engineering problems.
3. Introduction to double and triple integrals and its application to find area and volume, centre of gravity of plane and solids.
4. Introduction to vector calculus, curl, divergence and their application in engineering problems.
5. Introduction to matrices and their properties.

Course Outcomes

After completion, of course students will be able to:

1. Understand the concept of nth differentiation, Leibnitz theorems, Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
2. To understand the concept of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
3. The concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals and its application.
4. Understand the concept of matrices and their applications to solve linear simultaneous equations. The concept of eigen value and eigen vector and complex matrices.

Engineering Mathematics II (BEM-C201)

Course Objectives

This course provides an introduction to the basic concepts and techniques of:

1. Ordinary differential equations and their types. Linear differential equations and their applications.
2. Partial differential equations and their solutions.
3. Introduction to series solution and special functions.
4. Introduction to Fourier series, Fourier series of special functions, half range series.
5. Introduction of Statistical tools, Binomial, Poisson and Normal distribution.

Course Outcomes

After completion, of course students will be able to:

1. Understand the concept of differentiation and apply for solving differential equations.

2. Students understand the concepts of partial differential equations and how to solve linear Partial Differential with different methods and enable them to apply in solving problems like heat equation, wave equation etc.
3. Get an idea of power series method to solve differential equations Familiar with Legendre equation and Legendre polynomial
4. To represent periodic functions using Fourier series.
5. Explore small and large data-sets to create testable hypotheses and identify appropriate statistical tests. Perform correlation, regression analysis and appropriate statistical tests for real life situations.

Engineering Mathematics III (BEM-C301)

Course Objectives

This course provides an introduction to the basic concepts and techniques of:

1. Laplace transform and its application to the solution of ordinary differential equations.
2. Fourier transform and its application to solve partial differential equations.
3. Z transform of elementary sequences both from the definition and by using tables and use the appropriate theorems to calculate Z transforms and inverse Z transforms.
4. Functions of Complex variables and their existence. Complex Integration, Conformal mapping.

Course Outcomes

After completion, of course students will be able to:

1. Apply Laplace Transforms in the area of science and technology such as Electric circuit analysis, Communication engineering, Control engineering, signal processing etc. Students are able to find Solution of ordinary linear differential equations used in Mechanics, Electric circuits and Bending of beams.
2. Apply Fourier Transform in the study of solution of partial differential equation to solve initial boundary value problems. Fourier Transform is applicable in signal & image processing. Their application in cell phones, LTI system & circuit analysis. Student will understand that along with the Fourier transform, the Laplace transform is used to study signals in the frequency domain.

3. Apply Z transform for analyzing linear time invariant (LTI) systems. Application of Z transform in signals and systems.
4. To learn about function of complex variable and their difference with real functions. To check their analyticity using Cauchy Riemann equations. To evaluate complex integral by various methods. To understand the concept of conformal mapping and its application in engineering problems.

Discrete Mathematics (BEM-C401)

Course Objectives

This course provides an introduction to the basic concepts and techniques of

1. Introduction to sets and their properties, Mathematical Induction.
2. Relations and Functions and their properties.
3. Graphs and their types.
4. Introduction to tree, their types and properties.
5. Introduction to recurrence relations and generating functions.

Course Outcomes

After completion of course student will be:

1. Able to construct simple Mathematical proofs and possess the ability to verify them.
2. Gain experience in using various techniques of Mathematical induction (weak, strong and structural induction) to prove simple mathematical properties of a variety of discrete structures.
3. Able to specify and manipulate basic mathematical objects such as sets, functions and relations.
4. Acquire ability to describe computer programs (e.g. recursive Functions) in a formal mathematical manner.
5. Covering a number of recurring themes and set of general principles that have broad application to the field of discrete Mathematics.

Numerical Analysis (BEM-C402)

Course Objectives

This course is an introduction to a broad range of numerical methods for solving mathematical problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis, and use of these numerical methods, to find numerical solution of problems where analytical solutions are difficult to find.

This course provides an introduction to the basic concepts and techniques of:

1. Errors and numerical solution of algebraic and transcendental equations.
2. Solution of systems of linear equations and eigenvalue calculation.
3. Interpolation. Interpolation with equal and unequal intervals.
4. Numerical solution of differentiation, integration., and their inter- relations and applications to engineering areas and develops problem solving skills with both theoretical and computational oriented problems.
5. Numerical solution of ordinary differential equations and partial differential equations.

Course Outcomes

After completion, of course students will be able to:

1. Apply numerical methods to find numerical solution of algebraic and transcendental equations using different methods under different conditions and their convergence.
2. Apply numerical methods to solve linear system of algebraic equations.
3. Apply various interpolation methods and finite difference concepts.
4. Work out numerical differentiation and integration whenever and wherever analytical methods are not applicable.
5. Work numerically on the ordinary differential equations using different methods through the theory of finite difference. Solve partial differential equations using different methods through the theory of finite differences.

