

**B.Tech (Computer Science and Engineering) Course Structure –R20
(w.e.f the Academic Year 2020-21)**

Semester – 0							
S. No.	Course code	Course Title	Category	L	T	P	Credits
1	R20BSH-HM1001	Physical Activities (Sports, Yoga and Meditation, Plantation)	BS	0	0	3	0
2	R20CSE-ES1001	Career Counseling	ES	3	0	0	0
3	R20CSE-ES1002	Orientation (Know your Department)	ES	3	0	0	0
4	R20CSE-ES1003	Fundamentals of Computers	ES	3	0	2	0
5	R20BSH-MA1001	Basic Aptitude and Mathematical Skills	BS	3	0	0	0
6	R20BSH-MA1002	Remedial Training in Foundation Courses	BS	5	0	0	0
7	R20BSH-HM1002	Human Values & Professional Ethics	HM	3	0	0	0
8	R20BSH-HM1003	Communication Skills (Listening, Speaking, Reading skills Writing skills)	HM	2	1	2	0
Total				22	1	7	0

I Year - I Semester							
S. No.	Course code	Course Title	Category	L	T	P	Credits
1	R20BSH-EN1101	Communicative English	HM	2	0	2	3
2	R20BSH-MA1101	Numerical Method and Ordinary Differential Equations	BS	3	0	0	3
3	R20CSS-ES1102	Problem Solving and Programming using C	ES	3	0	0	3
4	R20BSH-PH1101	Applied Physics	BS	3	0	0	3
5	R20EEE-ES1101	Essentials of Electrical & Electronics Engineering	ES	3	0	0	3
6	R20CSS-ES1104	Problem Solving and programming using C Lab	ES	0	0	3	1.5
7	R20BSH-PH1102	Applied Physics Lab	BS	0	0	3	1.5
8	R20EEE-ES1103	Essentials of Electrical & Electronics Engineering Lab	ES	0	0	3	1.5
Total				13	1	11	19.5

I Year - II Semester							
S. No.	Course code	Course Title	Category	L	T	P	Credits
1	R20BSH-MA1201	Linear Algebra and Multivariable Calculus	BS	3	0	0	3
2	R20BSH-MA1202	Mathematical Methods	BS	3	0	0	3
3	R20BSH-CH1201	Applied Chemistry	BS	3	0	0	3
4	R20MEC-ES1201	Engineering Drawing	ES	1	0	4	3
5	R20CSE-ES1201	Data Structures	ES	3	0	0	3
6	R20BSH-EN1201	Communicative English Lab	HM	0	0	3	1.5
7	R20BSH-CH1202	Applied Chemistry Lab	BS	0	0	3	1.5
8	R20CSE-ES1202	Data structures using C Lab	ES	0	0	3	1.5
9	R20BSH-MC1201	Environmental Science	MC	3	0	0	0
Total				16	0	13	19.5

I Year - I Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
1	R20BSH-EN1101	Communicative English	HM	2	0	2	3

Course Objectives:

- Educate students in the acquisition of the English language through the study of literature and other contemporary forms of culture to understand the complex dynamics of human interpersonal relationships.
- Promote the development of empathy by engaging students in a discussion of literary works, highlighting the emotional aspects of the pieces for intellectual flexibility, creativity, and cultural literacy cultivating life-long learning.
- Acquire a wide range of vocabulary, an understanding of grammar and knowledge to demonstrate students' ability to think creatively in order to express effectively.
- Adopt activity-based teaching-learning methods to ensure that learners would be engaged in the use of language both in the classroom and laboratory sessions.
- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Help improve speaking skills through participation in activities such as role-plays, discussions and structured talks/oral presentations

Course Outcomes:

At the end of the course, the student will be able to:

1. Understand the value of Human Conduct for career development through life skills: Ethics & Values and use root words and Prepositions without errors. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading. Enhance pronunciation with befitting tone for clarity in a speech to communicate language effectively.
2. Observe the significance of imagery in poetry to use it in real-time contexts and learn to use and misuse of Articles, Prefixes, Suffixes, and Punctuations. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading. Participate in short conversations in routine contexts on topics of interest and ask questions and make requests politely.
3. Acquire conversation skills through drama and enhance the correct use of Nouns, Pronouns, Verbs and Concord to write paragraphs effectively. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading. Listen for specific information, gist, note-taking, note-making and comprehension and develop convincing and negotiating skills through debates.
4. Develop reading for inspiration, interpretation & innovation and learn to use modifiers, synonyms and antonyms to write essays effectively. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading
5. Learn meaningful use of language by avoiding meaningless cliches, bureaucratic euphemisms and academic jargon in order to acquire the skill of summarising. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading

Unit I

Theory:

On the Conduct of Life: William Hazlitt: **Reading;** **Grammar-**Prepositions; **Vocabulary-**Word Formation-I; Introduction to Word Formation; **Writing-**Clauses and Sentences; **Life-Skills:** Values and Ethics. If-- Rudyard Kipling.

Wings of Fire” An Autobiography of Dr.APJ Abdul Kalam--1. Strong Roots--2.Early Influences-3.Education Provides a Solid Foundation-for Extensive reading-Reading for Pleasure-Information and General Understanding

Practice:

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Learning Outcomes:

At the end of this unit, the student will be able to

- instill one's own creativity through poetry and prose for LSRW skills development(L3)
- build one's critical thinking skills (L3)
- enrich social skills which in turn make him/her a good engineer to the society(L3)
- impart reading skills that sensitise about worldly topics.(L2)
- understand new phrases and vocabulary to use in both communication and writing (L2)
- inculcate a sense of extensive reading and imbibe the habit of reading text independently.(L3)
- read to write effectively through a biography(L2)
- identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English (L3)
- ask & answer general questions on familiar topics (L2)

Unit II**Theory:**

The Brook: Alfred Tennyson: Reading; Grammar-Articles; **Vocabulary**-Word Formation-II: Root Words from Other Languages; **Writing**-Punctuation; **Life-Skills**: Self-Improvement. How I Became a Public Speaker:George Bernard Shaw.

Wings of Fire” An Autobiography of Dr.APJ Abdul Kalam--4.Preparing to Start a Career--5.Work Begins in Earnest--6. From Hovercraft to Rockets -for Extensive reading-Reading for Pleasure-Information and General Understanding.

Practice:

Listening: Answering a series of questions about the main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/ small groups on specific topics followed by short structured talks

Learning Outcomes:

At the end of this unit, the student will be able to

- experience literary imagery to use it in conversational English(L4)
- become aware of his/her responsibility towards nation(L2)
- understand his/her ability to write effectively through reading(L2)
- acquaint with perfect use of grammar and language(L3)
- inculcate a sense of extensive reading and imbibe the habit of reading text independently.(L3)
- read to write effectively through a biography(L2).
- comprehend short talks on general topics (L2)
- speak clearly on a specific topic using suitable discourse markers in informal discussions (L3)

Unit III**Theory:**

The Death Trap: Saki: Reading; Grammar-Noun-Pronoun Agreement-Subject-Verb Agreement; **Vocabulary**-Word Formation-III: Prefixes and Suffixes from Other Languages; **Writing**-Principal of Good Writing-Paragraph Writing; **Life-Skills**: Time Management- On Saving Time: Seneca

Wings of Fire” An Autobiography of Dr.APJ Abdul Kalam--7.Adding Momentum to Space Research--8. Balancing Defence Technology with Space Research--for Extensive reading-Reading for Pleasure-Information and General Understanding.

Practice:

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed.

Learning Outcomes:

At the end of this unit, the student will be able to

- instill empathy and a sense of humanity through the given literary piece (L3)
- acquire the ability to manage time in terms of goal setting (L3)
- communicate effectively with proper grammatical syntax and semantics (L3)
- understand new phrases and vocabulary to use in both communication and writing (L2)
- inculcate a sense of extensive reading and imbibe the habit of reading text independently.(L3)
- read to write effectively through a biography(L2)

- summarize the content with clarity & precision from short talks (L3)
- report what is discussed in informal discussions (L3)

Unit IV

Theory:

Chindu Yellamma: Reading; Grammar-Misplaced Modifiers;

Vocabulary-Synonyms & Antonyms; **Writing-**Essay Writing; **Life-Skills:** Innovations.

Muhammad Yunus.

Wings of Fire” An Autobiography of Dr.APJ Abdul Kalam--9. Dreaming of Satellites--10.The End of an Era--for Extensive reading-Reading for Pleasure-Information and General Understanding.

Practice:

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Roleplays for the practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Learning Outcomes:

At the end of this unit, the student will be able to

- understand the significance of art that brings the change in human.(L2)
- construct sentences with appropriate usage of grammar.(L3)
- develop writing skills through essay writing. (L3)
- acquire a wide range of vocabulary through synonyms and Antonyms.(L2)
- inculcate a sense of extensive reading and imbibe the habit of reading text independently.(L3)
- read to write effectively through a biography(L2).
- infer & predict about the content of spoken discourse (L4)
- engage in formal/informal conversations understanding verbal & non-verbal features of communication (L3)

Unit V

Theory:

Politics and the English Language-George Orwell: Reading; Grammar-Cliches and Redundancies;

Vocabulary-Common Abbreviations; **Writing-**Writing a summary; **Life-Skills:** Motivation- The Dancer with a White Parasol: Ranjana Deva

Wings of Fire” An Autobiography of Dr.APJ Abdul Kalam--11. Leading a Team--12. Dear ones Pass On--for Extensive reading-Reading for Pleasure-Information and General Understanding.

