Department of Chemical Engineering
Birla Institute of Technology, Mesra, Ranchi - 835215 (India)

Institute Vision

To become a Globally Recognized Academic Institution in consonance with the social, economic and ecological environment, striving continuously for excellence in education, research and technological service to the National needs.

Institute Mission

- To educate students at Undergraduate, Post Graduate Doctoral and Post-Doctoral levels to perform challenging engineering and managerial jobs in industry.
- To provide excellent research and development facilities to take up Ph.D. programmes and research projects.
- To develop effective teaching and learning skills and state of art research potential of the faculty.
- To build national capabilities in technology, education and research in emerging areas.
- To provide excellent technological services to satisfy the requirements of the industry and overall academic needs of society.

Department Vision

To be a centre of excellence for the provision of effective teaching/learning, skill development and research in the areas of chemical engineering and allied areas through the application of chemical engineering principles.

Department Mission

1) To educate and prepare graduate engineers with critical thinking skills in the areas of Food Technology, Chemical engineering & Polymer science and engineering, who will be the leaders in industry, academia and administrative services both at national and international levels.

2) To inculcate a fundamental knowledge base in undergraduate students which enable them to carry out post-graduate study, do innovative interdisciplinary doctoral research and to be engaged in long-life learning.

3) To train students in addressing the challenges in food, chemical, petrochemical, polymer and allied industries by developing sustainable and eco-friendly technologies.

Program Educational Objectives (PEO) for IMSc Food Technology

PEO 1: To develop knowledge and understanding about systems in the production, processing and consumption of food and an appreciation of their impact on society.

PEO 2: To impart knowledge about the nature of food and human nutrition and an appreciation of the importance of food to health.

PEO 3: To build up skills in researching, analyzing and communicating issues related to food preservation, processing, storage and packaging.

PEO 4: To enhance skills in experimenting with and development of food products and equipment by applying theoretical concepts.

PEO 5: To develop skills in designing, implementing and evaluating solutions to food industry situations.

Program Outcomes (PO) for IMSc Food Technology

PO 1: Students will develop ability to identify and discuss a range of historical and contemporary factors which influence the consumption of particular food product as well as accounts for individual and group food selection patterns in terms of structural, psychological, social and economic factors.

PO 2: Students will develop ability to explain the role of nutrients in human health and develop, prepare and present food products using modern processing, preservation and packaging techniques.

PO 3: Students will develop ability to explain and understand manufacturing processes and technologies used in the production of food products examine the nature and extent of the food industry, justify processes of food product manufacturing and equipment design in terms of market, technological and environmental considerations.

PO4: Students will be able to provide scientific advice and technical support to food industry covered under Food Safety and Standards Authority of India, US FDA regulations and other related food standards.

PO5: Students will develop ability to evaluate the impact and apply good manufacturing practices within the Indian food industry on the individual, society & environment with success skills in interpretation, communication, critical thinking, interaction, information acquisition, organization, professionalism, leadership, auto-didactics and life-long-learning.

PO6: Students will be prepared to be professionals with the skills and know-how that will enable them to work independently and rapidly enter the food and beverage production, quality control, research & development and distribution as well as other related sectors, in all areas from production to consumption.

COURSE INFORMATION SHEET

Course code: **PH 113**
Course title: **Physics**
Pre-requisite(s): **Intermediate Physics & Mathematics**
Co- requisite(s):
Credits: **L: 03 T: 01 P: 00**
Class schedule per week: **04**
Class: **B. Tech**
Semester / Level: **I/01**
Branch: **All**
Name of Teacher:

Course Objectives

This course enables the students:

1.	To explain principles of physical optics
2.	To construct Maxwell's equations from basic principles and use it to solve electromagnetic plane wave equations
3.	To distinguish between Newtonian Mechanics and special theory of relativity and develop the relationship of length contraction, time dilation and Einstein energy mass relation and to apply the concepts of special theory of relativity in various field of physics and engineering.
4.	To illustrate the phenomena of old quantum theory and derive Heisenberg uncertainty principle and Schrödinger's equations
5.	To understand basic lasing action, study various types of lasers and to have basic idea of fiber optics.

Course Outcomes

After the completion of this course, students will be:

CO 1	To interpret the intensity variation of light due to Polarization, interference and diffraction.
CO 2	To formulate and solve the engineering problems on electromagnetism.
CO 3	To explain special theory of relativity and apply its concepts in various fields of physics and engineering.
CO 4	To explain fundamentals of quantum mechanics and apply it to problems on bound states.
CO 5	To analyze working principle of lasers and to summarize its applications.

SYLLABUS

Module 1:
Physical Optics: Polarization, Malus' Law, Brewster's Law, Double Refraction, Interference in thin films (Parallel films), Interference in wedge-shaped layers, Newton's rings, Fraunhofer diffraction by single slit, Double slit. (9L)

Module 2:
Electromagnetic Theory: Curl, Gradient, Divergence, Gauss theorem, Stokes theorem, Gauss's law, Applications, Concept of electric potential, Relationship between E and V, Polarization of dielectrics, dielectric constant, Boundary conditions for E & D, Gauss's law in magnetostatics, Ampere's circuital law, Boundary conditions for B & H, Equation of continuity of charge, Displacement current, Maxwell's equations. (9L)

Module 3:
Special Theory of Relativity: Introduction, Inertial frame of reference, Galilean transformations, Postulates, Lorentz transformations and its conclusions, Length contraction, time dilation, velocity addition, Mass change, Einstein's mass energy relation. (9L)

Module 4:
Quantum Mechanics: Planck's theory of black-body radiation, Compton effect, Wave particle duality, De Broglie waves, Davisson and Germer's experiment, Uncertainty principle, physical interpretation of wave function, Schrodinger equation in one dimension, free particle, particle in an infinite square well. (9L)

Module 5:
Lasers: Spontaneous and stimulated emission, Einstein's A and B coefficients, Population-inversion, Light amplification, Basic laser action, Ruby and He-Ne lasers, Properties and applications of laser radiation, Elementary ideas of fiber optics and application of fiber optic cables. (9L)

Text books:

1. Optics, by A. Ghatak, 4th Edition, Tata Mcgraw Hill, 2009 (T1)
2. Elements of Electromagnetics by Mathew N.O. Sadiku,, Oxford University Press, 2001 (T2)
3. Concept of Modern Physicsby Arthur Beiser,, 6th edition, Tata McGraw- Hill, 2009 (T3)