Numerical Analysis Lab (BEM-C452)

Course Objectives

1. The course aims to provide exposure to problem-solving through programming. It aims to train the student to the basic concepts of the C-programming language. This course involves a lab component which is designed to give the student hands-on experience with the concepts.

2. To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.

Course Outcomes

After completion, of course students will be able to:

1. Identify situations where computational methods and computers would be useful.
2. Given a computational problem, identify and abstractthe programming task involved.
3. Approach the programming tasks using techniques learned and write pseudo-code.
4. Choose the right data representation formats based on the requirements of the problem.
5. Write the program on a computer, edit, compile, debug, correct, recompile and run it.
6. Identify tasks in which the numerical techniques learned are applicable and apply them to write their C programs, and hence use computers effectively to solve the task.

Optimization Techniques (BEM-C501/701)

Course Objectives

This course provides an introduction to the basic concepts and techniques of

1. Introduction to mathematical modelling to real word problem using LPP, Simplex method to find optimal solution.
2. Introduction to dual Simplex method.
3. Introduction to Integer programming problems and Dynamic programming problems and their solutions.
4. Introduction to Transportation, Assignment and Game theory.
5. Introduction to queuing theory, heir types and solutions.

Course Outcomes

After completion of course student will be:

1- Analyze any real life system with limited constraints and depict it in a model form.

2- Convert the problem in to a mathematical model solve it manually as well as using software.

3- Develop a repost that describe the model analyze the results and propose recommendations in decision making process in real life problem.

4- Understand variety of problems such as assignment, transportation, travelling salesman etc. and their application in real life systems.

5- Understand different queuing situations in real life and find their optimal solution using different queuing models.

Session 2019-20 (Effective from session 2019-20)

Engineering Physics (Paper code: BAP-C102)

Course Objectives

The main objective of this course is to improve the ability to think logically about the problems of Science and Technology and obtain their solutions. This course is aimed to offer broad areas of Physics which are required as an essential background to Electronics and Communication Engineering and Electrical Engineering students.

Course Outcomes

After successful completion of the course, the students will have desire and adequate understanding of different phenomena associated with developments in Physics.

Engineering Physics (Paper code: BAP-C202)

Course Objectives

The main objective of this course is to improve the ability to think logically about the problems of Science and Technology and obtain their solutions. This course is aimed to offer broad areas of Physics which are required as an essential background to Computer Science & Engineering and Mechanical Engineering students.

Course Outcomes

After successful completion of the course, the students will have desire and adequate understanding of different phenomena associated with developments in Physics.

Engineering Physics LAB (Paper code: BAP-C151/251)

Course Outcomes

After successful completion of the applied physics laboratory course, student should be able to:

1. Verify the theoretical formulations/concept of Physics.
2. Know the art of recording the observations of an experiment scientifically.
3. Learn by doing.

4. Handle and operate the various elements/ parts of experiments.
5. Understand the importance of experiments in engineering & technology.

Engineering Chemistry (Paper code: BAC-C102/202)

Course Objectives

1. To acquire knowledge about the periodic properties, hydrogen bonding and hybridization.
8. To understand the general concepts of thermodynamics, chemical kinetics and acid-base equilibria.
9. To gain the knowledge of polymers, conducting polymers, synthesis, properties and uses of some common polymers, rubbers and nylons.
10. To learn the significance of Nano chemistry and different approaches to synthesis of nanoparticles.
11. To understand the organic reactions like addition reactions, elimination reactions, substitution reactions and oxidation-reduction reactions.
12. To understand the synthesis of some common drugs like Aspirin, Phenacetin & Paracetamol.

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. The course will enable the student to:

1. Rationalize periodic properties such as atomic radius, ionization energy, electron affinity, electronegativity and electro-positivity.
2. Rationalize bulk properties and processes using thermodynamic considerations and learn about the general concepts of chemical kinetics.
3. Know about the polymers, polymerization, synthesis and uses of different polymers, conducting polymers, plastics, rubbers and nylons.
4. Know about the Nano chemistry, nanoparticles, Nano materials, their synthesis, properties and applications.
5. List major chemical reactions that are used in the synthesis of organic molecules like addition reactions, elimination reactions, substitution reactions and redox reactions.

6. Learn about the synthesis and uses of commonly used drugs like Aspirin, Phenacetin & Paracetamol.

Engineering Chemistry Lab. (Paper code: BAC-C151/251)

Course Objectives

The objective of the chemistry laboratory sessions is to:

1. Enable the students to get hands-on practice and to understand the applications of "qualitative and quantitative analysis" in engineering.
2. Develop the experimental skills by manual and by instrumentation.
3. Make students aware about the fundamental and experimental knowledge of Chromatographic techniques like Ascending paper chromatography and Thin layer chromatography.
4. Learn the students to analyze the turbidity, pH, conductivity and refractive index instrumentally.

Course Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:

1. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, pH, turbidity, refractive index, chloride content of water, etc.
2. Estimate concentration of an unknown sample via acid-base and oxidation – reduction titrations.
3. Synthesize a small drug molecule and analyze a salt sample.
4. Identify the acid base radicals.
5. Separate the components present in a mixture by TLC and ascending paper chromatography.