Practice:

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPT slides.

Learning Outcomes:

At the end of this unit, the student will be able to

- develop the Imagery techniques for speaking and writing. (L3)
- understand the gradual evolution in the field of Indian cinema. (L2)
- optimize the acquired skills of grammar and vocabulary contextually.(L3)
- inculcate a sense of extensive reading and imbibe the habit of reading text independently.(L3)
- read to write effectively through a biography(L2)
- take notes while listening to a talk/lecture to answer questions (L3)
- make formal oral presentations using effective strategies (L3)

Textbooks

1. Language and Life -A skills Approach by Orient Black Swan.
2. Wings of Fire An Autobiography APJ Abdula Kalam with Arun Tiwari Abridged by Universities Press.

Suggested Books for Additional Reading

1. Technical Communication, Meenakshi Raman & Sangeeta Sharma, Oxford University Press
2. Effective Communication Skills, Kulbushan Kumar, Khanna Publishing House, Delhi
3. Communication Skills, Pushplata, Sanjay Kumar, Oxford University Press
4. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.

5. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
6. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
7. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

Online References

1. <https://www.gradesaver.com/the-poetry-of-dh-lawrence/study-guide/summary>
2. <https://englicist.com/notes/summary-where-the-mind-is-without-fear-rabindranath-tagore>.
3. <http://www.authorstream.com/Presentation/cse1amity-2314117-stench-kerosene-amrita-pritam/>.
4. <https://www.poemhunter.com/poem/dream-love-8/comments/>
5. <https://www.poetryfoundation.org/collections>

Sample Web Resources

Grammar/Listening/Writing

1-language.com

<http://www.5minuteenglish.com/>

<https://www.englishpractice.com/>

Grammar/Vocabulary

English Language Learning Online

<http://www.bbc.co.uk/learningenglish/>

<http://www.better-english.com/>

<http://www.nonstopenglish.com/>

<https://www.vocabulary.com/>

BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

<https://www.usingenglish.com/comprehension/>

<https://www.englishclub.com/reading/short-stories.htm>

<https://www.english-online.at/>

Listening

<https://learningenglish.voanews.com/z/3613>

<http://www.englishmedialab.com/listening.html>

Speaking

<https://www.talkenglish.com/>

BBC Learning English – Pronunciation tips

Merriam-Webster – Perfect pronunciation Exercises

All Skills

<https://www.englishclub.com/>

<http://www.world-english.org/>

<http://learnenglish.britishcouncil.org/>

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

Assessment Procedure: Theory

1. The formative and summative assessment procedures are to be adopted (mid exams and end semester examination).
2. Neither the formative nor summative assessment procedures should test the memory of the content of the texts given in the textbook. The themes and global comprehension of the units in the present day context with application of the language skills learnt in the unit are to be tested.
3. Only new unseen passages are to be given to test reading skills of the learners. Written skills are to be tested from sentence level to essay level. The communication formats—emails, letters and reports-- are to be tested along with appropriate language and expressions.

Examinations:

As part of communication practice, an activity based assessment is conducted through mid exams for 30 marks in the laboratory.

End semester exams are based on theory for 70 marks.

Assessment Procedure: Laboratory

1. Every lab session (100 minutes) should be handled by not less than two teachers (three would be ideal) where each faculty has to conduct a speaking activity for 20/30 students.
2. The teachers are to assess each learner in a lab session for not less than 10 speaking activities.
3. As part of practice sessions of the whole semester in the lab, a minimum of 20 speaking activities should be conducted and each one is to be assessed for 10 marks or 10%. The average of any 10 activities' marks are scaled down to 10 in mid I and other 10 in mid
4. An Internal test is conducted for 10 marks.

S.No	Activity	Schedule	Evaluation	Final Marks
1	Spoken-1	After I Cycle	Each activity @ 1 Mark	10 Marks
2	Spoken-2	After II Cycle	Each activity @1 Mark	10 Marks
3	Spoken	Lab Internal	One activity @ 10 Marks	10 Marks

The rubric given below has to be filled in for all the students for all activities.

Body language (Gestures & Postures) (Eye Contact)	Fluency & Audibility	Clarity in Speech	Neutralization of accent	Appropriate Language (Grammar Accuracy & appropriate Vocabulary)	Total 10 marks	Remarks

I Year - I Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
2	R20BSH-MA1101	Numerical Method and Ordinary Differential Equations	BS	3	0	0	3

Course Objectives:

- To familiarize the numerical techniques for solving non-linear equations, interpolation, differentiation, integration and ordinary differential equations.
- To enlighten the learners in the concept of ordinary differential equations.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

Course Outcomes:

At the end of the course, the student will be able to

1. Solve non-linear equations using various numerical methods and apply numerical methods to find interpolation polynomial for a given data. (L2)
2. Apply numerical methods to evaluate derivatives and integration of a function and find the solutions of ordinary differential equations. (L3)
3. Solve the first order ordinary differential equations related to various engineering fields. (L3)
4. Solve the higher order differential equation and analyze physical situations. (L3)
5. Apply the Laplace transform for solving differential equations and integral equations. (L3)

Unit I

Solution of Algebraic and Transcendental Equations: Bisection method, Regula - Falsi method, Iterative Method, Newton- Raphson method for one variable. Gauss Seidel method.

Interpolation: Finite differences, symbolic relations, Newton's forward and backward formulae, Gauss central difference formulae, Lagrange's difference formula.

Learning Outcomes:

At the end of this unit, the student will be able to

- find approximate roots of an equation by using different numerical methods. (L3)
- apply forward and backward interpolation formulae for equal intervals to find interpolating polynomial/values. (L3)
- apply Lagrange's formulae for unequal intervals to find interpolating polynomial/values. (L3)

Unit II

Numerical Differentiation & Integration: Derivatives using forward & backward difference formulae, Trapezoidal rule and Simpson's 1/3rd and 3/8th rules.

Solutions of Ordinary differential equations:

Taylor's series method, Picard's method, Euler's and modified Euler's methods and Runge-Kutta method of fourth order.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply numerical methods to evaluate derivatives and integration of a function. (L3)
- find the numerical solutions of ordinary differential equations using numerical methods. (L3).

Unit III

Differential Equations of first Order and First Degree: Linear, Bernoulli's, exact differential equations and IF Methods.

Application: Newton's Law of cooling, orthogonal trajectories, simple electrical circuits.

Learning Outcomes:

At the end of this unit, the student will be able to

- solve the first order differential equation by appropriate method. (L2)
- apply suitable method to solve the real world problems using the concept of differential equations. (L3)

Unit IV

Linear Differential Equations of Higher Order: Complementary function, Particular integral (RHS e^{ax} , $\sin ax$, $\cos ax$, polynomial in x , $e^{ax} V(x)$, $xV(x)$), Method of variation of parameters, simultaneous linear equations with constant coefficients.

Applications: L-C-R circuits.

Learning Outcomes:

At the end of this unit, the student will be able to

- solve the linear differential equations with constant coefficients by appropriate method. (L3)
- solve the higher order differential equation by analyzing physical situations. (L3)

Unit V

Laplace transforms(All Theorems without proofs): Definition, existence conditions, properties, Laplace transforms of derivatives and integrals, multiplication by t^n , division by t , periodic functions, unit step function and impulse function. Inverse Laplace transforms and convolution theorem.

Applications: improper integrals, ordinary differential equations and integral equations.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply the Laplace and inverse Laplace transforms for different types of functions. (L3)
- solve ordinary differential equations and integral equations by using Laplace transformation technique. (L3)

Textbooks

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44/e, 2017.
2. B.S. Grewal, Numerical Methods in Engineering & Science, Khanna Publishers, 2014.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
5. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.
6. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
7. Sastry, S.S, Introductory Methods of Numerical Analysis, 5th edition, , Prentice Hall , 2017.

I Year - I Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
3	R20CSS-ES1102	Problem Solving and Programming using C	ES	3	0	0	3

Course Objectives:

The objectives of this course is to acquire knowledge on the

- To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.
- To enable effective usage of Control Structures and Implement different operations on arrays.
- To demonstrate the use of Strings and Functions.
- To impart the knowledge of pointers and understand the principles of dynamic memory allocation.
- To understand structures and unions and illustrate the file concepts and its operations.

Course Outcomes:

At the end of the Course, Student should be able to:

1. Illustrate the Fundamental concepts of Computers and basics of computer programming.
2. Use Control Structures and Arrays in solving complex problems.
3. Develop modular program aspects and Strings fundamentals.
4. Demonstrate the ideas of pointers usage.
5. Solve real world problems using the concept of Structures, Unions and File operations.

UNIT-I

Introduction to Computer Problem Solving: Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem Solving, Problem Solving Strategies, Top-Down Approach, Algorithm Designing, Program Verification, Improving Efficiency.