Reference books:

1. Fundamentals of Physics, Halliday, Walker and Resnick (R1)

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Self- learning such as use of NPTEL materials and internets

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	2	2	3	2	3
CO2	-	1	2	3	3	3
CO3	-	2	2	3	2	3
CO4	-	1	3	3	3	3
CO5	-	1	3	2	3	3

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3
CO2	CD1, CD2, CD3
CO3	CD1, CD2, CD3
CO4	CD1, CD2, CD3
CO5	CD1, CD2, CD3

COURSE INFORMATION SHEET

Course code: **MA 103**
Course title: **Mathematics I**
Pre-requisite(s): **Basic Calculus, Basic Algebra**
Co- requisite(s):
Credits: **L: 03 T: 01 P: 00**
Class schedule per week: **04**
Class: **B. Tech**
Semester / Level: **I/01**
Branch: **All**
Name of Teacher:

Course Objectives

This course enables the students to understand

1.	Infinite sequences and series.
2.	Theory of matrices including elementary transformations, rank and its application in consistency of system of linear equations, eigenvalues, eigenvectors etc.
3.	Multivariable functions, their limits, continuity, partial differentiation, properties and applications of partial derivatives.
4.	Integrals of multivariable functions viz. double and triple integrals with their applications.
5.	Properties like gradient, divergence, curl associated with derivatives of vector point functions and integrals of vector point functions.

Course Outcomes

After the completion of this course, students will be able to

CO 1	Decide the behaviour of sequences and series using appropriate tests.
CO 2	Get an understanding of partial derivatives and their applications in finding maxima -minima problems.
CO 3	Apply the principles of integral to solve a variety of practical problems in engineering and sciences.
CO 4	Demonstrate a depth of understanding in advanced mathematical topics.
CO 5	Enhance and develop the ability of using the language of mathematics in engineering.

SYLLABUS

Module 1:
Sequences and Series: Sequences, Convergence of Sequence. Series, Convergence of Series, Tests for Convergence: Comparison tests, Ratio test, Cauchy's root test, Raabe's test, Gauss test, Cauchy's Integral test, Alternating series, Leibnitz test, Absolute and Conditional Convergence. (9L)

Module 2:
Matrices: Rank of a Matrix, elementary transformations, Row - reduced Echelon form. Vectors, Linear Independence and Dependence of Vectors. Consistency of system of linear equations. Eigenvalues, Eigenvectors, Cayley - Hamilton theorem. (9L)

Module 3:
Advance Differential Calculus: Function of several variables, Limit, Continuity, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Chain rules, Jacobians and its properties, Taylor series for function of two variables, Maxima – Minima, Lagrange's method of multipliers. (9L)

Module 4:
Advance Integral Calculus: Beta and Gamma functions: definition and properties. Double integrals, double integrals in polar coordinates, Change of order of integration, Triple Integrals, cylindrical and spherical coordinate systems, transformation of coordinates, Applications of double and triple integrals in areas and volumes. (9L)

Module 5:
Vector Calculus: Scalar and vector point functions, gradient, directional derivative, divergence, curl, vector equations and identities. Line Integral, Work done, Conservative field, Green's theorem in a plane, Surface and volume integrals, Gauss – divergence theorem, Stoke 's theorem. (9L)

Text Books:

1. Thomas' Calculus by M. D. Weir, J. Hass and F. R. Giordano 11th Edition, Pearson Educations, 2008E. **(T1)**
2. Calculus by H. Anton, I. Brivens and S. Davis,, 10th Edition, John Wiley and sons, Singapore Pte. Ltd., 2013. **(T2)**
3. Higher Engineering Mathematics , Ramana B.V. Tata McGraw Hill New Delhi, 11thReprint, 2010. **(T3)**

Reference Books:

1. Calculus, by M. J. Strauss, G. L. Bradley And K. J. Smith, 3rd Ed, Dorling.Kindersley (India) Pvt. Ltd. (P Ed), Delhi, 2007. **(R1)**

2. Linear Algebra and its Applications by David C. Lay, , 3rd Edition, Pearson Ed. Asia, Indian Reprint, 2007. **(R2)**
3. Advanced Engineering Mathematics by D. G. Zill and W.S. Wright, 4th Edition, 2011. **(R3)**

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Self- learning such as use of NPTEL materials and internets

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	2	2	3	2	3
CO2	-	1	2	3	3	3
CO3	-	2	2	3	2	3
CO4	-	1	3	3	3	3
CO5	-	1	3	2	3	3

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3
CO2	CD1, CD2, CD3
CO3	CD1, CD2, CD3
CO4	CD1, CD2, CD3
CO5	CD1, CD2, CD3

COURSE INFORMATION SHEET

Course code: **CS 101**
Course title: **Programming for Problem Solving**
Pre-requisite(s):
Co- requisite(s): **Programming for Problem Solving Lab**
Credits: **L: 03 T: 01 P: 00**
Class schedule per week: **04**
Class: **B. Tech**
Semester / Level: **I/01**
Branch: **All**
Name of Teacher:

Course Objectives

This course enables the students:

1.	To learn computer language.
2.	To learn coding for solving scientific and engineering problems.
3.	To learn the problem-solving process through computer.
4.	To know the limitations of system during program execution.
5.	To know the practical application of various programming techniques.

Course Outcomes

After the completion of this course, students will be able to

CO 1	To formulate simple algorithms for arithmetic and logical problems.
CO 2	To translate the computer algorithms to computer programs.
CO 3	To test and execute the programs and correct syntax and logical errors.
CO 4	To apply programming to solve simple numerical method problems, differentiation of function and simple integration.
CO 5	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

SYLLABUS

Module 1:

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Problem Solving: Steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code (9L)

Module 2:

Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals, Iterations, Loops. (9L)

Module 3:

Array, Character array, strings. Case studies to discuss the various Problems related to Basic science (Matrix addition, Matrix-matrix multiplication, Roots of an equation etc.), Sorting, Searching. (9L)

Module 4:

Functions (including using built in libraries), Parameter passing in functions, call by value, call by reference. Passing arrays to functions, Recursion (Finding Factorial, Fibonacci series, Ackerman function etc.). (9L)

Module 5:

Structures, Defining structures and Array of Structures Pointers: Defining pointers, Use of Pointers in self-referential structures, File Handling (9L)

Text Books:

1. Problem solving and Program design in C by Jery R Hanly, 7thEdition, Pearson Education. Programming in ANSI C, Tata McGraw-Hill.
2. ReemaThareja, Introduction to C Programming by E. Balaguruswamy,, 2nd Edition, Oxford University Press, 2015.
3. The C Programming Language by Brian W. Kernighan and Dennis M. Ritchie,, Prentice. Byron Schaum's Outline of Programming with C Gottfried,, Tata McGraw-Hill.