Vedic Science & Engineering (BHU-S101/201)

Course Objectives

Subject Vedic Science & Engineering was introduced in all B. Tech. Programmes to make engineering students aware of:

1. Mahirshi Kanad's atomic theory, law of gravitation, distribution of energy, samata and vishamata.
2. Laws of thermodynamics applicable in life, entropy and concept of pralay, atomic spectrum and concept of kundalini,
3. Concepts of Vedic Mathematics.
4. Concept of various engineering subjects like Electrical, Electronics & Aeronautical Engineering Mechanical, Chemical, Civil & Architectural engineering in Vedic Literature.

Course Outcomes

B. Tech. students of all programmes of faculty of engineering & technology will be able to learn about the development of various concepts of sciences and engineering in ancient India.

Engineering Mathematics I (BEM-C102)

Course Objectives

This course provides an introduction to the basic concepts and techniques of

1. Introduction to differential calculus, Leibnitz theorem asymptotes, tracing of curves.
2. Introduction to partial differential calculus, Jacobians, Maxima, Minima and their application in engineering problems.
3. Introduction to double and triple integrals and its application to find area and volume, centre of gravity of plane and solids.
4. Introduction to vector calculus, curl, divergence and their application in engineering problems.
5. Introduction to matrices and their properties.

Course Outcomes

After completion, of course students will be able to

1. Understand the concept of nth differentiation, Leibnitz theorems, Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
2. To understand the concept of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
3. The concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals and its application.

4. Understand the concept of matrices and their applications to solve linear simultaneous equations. The concept of eigen value and eigen vector and complex matrices.

Engineering Mathematics II (BEM-C202)

Course Objectives

This course provides an introduction to the basic concepts and techniques of:

1. Ordinary differential equations and their types. Linear differential equations and their applications.
2. Partial differential equations and their solutions.
3. Introduction to series solution and special functions.
4. Introduction to Fourier series, Fourier series of special functions, half range series.
5. Introduction of Statistical tools, Binomial, Poisson and Normal distribution**.**

Course Outcomes

After completion, of course students will be able to

1. Understand the concept of differentiation and apply for solving differential equations.
2. Students understand the concepts of partial differential equations and how to solve linear Partial Differential with different methods and enable them to apply in solving problems like heat equation, wave equation etc.
3. Get an idea of power series method to solve differential equations Familiar with Legendre equation and Legendre polynomial
4. To represent periodic functions using Fourier series.
5. Explore small and large data-sets to create testable hypotheses and identify appropriate statistical tests. Perform correlation, regression analysis and appropriate statistical tests for real life situations.

Engineering Mathematics III (BEM-C302)

Course Objective

This course provides an introduction to the basic concepts and techniques of**:**

1. Laplace transform and its application to the solution of ordinary differential equations.
2. Fourier transform and its application to solve partial differential equations.

3. Z transform of elementary sequences both from the definition and by using tables and use the appropriate theorems to calculate Z transforms and inverse Z transforms.
4. Functions of Complex variables and their existence. Complex Integration.
5. Errors and numerical solution of algebraic and transcendental equations.

Course Outcomes

After completion, of course students will be able to:

1. Apply Laplace Transforms in the area of science and technology such as Electric circuit analysis, Communication engineering, Control engineering, signal processing etc. Students are able to find Solution of ordinary linear differential equations used in Mechanics, Electric circuits and Bending of beams.
2. Apply Fourier Transform in the study of solution of partial differential equation to solve initial boundary value problems. Fourier Transform is applicable in signal & image processing. Their application in cell phones, LTI system & circuit analysis. Student will understand that along with the Fourier transform, the Laplace transform is used to study signals in the frequency domain.
3. Apply Z transform for analyzing linear time invariant (LTI) systems. Application of Z transform in signal and systems.
4. To learn about function of complex variable and their difference with real functions. To check their analyticity using Cauchy Riemann equations. To evaluate complex integral by various methods.
5. Apply numerical methods to find numerical solution of algebraic and transcendental equations using different methods under different conditions and their convergence.

Discrete Mathematics (BEM-C401)

Course Objectives

This course provides an introduction to the basic concepts and techniques of:

1. Introduction to sets and their properties, Mathematical Induction.
2. Relations and Functions and their properties.
3. Graphs and their types.
4. Introduction to tree, their types and properties.
5. Introduction to recurrence relations and generating functions.

Course Outcomes

After completion of course student will be:

1. Able to construct simple Mathematical proofs and possess the ability to verify them.
2. Gain experience in using various techniques of Mathematical induction (weak, strong and structural induction) to prove simple mathematical properties of a variety of discrete structures.
3. Able to specify and manipulate basic mathematical objects such as sets, functions and relations.
4. Acquire ability to describe computer programs (e.g. recursive Functions) in a formal mathematical manner.
5. Covering a number of recurring themes and set of general principles that have broad application to the field of discrete Mathematics.