UNIT-II

Introduction to C Programming: Introduction, Structure of a C Program. Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements. Operators, Type Conversion.

Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else—if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

UNIT-III

Arrays: Introduction, Operations on Arrays, Two dimensional Arrays, Multi dimensional arrays.

Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer.

UNIT-IV

Functions: Introduction, Function Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Pointers as Function Arguments, Command Line Arguments, Arrays as Function Arguments, Scope of Variables, Variable Storage Classes. Recursion.

Strings: String Fundamentals, String Processing with and without Library Functions, Pointers and Strings.

UNIT-V

Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type —Enum variables, Using Typedef keyword, Bit Fields.

Data Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

Text Books

1. How to solve it by Computer, R. G. Dromey, and Pearson Education.
2. Computer Programming. Reema Thareja, Oxford University Press
3. Let us C , Yaswanth Kanetkar, 16th Edition, BPB Publication.

Reference Books

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. Programming In C A-Practical Approach. Ajay Mittal, Pearson.
3. C Programming — A Problem Solving Approach, Forouzan, Gilberg, Cengage.

4. The C Programming Language, Dennis Richie And Brian Kernighan, Pearson Education.
5. Programming In C, Ashok Kamthane, Second Edition, Pearson Publication.

Web Links

1. <http://www.c4learn.com/>
2. <http://www.geeksforgeeks.org/c/>
3. <http://nptel.ac.in/courses/122104019/>
4. <http://www.learn-c.org/>
5. <https://www.tutorialsyoint.com/cprogramming/>

I Year - I Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
4	R20BSH-PH1101	Applied Physics	BS	3	0	0	3

Course objectives:

- To impart knowledge in basic concepts of Wave optics, Lasers and Fiber optics, nano materials and Quantum Computing.
- To familiarize the applications of Wave optics, Lasers and Fiber optics, nano materials and Quantum Computing relevant to Computer Science Engineering

Course Outcomes:

After the completion of this course the student can able to

1. Interpret the interaction of optic energy with matter on the basis of interference(L2)
2. Explain the principles of diffraction of light by using diffraction grating(L2)
3. Apply the principles of polarization and Lasers to computer science engineering (L2)
4. Enumerate the applications of Fiber Optics to computer Science engineering(L2)
5. Identify the principles of Quantum computing based on Quantum Physics(L2)

Unit I:

Interference: Principle of superposition of waves- interference of light- Conditions for sustained interference- interference in thin films by Reflection-Newton's Rings-Determination of wavelength;

Applications: Interference Filters and Testing of flatness of the surfaces

Learning Outcomes

After the completion of this chapter the student can able to

- Outline the conditions for sustained interference(L2)
- Identify the Engineering applications of interference (L2)

Unit II

Diffraction: Introduction- comparison of interference and diffraction-Types of diffractions of light-Fraunhofer diffraction due to single slit, Fraunhofer diffraction due to double slit, Fraunhofer diffraction due to N-parallel slits, Diffraction Grating-Grating Spectrum-Determination of wavelength, Rayleigh's criterion; **Applications:** Resolving power of Grating

Learning Outcomes

After the completion of this chapter the student can able to

- Analyze the differences between interference and diffraction (L3)
- Explain the theory of single slit and double slit diffractions
- Identify the spectrum of diffraction grating and its resolving power(L2)

Unit III

Polarization and Lasers

Polarization: Polarization by reflection, refraction and double refraction-Nicol Prism-Half Wave and Quarter Wave Plate. **Applications:** Glare reduction due to sunglasses

Lasers: Characteristics- Spontaneous and Stimulated Emissions- Pumping and Population Inversion-Ruby Laser-He-Ne-Laser; **Applications:** Medical applications and communication applications

Learning Outcomes

After the completion of this chapter the student can able to

- Illustrate the concept of polarization and its applications (L2)
- Explain the Characteristics of Lasers(L2)
- Construct three level and four level laser systems(L3)
- Analyze the applications of lasers(L4)

Unit IV

Fiber Optics: Introduction to optical Fibers-Total Internal Reflection-Critical Angle of Propagation-Acceptance Angle-Numerical Aperture-Classification of fibers based on refractive index Profile-Modes of Propagation of Electromagnetic wave through optical Fiber; **Applications:** Fiber Optical communication, Medical Applications-Fiber Optic Sensors

Learning Outcomes

After the completion of this chapter the student can able to

- Enumerate the classification of Fibers based on Total Internal Reflection, Critical angle of propagation(L3)
- Classify the modes of propagation of electromagnetic wave through Optical Fiber (L3)
- Demonstrate the Fiber Optic communication through block diagram and applications in various fields(L3)

Unit V

Quantum Physics: Introduction- Matter Waves- Wave Function-Significance-Schrodinger Time Independent and Schrodinger Time Dependent Wave Equations-Classical and Quantum bits- Introduction to Quantum Computing; **Applications:** Particle in one dimensional potential box;

Learning Outcomes:

After the completion of this chapter the student can able to

- Describe the concept of matter waves(L2)
- Derive the equation of matter waves(L2)
- Analyze the matter wave equation to one dimensional potential box(L3)

Text Books

1. M.N. Avadhanulu, P.G. Kshrisagar “A Text book of Engineering Physics” –S.Chand Publications, 2017
2. 2.H.K. Malik &A.K. Singh “Engineering Physics”, - McGraw Hill Publishing Company Ltd, 2018
3. Ch. Srinivas, Ch. SeshuBabu, “Engineering Physics”, Cengage Learning

Reference Books

1. Gerd Keiser “Optical Fiber Communications” -4/e, Tata Mc GrawHill,2008
2. Quantum Mechanics by G.Aruldas-PHI publications
3. Sanjay D Jain, Girish G Shastra Buddi, “Engineering Physics” –University Press

I Year - I Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
5	R20EEE-ES1101	Essentials of Electrical & Electronics Engineering	ES	3	0	0	3

Course objectives:

- To familiarize with the basic DC and AC networks.
- To explain the concepts of electrical machines and their characteristics.
- To identify the importance of transformers in transmission and distribution of electric power.
- To impart knowledge about the characteristics of semiconductor devices.
- To expose basic concepts and applications of Operational Amplifiers.

Course Outcomes: At the end of this course, students are able to

1. Apply concept of KVL/KCL and network theorems in solving electrical circuits (L3)
2. Understand the principle of operation of different DC Machines(L2)
3. Measure the performance quantities such as losses, efficiency of transformers (L5)
4. Understand the importance and applications of p-n junction diode , Zener diode and rectifiers(L2)
5. Apply different modes of op-amps in different applications (L3)

UNIT I

Basic laws and Theorems: Ohms law, Kirchhoff's Laws, Series and Parallel circuits, Types of Elements and Sources, Mesh analysis, Nodal analysis, superposition theorem, Thevenin's and Norton's theorem, with simple examples.

Unit Outcomes: The students are able to

- Apply Ohms and Kirchhoff's Laws (L3)
- Analyze theorems such as superposition, Thevenin's & Norton's theorems. (L4)
- Find the current, voltage and power in a given electrical circuit(L1)

UNIT II

DC Machines: Constructional features, principle of DC generator & motor- emf equation of generator and torque equation of motor-numerical problems-different types and performance characteristics of DC machines, speed control of DC shunt motor, brake test on DC shunt motor, applications of DC machines.

Unit Outcomes: The students are able to

- Understand the constructional features of DC machines. (L2)
- Analyze EMF, torque and performance characteristics of DC machines. (L4)

UNIT III

AC Machines:Constructional details of single phase transformer, principle and types of transformers, EMF equation, open and short circuit tests on a single phase transformer, voltage regulation, losses and efficiency, numerical problems, principle of operation of three phase induction motor.

Unit Outcomes: The students are able to

- Outline the constructional details and principle of single phase transformer. (L2)
- Analyze the efficiency and voltage regulation of a single phase transformer. (L4)

UNIT IV

Semiconductor Devices: p-n Junction diode - basic operating principle, current-voltage characteristics, rectifier circuits (half-wave, full-wave), Zener diode as voltage regulator, introduction to transistors and its characteristics, applications of semiconductor devices.

Unit Outcomes: The students are able to

- Analyze the device structure, operation and characteristics of a p-n junction diode. (L4)
- Apply p-n diode for various applications. (L3)

UNIT V

Operational Amplifier: Ideal op-amp, inverting configuration, closed loop gain, effect of finite open-loop gain, non-inverting configuration, closed loop gain, voltage follower, differential amplifier.

Unit Outcomes: The students are able to

- Explain different modes of operation of op-amps. (L2)
- Make use of op-amp in different applications. (L3)

Textbooks

1. D.P. Kothari, I.J. Nagrath, Basic Electrical and Electronics Engineering, 1st edition, McGraw Hill Education (India) Private Limited, 2017.
2. B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, 1st edition, S. Chand Publishing, New Delhi, 2006.
3. Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits 6th edition, Oxford University Press, 2014.

References

1. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education, 2011.
2. Dharma Raj Cheruku, B T Krishna, Electronic Devices and Circuits, 2/e, Pearson Education, 2008.
3. R.K. Rajput, Basic Electrical and Electronics Engineering, University Science Press, New Delhi, 2012.