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Self- learning such as use of NPTEL materials and internets

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	2	2	3	2	3
CO2	-	1	2	3	3	3
CO3	-	2	2	3	2	3
CO4	-	1	3	3	3	3
CO5	-	1	3	2	3	3

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3
CO2	CD1, CD2, CD3
CO3	CD1, CD2, CD3
CO4	CD1, CD2, CD3
CO5	CD1, CD2, CD3

COURSE INFORMATION SHEET

Course code: **MT 123**
Course title: **Business Communication**
Pre-requisite(s): **NIL**
Co- requisite(s): **NIL**
Credits: 3 **L: 2 T: 0 P: 2**
Class schedule per week: **2**
Class: **All**
Level: **1**
Name of Teacher:

Course Objectives

This course enables the students:

A.	To analyze and demonstrate writing and speaking processes through invention, organization, drafting, revision, editing, and presentation.
B.	To understand the importance of specifying audience and purpose and to select appropriate communication choices.
C.	To interpret and appropriately apply modes of expression, i.e., descriptive, expositive, Narrative, scientific, and self-expressive, in written, visual, and oral communication
D.	To participate effectively in groups with emphasis on listening, critical and reflective thinking, and responding.
.E	To develop the ability to research and write a documented paper and/or to give an oral presentation.

Course Outcomes

After the completion of this course, students will be able to:

1.	Apply business communication strategies and principles to prepare effective communication for domestic and international business situations.
2.	Utilize analytical and problem-solving skills appropriate to business communication.
3.	Participate in team activities that lead to the development of collaborative work skills.
4.	Select appropriate organizational formats and channels used in developing and presenting business messages
5.	Communicate via electronic mail, Internet, and other technologies and deliver an effective oral business presentation.

Syllabus

Module I

Introduction to Business Communication: Importance and Objectives of Business communication, Process of communication, Barriers to effective communication, Techniques of effective communication. Forms of communication (Written, Oral, audio-visual communication).

Module II

Managing Business Communication: Formal and Informal communication, Non- verbal communication (Body language, Gestures, Postures, Facial expressions). The cross cultural dimensions of business communication. Techniques to effective listening, methods and styles of reading.

Module III

Other aspects of communication: Vocabulary: Single word substitution, Idioms and phrases, Precis writing, Comprehension. Group Discussions, Extempore, Principles of effective speech and presentations, Role playing.

Module IV:

Introduction to managerial writing: Business letters: Inquiries, Circulars, Quotations, Orders, Acknowledgement, Claims & adjustments, Collection letters, Sales letters, Drafting of different resumes, Covering letters Applying for a job, Social correspondence, Invitation to speak. Official Correspondence: Memorandum, Notice, Agenda, Minutes, Circular letters.

Module V:

Report writing: Business reports, Types, Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft, check lists for reports.

Text Books:

1. Communication Skills, Sanjay Kumar & PushpLata, Oxford University Press (T1).
2. Business Correspondence and Report Writing, R.C.Sharma, Krishna Mohan.Mcgraw Hill (T2).
3. Communication for Business, Shirley Taylor, V. Chandra, Pearson (T3).
4. Business Communication- Hory Sankar Mukherjee, Oxford University Press (T4).
5. Basic Business Communication- .Lesikar I Flatley, McGraw Hill. (T5).
6. Business Communication Today ,Bovee, Thill and Chaterjee, Pearson (T6).

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	2	2	3	2	3
CO2	-	1	2	3	3	3
CO3	-	2	2	3	2	3
CO4	-	1	3	3	3	3
CO5	-	1	3	2	3	3

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3
CO2	CD1, CD2, CD3
CO3	CD1, CD2, CD3
CO4	CD1, CD2, CD3
CO5	CD1, CD2, CD3

COURSE INFORMATION SHEET

Course code:	**PH 114**
Course title:	**Physics Lab**
Pre-requisite(s):	**Intermediate Physics (Theory and Lab)**
Co- requisite(s):	
Credits:	**1.5 L:0 T: 0 P: 03**
Class schedule per week:	**03**
Class:	**B. Tech**
Semester / Level:	**I/01**
Branch:	**All**
Name of Teacher:	

List of Experiments

1. Error analysis in Physics Laboratory
2. To determine the frequency of AC mains with the help of sonometer
3. To determine the wavelength of sodium light by Newton's rings Method
4. To determine the resistance per unit length of a Carey Foster's bridge wire and then to find the resistivity of the material of a given wire.
5. Measurement of mechanical equivalent of heat by electrical method
6. Determination of refractive index of the material of a prism using spectrometer and sodium light
7. To determine the frequency of electrically maintained tuning fork by Melde's experiment
8. Measurement of voltage and frequency of a given signal using cathode ray oscilloscope
9. To determine the wavelength of prominent spectral lines of mercury light by a plane transmission grating using normal incidence
10. To determine the electromotive force (emf) of an unknown cell using a stretched wire potentiometer
11. To study the frequency response and quality factor of series LCR circuit.
12. To find the specific rotation of sugar solution by using a polarimeter.
13. To determine the Hall voltage and calculate the Hall coefficient and carrier concentration of a semiconductor sample

COURSE INFORMATION SHEET

Course code:	**CS 102**
Course title:	**Programming for Problem Solving Lab**
Pre-requisite(s):	**Intermediate Physics (Theory and Lab)**
Co- requisite(s):	**Programming for Problem Solving**
Credits:	**1.5 L: 00 T: 00 P: 03**
Class schedule per week:	**03**
Class:	**B. Tech**
Semester / Level:	**I/01**
Branch:	**All**
Name of Teacher:	

Sample Program List

Module 1 & Module 2: Introduction and Control Flow

1. Write an interactive program that will read in a +ve integer value and determine the following
   i) If the integer is a prime number
   ii) If the integer is a Fibonacci number
2. WAP in C to compute sinx = x – x3/3! + x5/3! – x7/7! ….. to five place of accuracy. Test the program for x = 1, x = 2, and x = 3. In each case display the number of terms used to obtain the final answer.
3. WAP to generate every 3rd integer beginning with I = 2 and continue for all integers that are less than 150. Calculate the sum of those integers that are evenly divisible by 5.
4. WAP to find whether a given year is a leap year or not. Modify it to generate a list of leap years between two year limits given by user.
5. WAP to display the following pattern :

```
          11
       11 10 11
    11 10  9 10 11
11 10  9  8  9 10 11
```

6. Using Ternary / Conditional operator find the greatest among 3 numbers.
7. WAP to convert a decimal number into an equivalent number of the input base. Test your program for base 2, 8 & 16.
8. WAP to read a number n, and print it out digit-by-digit, as a series of words. For e.g. 123 would be printed as “one two three”.
9. WAP to check whether any input +ve integer is palindrome or not.
10. WAP to simulate a simple calculator (+ - / * %) that takes two operands and an operator as input and displays the result.
11. WAP to find the GCD of two input +ve integer numbers. Using this find GCD of 9 numbers.
12. WAP to swap the values of two variables without using a third variable.

Module 3: Array

13. Read a line of mixed text, and then write it out with all lower case and uppercase letters reversed, all digits replaced by 0s and all other characters (non-letters and nondigits) replaced by '*'.
14. WAP to find the product of two matrices A and B. Display the source matrices and product matrix C in matrix format.
15. WAP to find whether a given matrix is a triangular matrix or not.
16. WAP to find the transpose of a matrix. Display the source and the transposed matrix in matrix format.
17. Implement Prob. No. – 14 to 16 using functions for reading, manipulating and displaying the corresponding matrices in matrix form.
18. WAP to sort a list of strings alphabetically using a 2-dim. Character array.
19. WAP to display the row sum and the column – sum of an input 2- dim. Matrix. Display the source matrix with row and column sum.

Module 4: Functions, Pointer & String

20. Write a recursive function to calculate S = 2 + 4 + 6 + 8 + …… +2N. Implement the function in a complete C program.
21. Write a function that accepts two arguments an array and its size n. It performs Bubble up sort on the array elements. Using indirection operator '*' implement this in a complete C program. Display the source and the sorted array.
22. Using pointer, write a function that receives a character string and a character as argument. Delete all occurrences of this character in the string. The function should return corrected string with no holes.
23. Write a function for reading character string using pointer. Calculate the length of the string (without using strlen ()). Finally print the string in reverse order, using pointer.
24. Implement prob. No. 14 using pointers representation of 2 – dim. array.
25. Implement prob. No. 15 using pointer representation of 2 dim. array.
26. Implement prob. No. 16 using pointer representation of 2 dim. array.
27. WAP to sort a list of strings into alphabetical order using array of pointers.

Module 5: Structure and File

28. Create records of 60 students, where each record has fields-name, roll, GPA and fees. Write a function update () to reduce the fees of those students who have obtained GPA greater than 8.5 by 25% of the original fees. Write a complete program to exercise this function in the main program and display all the records before and after updation.
29. Define a structure that describes a hotel. It should have members that include the name, address, grade, average room charge and number of rooms. Write a function to perform the following operations:

a) To print out hotels of a given grade in order of charges.
b) To print out hotels with room charges less than a given value.

30. WAP to concatenate the contents of two files into a third file.
31. WAP to copy the content of one file into another file. Names of both the files are to be input as command line arguments

COURSE INFORMATION SHEET

Course code: **CE101**
Course title: **Environmental Science**
Pre-requisite(s): **NA**
Co- requisite(s): **NA**
Credits: **L:2 T:0 P:0**
Class schedule per week: **02**
Class: **B. Tech**
Semester / Level: **II/01**
Branch: **All**
Name of Teacher:

Course Objectives

This course enables the students:

1	To develop basic knowledge of ecological principles and their applications in environment.
2	To identify the structure and composition of the spheres of the earth, the only planet sustaining life.
3	To analyse, how the environment is getting contaminated and probable control mechanisms for them.
4	To generate awareness and become a sensitive citizen towards the changing environment.

Course Outcomes

After the completion of this course, students will be:

CO 1	Able to explain the structure and function of ecosystems and their importance in the holistic environment.
CO 2	Able to identify the sources, causes, impacts and control of air pollution.
CO 3	Able to distinguish the various types of water pollution happening in the environment and understand about their effects and potential control mechanisms.
CO 4	Able to judge the importance of soil, causes of contamination and need of solid waste management.
CO 5	Able to predict the sources of radiation hazards and pros and cons of noise pollution.

Syllabus

Module 1:

Ecosystem and Environment: Concepts of Ecology and Environmental science, ecosystem: structure, function and services, Biogeochemical cycles, energy and nutrient flow, ecosystem management, fate of environmental pollutants, environmental status and reports on climate change. (6L)

Module 2:

Air Pollution: Structure and composition of unpolluted atmosphere, classification of air pollution sources, types of air pollutants, effects of air pollution, monitoring of air pollution, control methods and equipment for air pollution control, vehicular emissions and control, indoor air pollution, air pollution episodes and case studies. (6L)

Module 3:

Water Pollution: Water Resource; Water Pollution: types and Sources of Pollutants; effects of water pollution; Water quality monitoring, various water quality indices, water and waste water treatment: primary, secondary and tertiary treatment, advanced treatments (nitrate and phosphate removal); Sludge treatment and disposal. (6L)

Module 4:

Soil Pollution and Solid Waste Management: Lithosphere – composition, soil properties, soil pollution, ecological & health effects, Municipal solid waste management – classification of solid wastes, MSW characteristics, collection, storage, transport and disposal methods, sanitary landfills, technologies for processing of MSW: incineration, composing, pyrolysis. (5L)

Module 5:

Noise pollution & Radioactive pollution: Noise pollution: introduction, sources: Point, line and area sources; outdoor and indoor noise propagation, Effects of noise on health, criteria noise standards and limit values, Noise measurement techniques and analysis, prevention of noise pollution; Radioactive pollution: introduction, sources, classification, health and safety aspects, Hazards associated with nuclear reactors and disposal of spent fuel rods-safe guards from exposure to radiations, international regulation, Management of radioactive wastes. (5L)

Text books:

1. Environmental Chemistry by A, K. De. (3rd Ed). 2008.. New Age Publications India Ltd.
2. Environmental Studies: From Crisis to Future by R. Rajagopalan.2016 3rd edition, Oxford University Press.
3. Fundamentals of Ecology by Eugene P. Odum. 1971. 3rd ed.- WB Sunders Company, Philadelphia.
4. Chemistry for Environmental Engineering and Science by C. N. Sawyer, P. L. McCarty and G. F. Parkin. 2002. John Henry Press.
5. Environmental Science by S.C. Santra. 2011. New Central Book Agency.