Web Links

1. <https://nptel.ac.in/courses/108/105/108105112>
2. <https://nptel.ac.in/courses/108/108/108108122>
3. <https://www.electronics-tutorials.ws>

I Year - I Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
6	R20CSS-ES1104	Problem Solving and programming using C Lab	ES	0	0	3	1.5

Course Objectives:

The objectives of this course is to acquire knowledge on the

- To impart knowledge on basic Linux commands, various Editors, Raptor.
- To make the students understand the concepts of C programming.
- To nurture the students on Control Structures and develop different operations on arrays.
- To make use of String fundamentals and modular programming constructs.
- To implement programs using dynamic memory allocation.
- To explain the concepts of Structure, Unions and files for solving various problems.

Course Outcomes:

1. Implement basic programs in C and design flowcharts in Raptor.
2. Use Conditional and Iterative statements to solve real time scenarios in C.
3. Implement the concept of Arrays and Modularity and Strings.
4. Apply the Dynamic Memory Allocation functions using pointers.
5. Develop programs using structures and Files.

List of Experiments

1. Introduction to Algorithms and Flowcharts

- 1.1) Implement Algorithm Development for Exchange the values of Two numbers.
- 1.2) Given a set of n student's examination marks (in the range 0-100) make a count of the number of students that passed the examination. A Pass is awarded for all of 50 and above.
- 1.3) Given a set of n numbers design an algorithm that adds these numbers and returns the resultant sum. Assume N is greater than or equal to zero.

2. Introduction to C Programming

- 2.1) Basic Linux Commands.
- 2.2) Exposure to Turbo C, Vi, Emacs, Code Blocks IDE, Dev C++.
- 2.3) Writing simple programs using printf(), scanf() .

3. Raptor

- 3.1) Installation and Introduction to Raptor.
- 3.2) Draw a flow chart to find the Sum of 2 numbers.
- 3.3) Draw a flow chart to find Simple interest.

4. Basic Math

- 4.1) Write a C Program to convert Celsius to Fahrenheit and vice versa.
- 4.2) Write a C Program to find largest of three numbers using ternary operator.
- 4.3) Write a C Program to Calculate area of a Triangle using Heron's formula.

5. Control Flow- I

- 5.1) Write a C Program to Find Whether the Given Year is a Leap Year or not.
- 5.2) Write a C program to find the roots of a Quadratic Equation.
- 5.3) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch...case.

6. Control Flow- II

- 6.1) Write a C Program to Find Whether the Given Number is Prime number or not.
- 6.2) Write a C Program to Find Whether the Given Number is Armstrong Number or not.
- 6.3) Write a C program to print Floyd Triangle.

7. Control Flow- III

- 7.1) Write a C program to find the sum of individual digits of a positive integer.
- 7.2) Write a C program to check whether given number is palindrome or not.
- 7.3) Write a C program to read two numbers, x and n, and then compute the sum of the geometric progression $1+x+x^2+x^3+\dots+x^n$.

8. Arrays

- 8.1) Write a C program to search an element in the given array (Linear Search).
- 8.2) Write a C program to perform matrix addition.
- 8.3) Write a C program to perform matrix multiplication.

9. Pointers

- 9.1) Write a C Program to Perform Addition, Subtraction, Multiplication and Division of two numbers using Command line arguments.
- 9.2) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
- 9.3) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

10. Functions, Array & Pointers

- 10.1) Write a C Program to demonstrate parameter passing in Functions.
- 10.2) Write a C Program to find Fibonacci. Factorial of a number with recursion and without recursion.
- 10.3) Write a C Program to find the sum of given numbers with arrays and pointers.

11. Strings

- 11.1) Implementation of string manipulation operations with library function:
Copy, concatenate, length, compare
- 11.2) Implementation of string manipulation operations without library function:
Copy, concatenate, length, compare

12. Structures

- 12.1) Write a C Program to Store Information of a book Using Structure.
- 12.2) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function.

13. Files

- 13.1) Write a C program to open a file and to print the contents of the file on screen.
- 13.2) Write a C program to copy content of one file to another file.
- 13.3) Write a C program to merge two files and store content in another file.

14. Application

Creating structures to capture the student's details save them in file in proper record format. search and prints the student details requested by the user.

Note: Draw the flowcharts using Raptor from Experiment 3 to Experiment 6.

Text Books

1. Let us C , Yaswanth Kanetkar, 16th Edition, BPB Publication.
2. How to solve it by Computer, R. G. Dromey, and Pearson Education.
3. Computer Programming. Reema Thareja, Oxford University Press

Reference Books

1. Programming in C A-Practical Approach Ajay Mittal. Pearson Education.
2. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
3. Problem solving using C , K Venugopal, 3'd Edition, TMG Publication.

Web Links

1. <https://www.hackerrank.com/>
2. <https://www.codechef.com/>
3. <https://www.topcoder.com/>
4. <https://code-cracker.github.io/>
5. <https://raptor.martincarlisle.com/>
6. <https://nptel.ac.in/courses/106105055/2>

I Year - I Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
7	R20BSH-PH1102	Applied Physics Lab	BS	0	0	3	1.5

Course Objectives

- To impart the practical knowledge in basic concepts of Wave optics, Lasers and Fiber optics.
- To familiarize the handling of basic physical apparatus like Vernier callipers, screw gauge, spectrometers, travelling microscope, laser device, optical fibre, etc.
- To expose the students in practical aspects of the theoretical physics.

Course Outcomes

1. Apply the working principles of laboratory experiments in optics, electronics to perform the experiments. (L3)
2. Compute the required parameter by suitable formula using experimental values (observed values) in optics, electronics(L3)
3. Analyze the experimental results through graphical interpretation. (L4)
4. Recognize the required precautions to carry out the experiment and handling the apparatus in the laboratory. (L2)
5. Demonstrate the working principles, procedures and applications. (L3)

List of Experiments

1. Determination of thickness of thin paper/piece of hair by wedge shaped air film.
2. Determination of the radius of curvature of the lens by Newton's rings method
3. Determination of the wavelength of mercury light by plane diffraction grating
4. Determination of wavelength of laser light by normal incidence method
5. Determination of the acceptance angle & Numerical Aperture of a given Optical Fiber
6. Determination of the energy band gap of a given semi-conductor
7. Determination of the temperature co-efficient of resistance of a given Thermistor
8. Determination of the resolving power of grating.

Virtual Lab Experiments

9. Determination of the Brewster's angle (Angle of polarization)
10. Determination of the Hall coefficient of the given sample material by Hall Effect.

Reference Books

1. S.BalaSubrahmanian, M.N.Srinivasan "A TextBook of practical physics" by S.Chand publishers,2017
2. Engineering Physics Lab Manual by Dr.Y. Aparna&Dr.K.Venkateswarao (V.G.S.Book links).
3. Laboratory Experiments in College Physics, C.H. Bernard and C.D. Epp, John Wiley and Sons, Inc., New York, 1995.
4. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative
5. Chemical Analysis 6/e, Pearson publishers (2000).
6. S.N.K Bhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, Dhanpat Rai Publishing Company (2007).

Web Source References

1. http://vlab.co.in/ba_labs_all.php?id=8
2. <http://va-iitk.vlabs.ac.in/>
3. <http://vlab.amrita.edu/?sub=1&brch=282>

I Year - I Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
8	R20EEE-ES1103	Essentials of Electrical & Electronics Engineering Lab	ES	0	0	3	1.5

Course objectives:

- To verify Kirchhoff's laws and theorems.
- To plot the characteristics of DC Machines.
- To know the performance of a Transformer.
- To plot the V-I Characteristics of a diode.
- To design inverting and non-inverting amplifier using PSPICE.

Course outcomes: At the end of this course, students are able to

1. Prove the laws and theorems (L5)
2. Analyze the characteristics of DC Machines (L4)
3. Identify the performance of a Transformer (L3)
4. Analyze the V-I characteristics of diode (L4)
5. Develop Inverting and Non-Inverting Amplifier using PSPICE (L3)

List of Laboratory Experiments:

1. Verification of Kirchhoff's Laws KVL and KCL.
2. Verification of DC Superposition Theorem.
3. Verification of Thevenin's Theorem and Norton's Theorem.
4. OCC and External characteristics of separately excited DC generators.
5. OC and SC Tests on single phase transformer.
6. Brake Test on DC shunt motor.
7. Speed control of a DC Shunt motor.
8. Input and output characteristics of Bipolar junction transistor
9. Current Voltage Characteristics of a p-n Junction Diode.
10. Diode Rectifier Circuits.
11. Voltage Regulation with Zener Diodes.
12. Inverting and Non-inverting Amplifier Design with Op-amps..

I Year - II Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
1	R20BSH-MA1201	Linear Algebra and Multivariable Calculus	BS	3	0	0	3

Course Objectives:

- This course is designed to equip the students with the necessary Mathematical skills and techniques that are essential for an engineering course.
- To enlighten the learners in the concept of Linear Algebra.
- To enlighten the learners in the concept of Multivariable Calculus.