Reference books:

1. Basic Concepts of Environmental Chemistry by D.W.Conell., CRC Press.
2. Environmental Engineering by Peavy, H.S, Rowe, D.R, Tchobanoglous, G., Mc-Graw - Hill International

3. Introduction to Environmental Engineering and Science by G.M. Masters& Wendell Ela. 1991., PHI Publishers.

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminar

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	1	2	3	2	2	3
CO2	1	1	3	2	3	3
CO3	1	2	2	3	2	3
CO4	1	1	3	3	3	3
CO5	1	1	3	3	2	3

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3
CO2	CD1, CD2, CD3
CO3	CD1, CD2, CD3
CO4	CD1, CD2, CD3
CO5	CD1, CD2, CD3

COURSE INFORMATION SHEET

Course code: **CH 101**
Course title: **Chemistry**
Pre-requisite(s): **Intermediate level chemistry**
Co- requisite(s):
Credits: **L: 03 T: 01 P: 00**
Class schedule per week: **04**
Class: **All**
Semester / Level: **II/01**
Branch: **All**
Name of Teacher:

Course Objectives

This course enables the students:

1.	To create concept of Chemical bonding & Coordination Chemistry.
2.	To understand the basic 3D structure in organic chemistry including stereochemistry, aromaticity and reaction mechanism.
3.	To understand the reaction dynamics and to know different types of catalysis.
4.	To understand the modern techniques related to spectroscopy and structural characterization.
5.	To develop knowledge on the physical state and electrochemistry of molecules.

Course Outcomes

After the completion of this course, students will be:

CO 1	Able to explain the bonding in a molecular structure.
CO 2	Able to explain the 3D structure, aromaticity and stereochemistry of organic molecules.
CO 3	Able to explain the spectroscopic data for structural characterization of the molecules.
CO 4	Able to predict the rate, molecularity and mechanism of a simple as well as catalytic reaction.
CO 5	Able to interpret the phases of solid and the electrochemical behavior of the molecules.

SYLLABUS

Module 1:
Chemical Bonding *Ionic bond:* Radius ratio rule, Born-Landé equation, Born-Haber cycle. *Metallic Bond:* valence bond and band theories, defects in solids, Werner's Theory, Bonding in Transition metal complexes, Ligands, coordination complexes, Ligand Field, Crystal Field Theory, Octahedral, Tetrahedral and square planar complexes, CFSE, Jahn Teller theorem, electronic spectra, magnetism, and isomerization in coordination compounds. (9L)

Module 1I:
Organic Structure and Stereochemistry *Covalent bond:* Lewis structure, Valence Bond theory, Molecular orbital theory, Molecular orbital of diatomic and polyatomic system, hybridization, conjugated molecules, Huckel molecular orbital theory of conjugated systems. Isomerism, Geometrical isomerism: *cis–trans* and syn-anti isomerism; Optical isomerism & Chirality; Wedge, Fischer, Newmann and Sawhorse Projection formulae and interconversions; E/Z, D/L, R/S nomenclature system; Conformational studies of ethane, n-butane, Cyclohexane. (9L)

Module 1II:
Kinetics and Catalysis: Order & molecularity of reactions: chain, parallel, Competing, Side, Consecutive reactions; Kinetics of Fast reactions, Characteristics of catalyst, types of catalysis, catalytic poison; Theories of catalysis; Acid base catalysis: including kinetics, Enzyme catalysis, Mechanism and kinetics of enzyme catalyzed reaction, Michaelis-Menten equation, Important catalysts in industrial processes; Hydrogenation using Wilkinsons catalyst, Hydroformylation by using Cobalt-catalyst, Phase transfer catalyst. (9L)

Module 1V:
Spectroscopic Techniques Absorption and emission Spectroscopy, Lambert-Beers Law, Principles and applications of UV-Visible, Factors influencing for UV-VIS spectrum; Rotational and Vibrational spectroscopy, Principle of FT-IR, and NMR spectroscopy; Modern techniques in structural elucidation of compounds by UV-VIS, IR, & NMR Spectroscopy. (9L)

Module V:
Phase and Chemical equilibrium Phase Rule: Terms Involved, Phase diagram of one component (Water) & two component (Pb/Ag) system & their applications. Law of chemical equilibrium, equilibrium constants and their significance, Weak and strong electrolytes, Standard electrode potential and its application to different kinds of half cells, EMF and its measurement and application, Batteries and Fuel Cells, Chemical and Electrochemical corrosion, Factors affecting the rate of corrosion. (9L)

Text books:

1. Inorganic Chemistry: Principles of Structure and Reactivity by Huheey, J. E.,, 4th edition,Pearson.**(T1)**
2. Organic Chemistry by Morrison, R. N. & Boyd, R. N., Seventh Edition, Pearson**(T2)**
3. Physical Chemistry by Atkins, P. W. & Paula, J., 10th Ed., Oxford University Press, 2014. **(T3)**

Reference books:

1. Concise Inorganic Chemistry by Lee, J. D. ELBS, 1991. **(R1)**
2. Physical Chemistry by Mortimer, R. G. 3rd Ed., Elsevier (2009). **(R2)**
3. Organic Spectroscopy by William Kemp, 3rd Ed., 2008 Macmillan. **(R3)**

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Laboratory experiments/teaching aids
CD4	Self- learning such as use of NPTEL materials and internets

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	2	2	3	3	3
CO2	-	1	2	3	3	3
CO3	-	2	2	3	3	3
CO4	-	1	3	3	3	3
CO5	-	1	3	2	3	3

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3,CD4
CO2	CD1, CD2, CD3, CD4
CO3	CD1, CD2, CD3, CD4
CO4	CD1, CD2, CD3, CD4
CO5	CD1, CD2, CD3, CD4

COURSE INFORMATION SHEET

Course code: **MA 107**
Course title: **Mathematics II**
Pre-requisite(s): **Mathematics - I**
Co- requisite(s):
Credits: **L: 03 T: 01 P: 00**
Class schedule per week: **04**
Class: **All**
Semester / Level: **II/01**
Branch: **All**
Name of Teacher:

Course Objectives

This course enables the students to understand:

1.	Various methods to solve linear differential equations of second and higher order.
2.	special functions viz. Legendre's and Bessel's and different properties associated with them.
3.	Diverse mathematical techniques for solving partial differential equations of first order and higher order, along with their applications in wave and heat equations using Fourier series.
4.	The theory of functions of a complex variable, complex differentiation and integration.
5.	About random variables and elementary probability distribution.