Course Outcomes:

At the end of the course, the student will be able to

1. Apply the matrix algebra techniques to engineering applications. (L3)
2. Apply the concepts of eigen values and eigen vectors to free vibration of a two mass system. (L3)
3. Apply partial differentiation to find maxima and minima of functions of several variables
4. Evaluate the volume and surface area of solids using multiple integrals. (L3)
5. Apply vector differential operators to find potential functions and estimate the work done against a field, circulation and flux using vector integral theorems. (L3)

Unit I

Systems of Linear Equations: Rank, echelon form and normal form of a matrix, PAQ form. homogeneous and non-homogeneous linear equations, Gauss elimination method, Gauss Jordan method.

Application: Finding the current in an electrical circuit.

Learning Outcomes:

At the end of this unit, the student will be able to

- solve the system of linear equations using various matrix techniques. (L3)
- apply the matrix methods to find the current in an electrical circuit at any time. (L3)

Unit II

Eigen values, Eigen vectors and Quadratic forms: Eigen values and Eigen vectors, properties (without proofs), diagonalisation, Cayley-Hamilton theorem (without proof), Quadratic forms, reduction to canonical form by orthogonal and linear transformation, rank, index, signature and nature of the quadratic forms.

Application: Free vibration of two mass systems.

Learning Outcomes:

At the end of this unit, the student will be able to

- find the eigen values and eigen vectors of the given matrix. (L2)
- find the inverse and powers of the matrix using Cayley- Hamilton theorem. (L2)
- identify special properties of a quadratic form (or corresponding matrix). (L3)
- Apply the concepts of eigen values and eigen vectors to free vibration of a two mass system. (L3)

Unit III

Partial Differentiation: Partial derivatives, total derivative, chain rule, Taylor's series and Maclaurin's series of functions of two variables, change of variables, Jacobian, functional dependence.

Applications: Tangent planes and Normal lines, Maxima and Minima of functions with and without constraints, method of Lagrange's multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to

- find partial derivatives of a given function. (L2)
- expand a function of two variables using Taylor's and Maclaurin's series expansion. (L2)
- apply the concept of Jacobian to test whether the given functions are functionally dependent or not. (L3)
- find the Jacobian matrix for given functions. (L2)
- apply the knowledge of partial differentiation to find the maxima and minima of functions of several variables. (L3)
- Use partial differentiation to find tangent planes and normal lines. (L3)

Unit IV

Multiple Integrals: Double integrals, change of variables, change of order of integration, triple integrals, change of variables to spherical polar co-ordinates.

Applications: Area enclosed by plane curves.

Learning Outcomes:

At the end of this unit, the student will be able to

- evaluate double integral of functions of several variables in two dimensions using cartesian and polar coordinates. (L3)
- evaluate triple integrals in cartesian, cylindrical and spherical geometries. (L3)
- apply double integration techniques in evaluating areas enclosed by plane curves. (L3)

Unit V

Vector Calculus (All Theorems without proofs): Scalar and vector point functions, vector operator del, Gradient, Divergence and Curl and vector identities. Line, surface and volume integrals, Green's, Stoke's and Divergence theorems.

Application: Potential surfaces, Work done, flux.

Learning Outcomes:

At the end of this unit, the student will be able to

- apply operator del to scalar and vector point functions. (L3)
- illustrate the physical interpretation of gradient, divergence and curl. (L3)
- find the work done in moving a particle along the path over a force field. (L2)
- evaluate the rates of fluid flow along and across curves. (L3)
- apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals. (L3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

References:

2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
3. James Stewart, Calculus, 7th Edition, Brooks/Cole Cengage Learning (Chapter 14).
4. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
5. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.
6. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
7. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
8. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

I Year - II Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
2	R20BSH-MA1202	Mathematical Methods	BS	3	0	0	3

Course Objectives:

- Use elementary number theory including the divisibility properties of numbers to perform modulo arithmetic and computer arithmetic.
- To familiarize the learners with transform techniques.
- To enlighten the learners in the concept of partial differential equations.

Course Outcomes:

At the end of the course, the student will be able to

1. Apply mean value theorems to real world problems.(L3)
2. Apply elementary number theory concepts, including the divisibility properties of numbers to perform modulo arithmetic and use them in cryptographic applications. (L3)
3. Apply simplex method to solve an LPP. (L3)
4. Find the Fourier series of periodic functions and evaluate Fourier integral, Fourier transform and inverse Fourier of a given function. (L3)
5. Solve partial differential equations of first order using analytical methods. (L2)

Unit I

Mean Value Theorems: Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders.

Infinite Series(without proofs):: Infinite series, convergence and divergence of series, geometric series, auxiliary series, comparison tests, ratio test, Cauchy's root test, Raabe's test, alternating series, Leibnitz test, absolute and conditional convergence.

Learning Outcomes:

At the end of this unit, the student will be able to

- analyze the behaviour of functions by using mean value theorems. (L3)
- translate the given function as series of Taylor's and Maclaurin's with remainders. (L3)
- apply the suitable test to study the convergence of a given series. (L3).

Unit II

Number Theory: (All theorems without proofs)

Properties of integers, divisibility, Division theorem, Greatest Common Divisor (GCD), Euclidean algorithm, Least Common Multiple (LCM), testing for prime numbers, The Fundamental theorem of arithmetic, floor, ceiling functions.

Modular Arithmetic: Congruences, congruence equations, Fermat's Theorem, Euler's Totient function, Euler's theorem.

Cryptographic Applications: Plaintext, ciphertext, shift and affine ciphers, secret sharing.

Learning Outcomes:

At the end of this unit, the student will be able to

- find quotients and remainders from integer division. (L2)
- find GCD and LCM of integers. (L2)
- understand the definitions of congruences, residue classes and least residues (L2)
- perform different operations on integers modulo n. (L3)
- solve linear congruences using different theorems in number theory. (L3)
- apply number theory concepts to cryptographic applications. (L3)

Unit III

Linear Programming Problem: Formulation of LPP, graphical method, Standard form of LPP, slack and surplus variable, The simplex method, Artificial variables, Big-M-method, dual and simplex.

Learning Outcomes:

At the end of this unit, the student will be able to

- Formulate the LPP. (L3)
- Solve the LPP with two variables using graphical method. (L3)
- Apply simplex method to solve the LPP. (L3)
- Formulate the dual problem from primal.(L2)

Unit IV

Fourier Series: Fourier series, Dirichlet's conditions, even and odd functions, Fourier series of functions in an arbitrary interval, Half-range series.

Applications: Practical Harmonic Analysis.

Fourier transforms: Fourier integrals, Fourier cosine and sine integrals, Fourier transform, sine and cosine transform.

Learning Outcomes:

At the end of this unit, the student will be able to

- evaluate the Fourier series expansion for different periodic functions. (L3)
- understand the nature of the Fourier series that represent even and odd functions.(L3)
- examine the properties of Fourier transformation. (L2)
- apply Fourier transformation for different functions. (L3)

Unit V

Partial Differential Equations: Formation of first order partial differential equations, solutions of first order linear and standard forms of non-linear PDE. Method of separation of variables.

Applications: One dimensional Wave equation.

Learning Outcomes:

At the end of this unit, the student will be able to

- solve the first order linear PDE. (L2)
- solve the first order non- linear PDE. (L2)

Text Books

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.
2. Ivan Niven, S. Zuckerman, An Introduction to Theory of Numbers, Wiley & Sons **(for Unit-II)**.
3. James S. Kraft, Lawrence C. Washington, An introduction to Number Theory and Cryptography, CRC Press, Taylor's and Francis group. **(Chapter 5 for Cryptographic Applications of Unit-II)**
4. S. D. Sharma, Operations Research, KedarnathRamnath& Co., 11th Edition.**(for Unit-III)**

References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. Prakash Om, Theory of Numbers, Golden Series, 2005.
3. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
4. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018.
5. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
6. KantiSwarup, P.K Gupta &Manmohan, Operations Research, Sultan Chand Publications, New Delhi

I Year - II Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
3	R20BSH-CH1201	Applied Chemistry	BS	3	0	0	3

Course Objectives:

- To familiarize various properties and applications of polymers.
- To impart knowledge on the basic concepts of battery technology.
- To explain the working principle and materials used in Floppy, CD and pen drive & applications of semiconductors and liquid crystals.
- To demonstrate the construction of photovoltaic cells, Ocean Thermal Energy Conversion (OTEC).
- To introduce different types of Nano materials and applications of computational chemistry.

Course Outcomes:

- Distinguish thermoplastics, thermosetting plastics, elastomers and analyze the importance of smart polymers (L4)
- Discuss the working principle and applications of primary, secondary battery cells and fuel cells. (L6)
- Compare the working principle and materials used in Floppy, CD and pen drive & explain the applications of semiconductors and liquid crystals. (L4)
- Demonstrate the working principle of Photo Voltaic Cell, Ocean Thermal Energy Conversion (OTEC). (L2)
- Illustrate the preparation, properties and applications of Nano materials and applications of computational chemistry. (L2)

UNIT-I

POLYMER CHEMISTRY

Polymers: Introduction, functionality of monomers, chain growth, step growth polymerization, stereo regular polymers.

Plastics: Thermoplastics and thermosetting, preparation, properties and applications of Bakelite, Urea-Formaldehyde & Nylon-66.

Elastomers: Introduction, preparation, properties and applications of Buna-S & Buna-N,

Smart Polymers: Introduction, types of smart polymers and applications of smart polymers.

Applications:

- Polymers are used in making the body components of computers, laptops, mobile phones and TV's.
- Smart polymers used as glucoses sensor.
- Smart polymers are used as molecular gates and switches.

Learning Outcomes:

At the end of this unit, the students will be able to

- Explain different types of polymers and their applications (L2)
- Explain the preparation, properties and applications of Bakelite, Urea-Formaldehyde, Nylon-66, Buna-S and Buna-N (L2)
- Discuss the applications of smart polymers (L2)

UNIT-II

ELECTROCHEMICAL ENERGY SYSTEMS

Batteries: Introduction, classification of batteries, dry cell, lead acid cell, Ni-Cd cell, Lithium cells-Li MnO₂ cell, Lithium ion cells, Fuel cells – Hydrogen and Oxygen fuel cell, Methanol and Oxygen fuel cell, applications of batteries.

Applications:

- These long life batteries are used in portable consumer instruments like calculators, iPods, digital diaries, wrist watches and stop watches, toys, and artificial pacemakers.

Learning outcomes:

At the end of this unit, the students will be able to

- Apply principles for construction of batteries and fuel cells. (L-3)

UNIT –III

SEMICONDUCTORS, STORAGE DEVICES AND LIQUID CRYSTALS

Semiconductors: Introduction-purification of semi conductors-Zone refining, preparation of single crystal semi conductors- Czochralski process, stiochiometric, non stichometric and organic semiconductors-applications.

Storage Devices: Materials used in storage devices, working of floppy, CD, and pen drive.

Liquid crystals: Introduction-types-applications.

Applications:

- Semi conductors are used in electronic circuit devices
- Floppy, CD and pen drive are used to store large data.
- Liquid crystals are used in making laptop, desktop, mobile phones and TV screens.

Learning Outcomes:

At the end of this unit, the students will be able to

- Demonstrate the applications of semiconductors and liquid crystals (L2)
- Discuss the materials used in floppy, CD, pen drive. (L2)

UNIT- IV

ENERGY SOURCES

Solar Energy: Introduction- green house effect-causes, consequences, and remedies, harnessing of solar energy, thermal conversion-solar water heater, parabolic dish parabolic trough and solar tower, solar power plant-construction and working, photo voltaic conversion- construction and working of Photo voltaic cell, applications of solar energy.

Ocean thermal energy: Introduction, closed-cycle ocean thermal energy conversion (OTEC), open cycle OTEC- schematic diagram and explanation.

Applications:

- Solar energy used for large amounts of electricity production using solar power plants.
- OTEC is used for electricity in small amounts.

Learning outcomes

At the end of this unit, the students will be able to

- Illustrate the construction of PV cell, closed-cycle ocean thermal energy conversion and open cycle OTEC. (L-2)

UNIT – V

NANOMATERIALS AND COMPUTATIONAL CHEMISTRY

Introduction, preparation of nanomaterials-sol-gel method, characterization by scanning electron microscopy (SEM), Types of nanomaterials-Carbon Nano Tubes (CNT's) and fullerenes, preparation, properties and applications of CNTs and fullerene, applications of Nanomaterials.

Computational Chemistry: Introduction to computational chemistry, molecular modeling and docking studies.

Applications:

- Nano materials are used in paints, lubricants and medicine technology.
- Apply the knowledge of computational chemistry on molecular design

Learning outcomes:

At the end of this unit, the students will be able to

- Classify nano materials. (L-2)
- Explain the synthesis and applications of nano materials. (L-2)
- Explain the importance of computational chemistry in molecular design

Text Books

1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, Dhanapat Rai & Sons, Delhi (2014).
2. B.K. Sharma, Engineering Chemistry, Krishna Prakashan, Meerut.
3. O G Palanna, Engineering Chemistry, Tata McGraw Hill Education Private Limited, (2009).

References

1. Sashi Chawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons, (2003)
2. B.S Murthy and P. Shankar, A Text Book of Nano Science and NanoTechnology , University Press (2013).

3. S.S. Dara, A Textbook of Engineering Chemistry, S.Chand & Co, (2010)
4. N. Krishna Murthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014).
5. K. Sesa Maheshwaramma and Mridula Chugh, Engineering Chemistry, Pearson India Edn services, (2016).

I Year - II Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
4	R20MEC-ES1201	Engineering Drawing	ES	1	0	4	3

Course Objectives:

- To enhance the communications of the students using engineering drawing.
- To make the student familiar to the drawing practices and convection.
- To familiarize the techniques of constructing polygons curves.
- To introduce the orthographic projections, projections of points, lines and planes.
- To make the students understand as to how the industry communicates technical information.
- To enable the student draft simple engineering components and analyze different views of components.

Course Outcomes:

After the completion of this course, the student can able to

1. Apply the basics of engineering drawing to construct the polygons, curves and orthographic projections of points. (L3)
2. Draw the orthographic projections of straight lines inclined to both the planes. (L3)
3. Draw the projections of planes in various conditions. (L3)
4. Draw the projections of regular solids inclined to one of the planes. (L3)
5. Develop 3D isometric views from 2D orthographic views and vice versa. (L6)

Unit I

Introduction to Engineering drawing: Principles of Engineering drawing and their significance- Conventions in drawing-lettering - BIS conventions, types of lines and methods of dimensioning.

Polygons: - Construction of regular polygons using given length of a side;

Ellipse: - Arcs of circles and Oblong methods.

Projections: Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants.

Applications:

- Elliptical shape - bridges and arches, elliptical trammel.

Learning Outcomes:

- Identify the standards of BIS conventions. (L3)
- Construct the elliptical curve by using different methods. (L3)
- Visualize and draw the projections of points in various quadrants. (L3)

Unit II

Orthographic projections of straight lines, lines parallel either two of the reference planes (HP,VP or PP)

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination

Applications:

- Structural plans and elevations.
- Stair casing designs, Structural plans and elevations.

Learning Outcomes:

- Visualize and draw the projections of lines in various conditions. (L3)
- Draw the projections of lines in various conditions. (L3)

Unit III

Projections of Planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

Applications: Structural plans and elevations, stair casing designs.

Learning Outcomes:

- Visualize and draw the projections of planes in various conditions. (L3)
- Draw the planes inclined to both the reference planes in engineering. (L3)

Unit IV

Projections of Solids: Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

Applications: Machine component drawings, AC ducts, cooling towers , piping layout designs,

Learning Outcomes:

- Draw the different types of solids graphically. (L3)
- To visualize and draw the projections of various solids.(L3)

Unit V

Isometric Views And Orthographic Views

Conversion of isometric views to orthographic views;

Conversion of orthographic views to isometric views.

Applications : Structural drawings –industrial components, architectural drawing.

Learning Outcomes:

- Identify the orthographic views and isometric views(L3)
- able to convert isometric views to orthographic views and orthographic views to isometric views, (L3)

Text Books

1. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.
2. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.
3. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.

Reference Books

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013

I Year - II Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
5	R20CSE-ES1201	Data Structures	ES	3	0	0	3

Course Objectives:

- Describe to algorithmic complexities, recursive algorithms, searching and sorting techniques.
- Describe to list representation models in various types of applications
- Applying stack and queue techniques for logical operations
- Implementation of tree implementation in various forms
- Develop of Advanced trees and their operations

Course Outcomes:

1. Analyze different searching and sorting Techniques.
2. Analyze concepts of linked lists and with their implementation of different Linked Lists
3. Apply the concepts of stacks and queues in real time applications
4. Analyze the non linear data structures trees and their operations
5. Implementation of different advanced Trees with their applications.

Unit I

Data structure- Definition, types of data structures Recursion: Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion, recursive algorithms for factorial function, GCD computation, Fibonacci sequence, Towers of Hanoi, Tail recursion, List Searches using Linear Search, Binary Search, Fibonacci Search

Sorting Techniques: Basic concepts, Sorting by: Insertion Sort, Bubble Sort Quick Sort, Merge Sort Merging, Iterative Merge Sort, Recursive Merge Sort, Heap Sort.

Learning Outcomes: student will be able to

- Describe algorithms and its analysis procedure (L2).
- Analyze sorting techniques (L4).
- Analysis procedure of search (L4).

Unit II

Linked Lists: Data structures-Linear and non linear data structures, ADT concept, Linear List ADT, Array representation, Linked representation, Vector representation, singly linked lists -insertion, deletion, search operations, applications of single linked list to represent polynomial expressions, doubly linked lists-insertion, deletion operations, circular lists. Representation of single, two dimensional arrays.

Learning Outcomes: Student will be able to

- Understand the linked list process (L2).
- Analyze operation on different Linked lists (L4).
- Apply linked list into polynomial expressions (L3).

Unit III

Stacks and Queues: Basic Stack Operations, Representation of a Stack using Arrays, Stack Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions.

Queues: Basic Queues Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack, Applications of Queues-Round robin Algorithm, Circular Queues, Priority Queues.