Course Outcomes

After the completion of this course, students will be:

CO 1	Investigate the occurrence of differential equations in science and engineering and use methods available for their solutions.
CO 2	Gain an understanding on complex variable functions and using their properties in real life problems.
CO 3	Construct appropriate probability models in solving real world problems.
CO 4	Demonstrate a depth of understanding in advanced mathematical topics.
CO 5	Enhance and develop the ability of using the language of mathematics in engineering.

SYLLABUS

Module 1:
Ordinary Differential Equations – I Linear differential equations, Wronskian, Linear independence and dependence of solutions, Linear differential equations of second and higher order, Operator method, Legendre's and Euler – Cauchy's form of linear differential equation, Method of variation of parameters. (9L)

Module 1I:
Ordinary Differential Equations – II: Ordinary and singular points of differential equation, Power and Frobenius series solutions. Bessel's differential equation, Bessel function of first kind and its properties. Legendre's differential equation, Legendre's polynomial and its properties. (9L)

Module 1II:
Fourier series and Partial Differential Equations Fourier series: Euler formulae for Fourier series, Dirichlet conditions, Half range Fourier series. Partial Differential Equations: Linear partial differential equations, Lagrange's method. Method of separation of variables and its application in solving one dimensional wave and heat equations. (9L)

Module IV:
Complex Variable-Differentiation & Integration Function of a complex variable, Limit, Continuity, Differentiability, Analyticity, Analytic functions, Cauchy – Riemann equations. Harmonic functions, Harmonic Conjugate. Cauchy's theorem, Cauchy's Integral formula, Taylor and Laurent series expansions. Singularities and its types, Residues, Residue theorem. (9L)

Module 5: Applied Probability
Discrete and continuous random variables, cumulative distribution function, probability mass and density functions, expectation, variance, moment generating function. Introduction to Binomial, Poisson and Normal Distribution. (9L)

Text Books:

1. Advanced Engineering Mathematics by E. Kreyszig,, 9th Edition, John Wiley & Sons, 2006. **(T1)**
2. Advanced Engineering Mathematics by D. G. Zill and W.S. Wright,, 4th Edition, 2011.
3. JComplex Variables and Applications, by W. Brown and R. V. Churchill, 7th Edition, McGraw Hill, 2004. **(T2)**
4. Advanced Engineering Mathematics by R.K. Jain and S.R.K. Iyengar, 3rd Edition, Narosa Publishing, 2009. **(T3)**
5. Probability and Statistics for Engineers by R. A . Johnson, I. Miller and J. Freund:, PHI. **(T4)**

Reference Books:

1. Elementary Differential Equations and Boundary Value Problems by W. E. Boyce and R. C. DiPrima, 9th Edition ., Wiley India, 2009. **(R1)**
2. A text book of Engineering Mathematics by N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2008. **(R2)**
3. An Introduction to Ordinary Differential Equations by E. A. Coddington, Prentice Hall India, 1995. **(R3)**
4. Differential Equations with Applications and Historical Notes by G. F. Simmons,, TMH, 2nd Edition, 2003. **(R4)**

5. Introductory Probability and Statistical Applications by P. L. Meyer:, Oxford & IBH. **(R5)**

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Laboratory experiments/teaching aids
CD4	Self- learning such as use of NPTEL materials and internets

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	2	2	3	2	3
CO2	-	1	2	3	3	3
CO3	-	2	2	3	2	3
CO4	-	1	3	3	3	3
CO5	-	1	3	2	3	3

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3,CD4
CO2	CD1, CD2, CD3, CD4
CO3	CD1, CD2, CD3, CD4
CO4	CD1, CD2, CD3, CD4
CO5	CD1, CD2, CD3, CD4

COURSE INFORMATION SHEET

Course code: **BE 203**
Course title: **Microbiology**
Pre-requisite(s): **Intermediate level Physics, Chemistry & Mathematics**
Co- requisite(s):
Credits: **L: 03 T: 00 P: 00**
Class schedule per week: **03**
Class: **IMSc**
Semester / Level: **II/01**
Branch: **Food Technology**
Name of Teacher:

Course Objectives

This course enables the students:

1.	To develop fundamental understanding of the microbial world, basic structure and functions of microbes, metabolism, nutrition, their diversity, physiology and relationship to environment and human health.
2.	To explain the basic microbial structure , function and study the comparative characteristics of prokaryotes and eukaryotes
3.	To develop the knowledge of different culture media composition, its applications and preparation and demonstrate various physical and chemical means of sterilization
4.	To apply general bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae
5.	To relate the microbial growth , pathways and associated control parameters
6.	To solve the problems in microbial infection and their control.

Course Outcomes

After the completion of this course, students will be:

CO 1	Able to develop the knowledge in the basic area of Microbiology
CO 2	Able to explain the basic microbial structure , function and study the comparative characteristics of prokaryotes and eukaryotes
CO 3	Able to formulate various culture media and have understanding of their applications
CO 4	Able to explain various physical and chemical means of sterilization
CO 5	Able to build knowledge on general bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi & algae and able to understand the microbial growth , pathways and associated control parameters

SYLLABUS

Module 1:
Landmark discoveries relevant to the field of microbiology; Controversy over spontaneous generation; Role of microorganisms in transformation of organic matter and in the causation of diseases; Pure culture techniques; Serial dilution technique; Theory and practice of sterilization; Principles of microbial nutrition; Enrichment culture techniques for isolation of microorganisms; Light-, phase contrast- and electron-microscopy. (8L)