Learning Outcomes: Student will be able to

- Understand working process of stack and Queue (L2)
- Evaluating Arithmetic Expressions (L5)
- Apply Transformation of infix to postfix conversion (L3)

Unit IV

Trees: Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays and linked lists, operations on a Binary tree , Binary Tree Traversals (recursive), Creation of binary tree from in, pre and post order traversals

Learning Outcomes: Student will be able to

- Create Binary Tree using linked list and Arrays(L6)
- Create Binary tree from different Traversals(L6)

Unit V

Advanced concepts of Trees: Tree Travels using stack (non recursive), Threaded Binary Trees. Binary search tree, Basic concepts, BST operations: insertion, deletion.

Learning Outcomes: Student will be able to

- Understand how Binary Search Tree works(L2)
- Analyze different Operation of Binary Search Tree operations(L4)
- Evaluate the smallest and largest elements in a tree, and the successor and predecessor of an element (L5)

Text Books

1. Data Structure with C, Seymour Lipschutz, TMH
2. Fundamentals of Data Structures in C++, Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, 2nd Edition, Universities Press (India) Pvt. Ltd.
3. Data Structures using C, Reema Thareja, Oxford
4. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage
5. Data structures and algorithm analysis in C, 2nd edition, mark Allen Weiss

Reference Books

1. Data Structures and Algorithms, 2008,G.A.V.Pai, TMH
2. Classic Data Structures, 2/e, Debasis ,Samanta,PHI,2009
3. Fundamentals of Data Structure in C, 2/e, Horowitz, Sahni , Anderson Freed,University Press

I Year - II Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
6	R20BSH-EN1201	Communicative English Lab	HM	0	0	3	1.5

Course Objectives

- Adopt activity based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions.
- Facilitate active listening to enable inferential learning through expert lectures and talks
- Impart critical reading strategies for comprehension of complex texts
- Provide training and opportunities to develop fluency in English through participation in formal group discussions and presentations using audio-visual aids
- Demonstrate good writing skills for effective paraphrasing, argumentative essays and formal correspondence
- Encourage use of a wide range of grammatical structures and vocabulary in speech and writing

Course Outcomes

1. Acquire Listening skills for answering questions, make formal presentations without graphical elements, prioritize information from reading texts, paraphrase short academic texts and get awareness about plagiarized content and academic ethics.
2. Comprehend academic lectures by taking notes,, make formal presentations on academic topics using PPT slides with relevant graphical elements, distinguish facts from opinions while reading, write formal letters and emails and use a range of vocabulary in formal speech and writing.
3. Participate in group discussions using appropriate language strategies, comprehend complex texts, produce logically coherent argumentative essays and use appropriate vocabulary to express ideas and opinions.
4. Draw inferences and conclusions using prior knowledge and verbal cues, express thoughts and ideas accurately and fluently, develop advanced reading skills for a deeper understanding of texts, prepare a CV with a cover letter to seek internship/ job, and understand the use of passive voice in academic writing.
5. Develop advanced listening skills for an in-depth understanding of academic texts, make presentations collaboratively, understand the structure of Project Reports and use grammatically correct structures with a wide range of vocabulary.

Unit I

Listening: Listening for presentation strategies and answering questions on the speaker, the audience, and key points. **Speaking:** Formal presentations using PPT slides without graphic elements. **Reading:** Reading for presenting – strategies to select, compile and synthesize information for presentation; reading to recognize the academic style. **Writing:** Paraphrasing; using quotations in writing; using academic style - avoiding colloquial words and phrases. **Grammar and Vocabulary:** Formal/academic words and phrases.

Learning Outcomes

At the end of the module, the learners will be able to

- understand the purpose of a presentation & make note of key points (L2)
- make formal structured presentations on general topics using PPT slides without graphical elements (L3)
- prioritize information from reading texts after selecting relevant and useful points (L3)
- paraphrase short academic texts using suitable strategies and conventions (L3)
- cultivate awareness about plagiarized content and academic ethics (L2)

Unit II

Listening: Following an argument/ logical flow of thought; answering questions on key concepts after listening to extended passages of spoken academic discourse. **Speaking:** Formal presentations using PPT slides with graphic elements. **Reading:** Understand formal and informal styles; recognize the difference between facts and opinions. **Writing:** Formal letter writing and email writing (enquiry, complaints, seeking permission, seeking internship); structure, conventions and etiquette. **Grammar and Vocabulary:** Phrasal prepositions; phrasal verbs.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend academic lectures by taking notes to answer questions (L2)
- make formal structured presentations on academic topics using PPT slides with relevant graphical elements (L3)
- distinguish facts from opinions while reading (L2)
- write formal letters and emails (L3)
- use a range of vocabulary informal speech and writing (L2)

Unit III

Listening: Identifying views and opinions expressed by different speakers while listening to discussions.

Speaking: Group discussion on general topics; agreeing and disagreeing, using claims and examples/evidence for presenting views, opinions and positions. **Reading:** Identifying claims, evidence, views, opinions and stance/ position. **Writing:** Writing structured persuasive/argumentative essays on topics of general interest using suitable claims, examples and evidence. **Grammar and Vocabulary:** Language for different functions such as stating a point, expressing opinions, agreeing/ disagreeing, adding information to what someone has stated, and asking for clarification.

Learning Outcomes

At the end of the module, the learners will be able to

- follow a discussion (L2)
- participate in group discussions using appropriate conventions and language strategies (L3)
- comprehend complex texts identifying the author's purpose (L2)
- produce logically coherent argumentative essays (L3)
- use appropriate vocabulary to express ideas and opinions (L2)

Unit IV

Listening: Understanding inferences; processing of information using specific context clues from the text. **Speaking:** Group discussion; reaching consensus in group work (academic context). **Reading:** Reading for inferential comprehension. **Writing:** Applying for internship/ job - Writing one's CV/Resume and cover letter. **Grammar and Vocabulary:** Active and passive voice – use of passive verbs in academic writing.

Learning Outcomes

At the end of the module, the learners will be able to

- draw inferences and conclusions using prior knowledge and verbal cues (L3)
- express thoughts and ideas with acceptable accuracy and fluency (L2)
- develop advanced reading skills for a deeper understanding of texts (L3)
- prepare a CV with a cover letter to seek internship/ job (L2)
- understand the use of passive voice in academic writing (L2)

Unit V

Listening: Understanding inferences - the processing of explicit information presented in the text and implicit information inferable from the text or from previous/background knowledge. **Speaking:** Formal team presentations on academic/ general topics using PPT slides. **Reading for Writing:** Structure and contents of a Project Report; identifying sections in project reports; understanding the purpose of each section; the significance of references. **Grammar and Vocabulary:** Reinforcing learning; editing short texts; correcting common errors in grammar and usage.

Learning Outcomes

At the end of the module, the learners will be able to

- develop advanced listening skills for in-depth understanding of academic texts (L3)
- collaborate with a partner to make presentations (L2)
- understand the structure of Project Reports (L2)
- use grammatically correct structures with a wide range of vocabulary (L3)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.

Sample Web Resources

Grammar/Listening/Writing

1-language.com

<http://www.5minuteenglish.com/>

<https://www.englishpractice.com/>

Grammar/Vocabulary

English Language Learning Online

<http://www.bbc.co.uk/learningenglish/>

<http://www.better-english.com/>

<http://www.nonstopenglish.com/>

<https://www.vocabulary.com/>

BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

<https://www.usingenglish.com/comprehension/>

<https://www.englishclub.com/reading/short-stories.htm>

<https://www.english-online.at/>

Listening

<https://learningenglish.voanews.com/z/3613>

<http://www.englishmedialab.com/listening.html>

Speaking

<https://www.talkenglish.com/>

BBC Learning English – Pronunciation tips

Merriam-Webster – Perfect pronunciation Exercises

All Skills

<https://www.englishclub.com/>

<http://www.world-english.org/>

<http://learnenglish.britishcouncil.org/>

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

Communicative English Lab-II End Exam Pattern

Internal Exam Pattern:

Day to Day Performance (10M)	Record (5M)	Internal Exam(10M)	Final Total (25 M)
In lab Activity Participation and day to day Assessment performance (10)	Completing the exercises in Lab Manual cum Record (5)	Written Exam (5) +Oral (5)	25(M)

NOTE:

- 10 day to day Assessments based on five modules carry grades which can be scaled to 10 marks.
- Similarly all 2 modules Practice work is graded that can be scaled to 5 marks for the Record
- Written exam is on Listening, Reading & Writing along with Grammar & Vocabulary.
 - a) **Listening:**(Note taking/inference meaning/watching Video clips & Listening to Audio Clip)5 marks
 - b) **Reading Comprehension:Chapter 13 to 16 in Wings of Fire**(Multiple-Choice/Multiple cloze/right,wrong,doesn't say)-5 Marks
 - c) **Writing:**Emails,/Letter writing/CV -10 Marks

- d) **Grammar & Vocabulary:**Common errors in grammar (5M) pg 108-114 from Avenues & Vocabulary (**How to talk About Personality types-pg31-57 (Session 1-3)** from Word power Made Easy (5 M)-10 Mark

Note: The written exam is for 30 marks and the final score will be scaled for 5 marks.

- Oral Examination is on (Group Discussion/Debate/Presentation Skills / Interview technique tasks from AVENUE Lab Manual)

External Exam Pattern:

- **Written test: 20 marks.(Listening+Reading+Writing+Grammar & Vocabulary)**

Note: LRWGV Activities are given from Internal exam Specified Syllabi.

- **Oral Exam: 10 marks (Debate/GD/Oral presentation) (Speaking)**

- **Viva-Voce by the External Examiner: 20 marks**

Note: Total marks allotted for the exam is 50

I Year - II Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
7	R20BSH-CH1202	Applied Chemistry Lab	BS	0	0	3	1.5

COURSE OBJECTIVES

- To familiarize the students with the basic concepts of Engineering Chemistry lab.
- To train the students on how to handle the instruments.
- To demonstrate the digital and instrumental methods of analysis.
- To expose the students in practical aspects of the theoretical concepts.

COURSE OUTCOMES

1. Apply the working principles of laboratory experiments in optics, electronics, pH meter, Conductivity meter to perform the experiments. (L3)
2. Compute the required parameter by suitable formula using experimental values (observed values) in optics, electronics, pH meter & Conductivity meter. (L3)
3. Analyze the experimental results through graphical interpretation. (L4)
4. Recognize the required precautions to carry out the experiment and handling the apparatus in the laboratory. (L2)
5. Demonstrate the working principles, procedures and applications. (L3)

List of Experiments

1. Preparation of Phenol-Formaldehyde resin
2. Preparation of urea-formaldehyde resin.
3. Determination of Sulphuric acid in Lead-acid storage cell.
4. Determination of strength of an acid by Conductometric metric method.
5. Determination of strength of an acid by pH metric method.
6. Determination of Copper in a copper ore
7. Determination of Zinc by EDTA method.
8. Determination of Hardness of a ground water sample.

Virtual Labs

1. Chemical Etching of Printed Circuit Boards(PCB)
2. Preparation of Nano particles using sol-gel method.

I Year - II Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
8	R20CSE-ES1202	Data Structures using C Lab	ES	0	0	3	1.5

Objectives:

- To develop skills to design and analyze simple linear and non linear data structures
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- To Gain knowledge in practical applications of data structures

Course Outcomes:

1. Analyze different searching and sorting Techniques.
2. Analyze concepts of linked lists and with their implementation of different Linked Lists
3. Apply the concepts of stacks and queues in real time applications
4. Analyze the non linear data structures trees and their operations
5. Implementation of different advanced Trees with their applications.

List of Programs:

1. Write C programs that uses recursive function to:
 - i) Compute factorial of a given number
 - ii) Solve the towers of Hanoi problem.
2. Write C programs to implement the following search algorithms:
 - i) Linear Search
 - ii) Binary Search
 - iii) Fibonacci Search.
3. Write C programs to implement the following sorting algorithms:
 - i) Bubble Sort
 - ii) Insertion Sort
 - iii) Selection Sort.
4. Write C programs to implement the following sorting algorithms
 - i) Merge Sort
 - ii) Quick Sort.
5. Write C programs to implement the following types of Lists
 - i) Singly linked list
 - ii) Circular Linked list
 - iii) Doubly linked list.
6. Write C programs that implement the following data structures using arrays:
 - i) Stack
 - ii) Queue.
7. Write C programs to implement the following Stack applications
 - i) Factorial
 - ii) Evaluations of postfix expression.
8. Write C programs to implement the following data structures using Lists
 - i) Stack
 - ii) Queue.
9. Write C program to implement the following types of queues
 - i) Priority Queue
 - ii) Circular Queue.
10. Write a C program to implement binary tree using arrays and to perform binary tree traversals
 - i) in-order
 - ii) post-order
 - iii) pre-order.
11. Write a C program to perform the following operations using linked lists:
 - i) insert an element into a binary search tree.
 - ii) Delete an element from a binary search tree.
 - iii) Search for a key element in a binary search tree.

References

1. G A V PAI, "Data Structures and Algorithms, Concepts, Techniques and Applications", Volume-1, 1st Edition, TataMcGraw-Hill, 2008.
2. Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures, A Pseudo code Approach with C", 2nd Edition, Cengage Learning India Edition, 2007.

I Year - II Semester

S. No.	Course code	Course Title	Category	L	T	P	Credits
9	R20BSH-MC1201	Environmental Science	MC	3	0	0	0

Course Objective:

- To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations.
- Students get awareness on pollution that is caused due to the day to day activities of human life to minimize the environmental degradation.
- To make student get awareness on the social issues, environmental legislation.

Course Outcomes:

Student will be able to

1. Understand about the environment and natural resources.
2. Understands about various attributes of different types of pollution and their impacts on the environment and control methods along with waste management practices.
3. Illustrate about the ecosystem and knows the importance of conservation of biodiversity.
4. Relate the current environmental impacts with the societal problems.
5. Identify the current population explosion and their impacts on the environment.

UNIT – I

Multidisciplinary Nature of Environmental Studies: Definition, Multi disciplinary nature of environmental studies, Scope and Importance, Need for Public Awareness.

Natural Resources : Forest resources – Uses of forest resources, deforestation-causes, consequences, Water resources – Use and over utilization of surface and ground water, Floods, drought, dams – benefits and problems, Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources:, Effects of modern agriculture, fertilizer-pesticide related problems, water logging, salinity, Energy resources: Renewable and non-renewable resources – Natural resources and associated problems, Land Resources: Land degradation, Soil erosion, Desertification.

Learning Outcomes

Students will be able to

- Relate scientific disciplines as they apply to environmental science, such as ecology, evolutionary biology, hydrology, and human behavior.(L1)
- Explain how water resources should be used.(L2)
- Articulate basic understanding of effects of modern agriculture on environment.(L2)
- Explain why renewable and non-renewable energy resources are important.(L2)
- Get awareness about land degradation, soil erosion & desertification.(L2)

Specific Applications:

- Different conservation methods of different natural resources like aforestation programs, social forestry programs, water conservation practices like rainwater harvesting, soaking pits.

UNIT – II

Environmental Pollution and Solid Waste Management: Environmental Pollution: Definition, Cause, effects and control measures of (a) Air Pollution (b) Water pollution (c) Noise pollution

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes, e-waste management, Role of an individual in prevention of pollution.

Learning Outcomes

Students will be able to

- Define and explain the various causes, effects and control measures of different types of pollution.(L3)
- Characterize solid waste and e-waste management.(L2)

Specific Applications:

- Different treatment methods for different types of pollution- cyclone separator, electrostatic precipitators, waste water treatment, solid waste management, e-waste management.

UNIT – III

Ecosystems, Biodiversity, and its Conservation

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem – Producers, consumers and decomposers, Food chains, food webs, Energy flow in the ecosystem, primary and secondary productivity, ecosystem regulation and development.

Biodiversity And Its Conservation: Definition: levels of biodiversity- genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity, India as a mega-diversity nation, Hot-spots of biodiversity- Indo Burma, Eastern Himalayas, Western Ghats, Threats to biodiversity- habitat loss, poaching of wildlife, Global environmental issues, Pollution, Man-wildlife conflicts, Conservation of biodiversity- In-situ and Ex-situ conservation of biodiversity.

Learning Outcomes

Students will be able to

- Understand the structure and functions and types of ecosystems.(L2)
- Identify the threats to biodiversity.(L2)
- Compare endangered and endemic species of India.(L2)

Specific Applications:

- Different conservation methods like gene bank, seed bank and botanical garden.

UNIT –IV

Social Issues and the Environment

Social Issues And The Environment: Water conservation- rain water harvesting and watershed management, Resettlement and rehabilitation issues of people, its problems and concerns, case studies-current issue regarding the covid-19.. Climate change- global warming, acid rain, ozone layer depletion, Environmental legislation- Wildlife Protection Act, Forest Conservation Act. Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act.

Learning Outcomes:

Students will be able to

- Articulate the basic structure, functions, and processes of key social systems affecting the environment.(L3)
- Aware of the reasons for various global environmental challenges.(L2)
- Explain the enforcement of Environmental legislation.(L1)
- Remember the various Acts enforced in India and some of their features.(L1)

Specific Applications:

- Water conservation practices like rain water harvesting, soaking pits and modern agricultural methods to minimize the environmental effects.
- Energy conservations methods in houses, industrial sector and commercial sector, apply environmental related laws in environmental issues.

UNIT – V

Human Population and Environmental Management:

Human Population: Population growth, Population explosion, Role of information Technology in Environment and human health.

Environmental management- Significance of EIA ,Environmental Impact Assessment- Methodology, Environmental Impact Statement, Environmental Management Plan, Environmental Audit- process.

Learning Outcomes

Students will be able to

- Understand about the population effects on environment.(L2)
- Be acquainted with role of information technology in environment.(L2)
- Understand about the various environmental management practices. (L2)

Specific Applications:

- Information Technology in different natural calamities and health aspect point of view.
- Industrial and developmental activities.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain, Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Text Books

1. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014.
2. Text Book of Environmental Studies, K. Raghavan Nambiar, Scitech Publications.
3. Environmental Studies by Palaniswamy – Pearson education
4. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

References

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental Studies by J.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.