Module 2:
Bacteria, Archea and their broad classification; Eukaryotic microbes: Yeasts, molds and protozoa; Viruses and their classification; Molecular approaches to microbial taxonomy. Prokaryotic Cells: cell walls, cell membranes, mechanisms of solute transport across membranes, Flagella and Pili, Capsules, Cell inclusions like endospores and gas vesicles; Eukaryotic cell organelles: Endoplasmic reticulum, Golgi apparatus, mitochondria and chloroplasts. (8L)

Section 3:
Definition of growth; Growth curve; Mathematical expression of exponential growth phase; Measurement of growth and growth yields; Synchronous growth; Continuous culture; Effect of environmental factors on growth; Effect of physical and chemical agents; Evaluation of effectiveness of antimicrobial agents; General characteristics of antimicrobial drugs; Antibiotics: Classification, mode of action and resistance; Antifungal and antiviral drugs.(8L)

Section 4:
Energetics: redox reactions and electron carriers; An overview of metabolism; Glycolysis; Pentose-phosphate pathway; Entner-Doudoroff pathway; Glyoxalate pathway; The citric acid cycle; Fermentation; Aerobic and anaerobic respiration; Chemolithotrophy; Photosynthesis; Calvin cycle; Biosynthetic pathway for fatty acids synthesis; Common regulatory mechanisms in synthesis of amino acids; Regulation of major metabolic pathways; Microbial interactions; Carbon, sulphur and nitrogen cycles; Soil microorganisms associated with vascular plants. (8L)

Section 5:
Normal microbiota; Classification of infectious diseases; Reservoirs of infection; Nosocomial infection; Emerging infectious diseases; Mechanism of microbial pathogenicity; Nonspecific defense of host; Antigens and antibodies; Humoral and cell mediated immunity; Vaccines; Immune deficiency; Human diseases caused by viruses, bacteria, and pathogenic fungi. Types of mutation; UV and chemical mutagens; Selection of mutants; Ames test for mutagenesis; Bacterial genetic system: transformation, conjugation, transduction, recombination, plasmids, transposons; DNA repair; Regulation of gene expression: repression and induction; Operon model; Bacterial genome with special reference to E.coli; Phage λ and its life cycle; RNA phages; RNA viruses; Retroviruses; Basic concept of microbial genomics. (8L)

Text books:

1. Microbiology, by M. J. Pelczar, E.C.S. Chan, N.R. Krieg, 5 Edition. Tata McGraw Hill Publication Co. Ltd. New Delhi. **(T1)**
2. General Microbiology by R.Y. Stanier, J.L. Iingraham, M.L. Wheelis, R.K. Painter, , 5 Edition. MacMillan Press Ltd., London. **(T2)**
3. A Text Book of Microbiology by R.C Dubey and D. K Maheshwari , 3rd ed, S. Chand and Company. **(T3)**

4. General Microbiology by C.B Powar and H.F Daginawala- (Vol I & II) 3rd ed, Himalaya Publishing. **(T4)**
5.

Reference books:

1. Fundamental Principles of Bacteriology by A.J. Salle. -, Tata Mcgraw Hill (**R1**)
2. General Microbiology by Hans G. Schlegel, , 7thed, Cambridge Low Price Edns (**R2**)
3. Chemical Microbiology by A.H. Rose, , 3rded, Butterworth World Student Reprints (**R3**)

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Seminars
CD4	Mini projects/Projects
CD5	Laboratory experiments/teaching aids

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	2	3	1	3	2	3
CO2	2	3	2	3	3	3
CO3	2	3	1	3	2	3
CO4	3	3	1	3	3	3
CO5	2	3	2	3	2	3

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3, CD4, CD5
CO2	CD1, CD2, CD3, CD4, CD5
CO3	CD1, CD2, CD3, CD4, CD5
CO4	CD1, CD2, CD3, CD4, CD5
CO5	CD1, CD2, CD3, CD4, CD5

COURSE INFORMATION SHEET

Course code: **EC 101**
Course title: **Basic Electronics Engineering**
Pre-requisite(s): **Intermediate level Physics, Chemistry & Mathematics**
Co- requisite(s):
Credits: **L: 03 T: 0 P: 00**
Class schedule per week: **03**
Class: **IMSc**
Semester / Level: **II/01**
Branch: **All**
Name of Teacher:

Course Objectives

This course enables the students:

1.	To understand PN Junction, diodes and their applications.
2.	To comprehend BJT, FET and their bias configurations.
3.	To grasp importance of feedback in amplifier circuits, op amp and its applications.
4.	To understand number system, Logic Gates and Boolean algebra.
5.	To apprehend fundamentals of communication technology.

Course Outcomes

After the completion of this course, students will be:

CO 1	Explain PN Junction, diodes and their applications.
CO 2	Appraise the BJT, FET and their biasing techniques.
CO 3	Comprehend feedback in amplifier circuits, op amp and its applications.
CO 4	Translate one number system into another, build circuits with Logic Gates, electronic components and OPAMP IC 741 and analyze the measurement results using CRO.
CO 5	Appraise the fundamentals of communication technology.

SYLLABUS

Module 1:
Diodes and Applications: Introduction to PN junction diodes; Characteristics of semiconductor diodes: V-I characteristics, diode-resistance, temperature-dependence, diode-capacitance; DC & AC load lines; Breakdown Mechanisms; Zener Diode – Operation and Applications; Diode as a Rectifier: Half Wave and Full Wave Rectifiers with and without C-Filters. (9L)

Module 1I:
Bipolar Junction Transistors (BJT): PNP and NPN Transistors, Basic Transistor Action, Input and Output Characteristics of CB, CE and CC Configurations, dc and ac load line analysis, operating point, Transistor biasing: Fixed bias, emitter bias/self-bias, Low-frequency response of CE amplifier. Field Effect Transistors: JFET, Idea of Channel Formation, Pinch-Off and saturation Voltage, Current-Voltage Output Characteristics; MOSFET: Basic structure, operation and characteristics. (9L)

Module III:
Sinusoidal Oscillators: Concept of positive and negative feedback, Barkhausen criterion for sustained oscillations, Determination of Frequency and Condition of oscillation, Hartley and Colpitt's oscillator. Operational Amplifiers: Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Inverting and non-inverting amplifiers, Offset error voltages and currents; Power supply rejection ratio, Slew Rate and concept of Virtual Ground, Summing and Difference Amplifiers, Differentiator and Integrator, RC phase shift oscillator. (9L)

Module 1V:
Logic Gates and Boolean algebra: Introduction to Boolean Algebra and Boolean operators, Symbolic representation, Boolean algebraic function and Truth table of different Digital logic, Gates (AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR); Realization of Basic logic gates using universal gates, Adder, Subtractor, adder/subtractor. (9L)

Module V:
Electronic communication: Introduction to electronic communication system, Electromagnetic Communication spectrum band and applications, Elements of Electronic Communication System; Merits and demerits of analog and digital communication, Modes of communication; Signal radiation and propagation; Need for modulation; Introduction to Amplitude modulation and Angle modulation. (9L)

Text Books:

1. Integrated Electronics: Analog and Digital Circuits and Systems by Millman J., Halkias C.C., Parikh Chetan,, 2nd Edition, Tata McGraw-Hill.
2. Digital Logic and Computer Design by Mano M.M., Pearson Education, Inc, Thirteenth Impression, 2011.
3. Analog and Digital Communications by Singal T. L.,, 2nd Edition, Tata McGraw-Hill.
4. Introduction to Analog & Digital Communications by Haykin S., Moher M.,, 2nd Edition, Wiley India Pvt. Ltd.

Reference Book:

1. Electronic Devices and Circuit Theory by Boylstead R.L., Nashelsky L.,, 10th Edition Pearson Education, Inc.

Course Evaluation:

Individual assignment, Theory (Quiz and End semester) examinations.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Tutorials/Assignments
CD3	Laboratory experiments/teaching aids

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6
CO1	-	2	2	3	2	3
CO2	-	1	2	3	3	3
CO3	-	2	2	3	2	3
CO4	-	1	3	3	3	3
CO5	-	1	3	2	3	3

< 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD3
CO2	CD1, CD2, CD3
CO3	CD1, CD2, CD3
CO4	CD1, CD2, CD3
CO5	CD1, CD2, CD3

COURSE INFORMATION SHEET

Course code:	**BE 201**
Course title:	**Microbiology Lab**
Pre-requisite(s):	
Co- requisite(s):	**Microbiology**
Credits:	**L: 00 T: 00 P: 03**
Class schedule per week:	**03**
Class:	**IMSc**
Semester / Level:	**II/01**
Branch:	**Food Technology**
Name of Teacher:	

Syllabus

1. General terms and safety procedure of microbiology Laboratory
2. Microscopy- Brightfield, Darkfield Microscopy, Phase-Contrast Microscopy, Fluorescence Microscopy & Microscopic Measurements
3. Aseptic Technique- Transfer from broth culture to another broth, Transfer of bacteria from slant to slant, Working with agar plates(Inoculating a slant from a Petri plate)
4. Media preparation & methods of inoculation of different microbes in selective media.
5. Smear Preparation-from liquid and solid media
6. Pure Culture Techniques- streak plate method, pour plate method
7. Bacterial Population Counts- Quantitative plating method, Pipette Handling, Diluting and Plating Procedure
8. Identification of microorganisms from the habitats [simple staining, differential staining, acid fast staining, capsule staining, Gram staining , spore staining and motility]
9. Observation of morphology - shape and arrangement of cells.
10. Bacteria and its general properties
11. Bacteriology of air, soil and water
12. General properties of The Fungi: Yeasts and Molds
13. Study of yeast and mold
14. Motility determination-Soft agar deeps and Hanging drop method

COURSE INFORMATION SHEET

Course code:	**CH 102**
Course title:	**Chemistry Lab**
Pre-requisite(s):	**Intermediate level Chemistry**
Co- requisite(s):	
Credits:	**1.5 L: 03 T: 00 P: 00**
Class schedule per week:	**03**
Class:	**B. Tech.**
Semester / Level:	**II/01**
Branch:	**All**
Name of Teacher:	

Syllabus

1. Gravimetric estimation of Nickel by Dimethylglyoxime.
2. Quantitative estimation of Ca^{2+} and Mg^{2+} ions by complexometric titration using Na_2-EDTA.
3. To verify Bears Law using Fe^{3+} solution by spectrophotometer/colorimeter and to determine the concentration of a given unknown Fe^{3+} solution.
4. Separation of binary organic mixture by acid-base extraction and analysis using given FTIR and NMR spectrum.
5. Preparation of Diazoamino Benzene and report the melting point and yield of product.
6. Draw melting point-mass percent composition diagram for two component mixture and determine the Eutectic Temperature.
7. To study the kinetics of acid-catalyzed hydrolysis of ethyl acetate and to evaluate the value of the rate constant.
8. To determine the rate law for the reaction between iodide and hydrogen peroxide in an acidic environment and to determine the effect of a catalyst on the rate of reaction.
9. To determine the strength of the given strong acid by strong base Potentiometrically.
10. To determine the transition temperature of the given salt hydrate.
11. Qualitative detection of special elements in organic compounds.
12. To draw the pH-titration curve of strong acid vs strong base.

Reference book:

1. Experimental Physical Chemistry, By B. Viswanathan, P. S. Raghavan, Narosa Publishing House (1997).
2. Vogels Textbook of Practical Organic Chemistry
3. Experiments in General chemistry, by C. N. R. Rao and U. C. Agarwal
4. Experimental Organic Chemistry Vol 1 and 2 by P R Singh, D S gupta, K S Bajpai,
5. Tata McGraw Hill

COURSE INFORMATION SHEET

Course code:	**EC 102**
Course title:	**Electronics & Communication Lab**
Pre-requisite(s):	**Intermediate level Chemistry**
Co- requisite(s):	
Credits:	**1.5 L: 0 T: 0 P: 03**
Class schedule per week:	**03**
Class:	**B. Tech.**
Semester / Level:	**II/01**
Branch:	**All**
Name of Teacher:	

Syllabus

List of Compulsory experiments:

1. Measurement of voltage, time period and frequency of different signals on CRO.
2. Measurement of frequency and phase of two different signals using Lissajous pattern.
3. To determine the forward and reverse bias characteristics of PN junction diode.
4. To determine the reverse bias characteristics of Zener diode and application as a voltage regulator.
5. Measurement of rectification efficiency and ripple factor of Half-wave and Full-wave rectifier Circuits with and without C-Filter.
6. To determine the frequency response of CE transistor amplifier and finding its gain bandwidth product.
7. To determine the transfer characteristics of JFET and measurement of its voltage gain.
8. Design of RC phase shift oscillator using IC-741 Op-Amp and finding its frequency of oscillation.